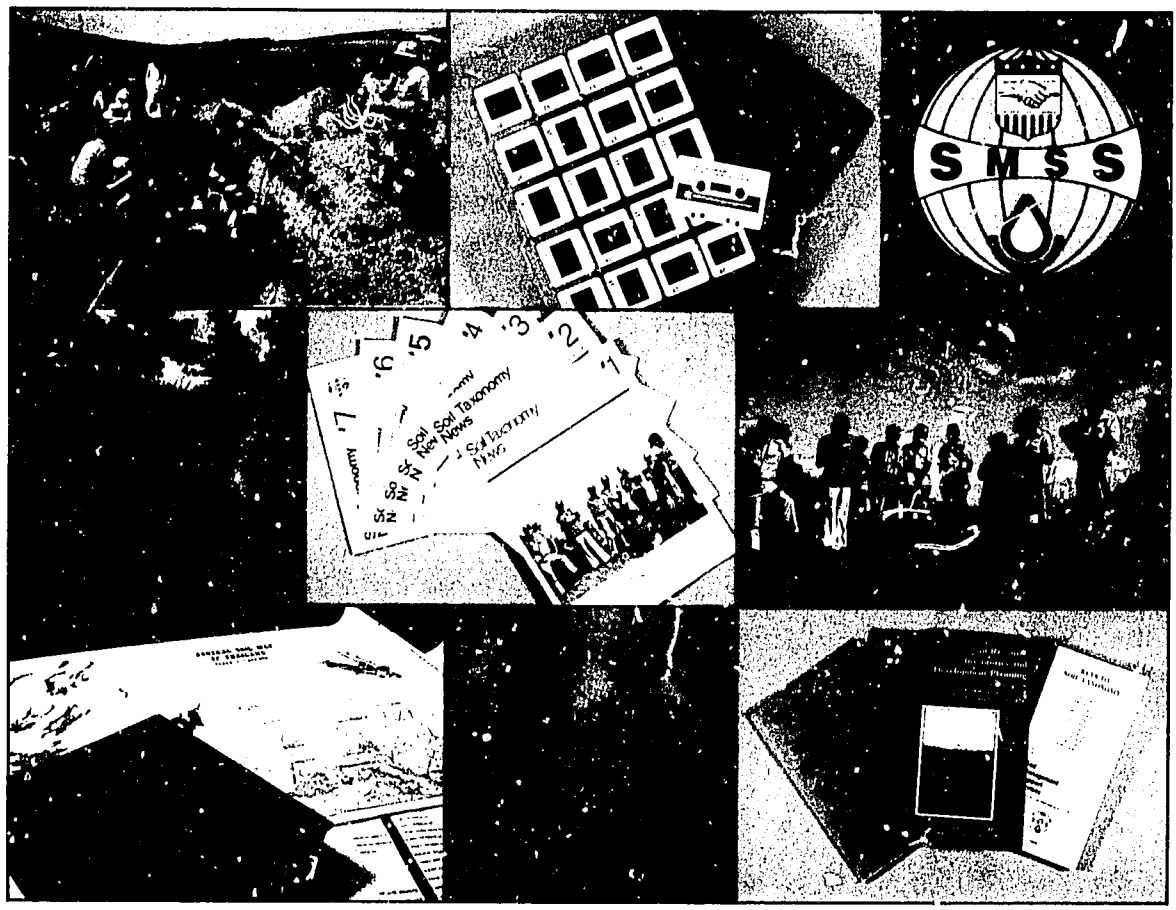
Progress Report

Soil Management Support Services

October 1, 1982–September 30, 1984



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PROGRESS REPORT

October 1, 1982–September 30, 1984

SOIL MANAGEMENT SUPPORT SERVICES

Hari Eswaran
Program Leader

Soil Management Support Services (SMSS) is a program of the Agency for International Development (AID), implemented by the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA) with logistical support from the Office of International Cooperation and Development (OICD) of USDA. SMSS provides technical assistance to developing countries in soil surveys, soil classification, and the use and management of soils.

R. S. Murthy (1925–1983)
Member SMSS Advisory Panel

This report is dedicated to R. S. Murthy, former Director of the National Bureau of Soil Survey and Land Use Planning, India. He, more than anyone else, worked relentlessly to increase and improve the quality of soils information in India and the developing countries. His "lab to land" program was an effort to utilize soils information—an example all countries can follow.

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ACKNOWLEDGMENTS

The achievements of Soil Management Support Services would not have been possible but for the excellent cooperation and collaboration of several organizations and individuals. The most important of these are our collaborators from foreign countries whose support and commitment to the program ensures continued success. Soil scientists throughout the world and heads of institutions made the program meaningful, relevant, and useful; we are indeed grateful.

Technical assistance requests are channeled by USAID Missions, and their support of the program and the facilities they provided to our temporary duty assignment (TDY) staff have ensured the success of consultations. The feedback we obtained from Missions about SMSS activities in each country has been valuable for evaluating and improving our assistance program.

An important cog in the wheel of our operations is the staff of John Hyslop, particularly Bob Wack, in the worldwide programs of OICD. OICD, together with the Office of International Activities of SCS, provided the logistical support for our activities.

R. J. McCracken and the staff of the Soil Division of SCS provided advice and assistance on technical problems of the SCS. The fact that we could use their staff on TDYs on very short notice was largely the reason for the confidence of the international community in our technical assistance program. We are also indebted to S. Holzhey, director of the National Soil Survey Laboratories, SCS, and his staff for their continued support of the program; they rushed through analyses on many an occasion so that we could meet deadlines.

In the last five years, universities and institutions in the United States have been very responsive to our requests. We would like to express our special appreciation to A. Van Wambeke and Cornell University, F. H. Beinroth and the University of Puerto Rico, S. W. Buol and North Carolina State University, and R. Olsen and the University of Nebraska. A special mention must be made of G. Uehara and the University of Hawaii, who, under a contract with OICD, were largely responsible for managing the program. Retired SCS staff have continued to assist us and we wish to thank in particular Roy Simonson, Cliff Overdall, and William Johnson.

Last but not least is the staff of Renewable Natural Resources (RNR) of the Office of Agriculture, AID, and in particular T. S. Gill, chief of RNR and Raymond Meyer, project monitor of SMSS. Their continuous encouragement, prodding, and feedback were the fuel for our progress. With ideas and advice flowing in from the SMSS Advisory Panel, they ensured that the program moved.

SUMMARY

Statistics

Title:	Soil Management Support Services (SMSS)
Contractor:	Office of International Cooperation and Development (OICD), USDA
Implementer:	Soil Conservation Service (SCS), USDA
Principal Investigator:	Richard Arnold
Program Leader:	Hari Eswaran
Soil Scientist:	Terry Cook
Soil Chemist:	John Kimble
Project Monitor:	Raymond Meyer (S&T/AGR/RNR)
Duration:	Phase I. 1 October 1979–30 September 1982
	Phase II. 1 October 1982–30 September 1987
Reporting Period:	1 October 1982–30 September 1984
AID Funding:	Phase I. $2,127,000
	Phase II. $5,250,000
	Total $7,377,000
	Until FY 1984 $3,757,000

Descriptive Background

> Soil-related factors are among the most significant environmental constraints on crop production in the developing countries.
>
> Nyle C. Brady (1980)

> As of 1975, each hectare (2.4 acres) of the globe's surface under cultivation had to provide for the nutritional needs of three people. By the end of the century, it is estimated the arable land-to-population ratio will become one hectare for six people.
>
> World Development Forum (1983)

The concerns expressed in these quotations are not new to those concerned with the constraints to food and fiber production in the less developed countries (LDCs). Millions of dollars are being spent on international agriculture research centers and other regional and national centers to improve agriculture research. Most of these are commodity-oriented research with spectacular outputs. Yields of wheat have been pushed up from about 500 kg/ha to more than 14 tons/ha under stringent experimental conditions; yet, in LDCs the average farmer's yield remains about 1000 kg/ha. The situation is similar for other crops. Close to a billion dollars has been invested in agriculture research for the tropics in the last two decades. Where have we gone wrong?

One reason probably lies in the lack of attention given to soils. The apathy of the CGIAR Institutes (Consultative Group on International Agriculture Research) toward soil research is surprising. Insufficient information on soils and particularly the geographic distribution of soils prevents agrotechnology transfer. LDCs do not have personnel or financial resources to do the necessary research on their soils and to match soil conditions to crop performance. Compounding this problem is the fact that many countries use different soil classification systems, thereby preventing the exchange of soil research information (usually acquired at high expense) from country to country. With the advent of *Soil Taxonomy*, this situation can now be overcome.

Increasing food production through improved land resource management in the developing countries became the goal of Soil Management Support Services. The four major objectives of the program are:

1. to provide technical assistance to AID and LDCs in problem identification, evaluation of opportunities, and 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 links for a more efficient utilization of agricultural information for crop production;
3. to improve the interpretation potential of soil surveys for agricultural development in LDCs; and
4. to refine *Soil Taxonomy* for intertropical areas and assist LDC scientists in its use and application in transferring agrotechnology from one tropical region to another similar region.

Accomplishments

Project activities were designed to meet these objectives. This progress report summarizes the activities and accomplishments during the first five years of operation.

In fulfillment of the first objective, technical assistance has been provided to 45 countries. A total of 157 persons were used as TDY consultants, who worked a total of 2113 person-days. TDY's were provided for:

1. helping countries establish policies and programs for solving problems in land use and food and fiber production;
2. helping plan, carry out, and evaluate soil surveys and soil conservation programs;
3. providing laboratory and field testing services;
4. publishing soil management information that is needed in land-use planning and for food and fiber production;
5. conducting seminars and other training sessions on soil management improvements and soil classifications;
6. interpreting soil properties to determine the potential of the soils for agriculture and to predict their response to management; and
7. disseminating new ideas for increasing soil fertility, improving plant nutrition, and controlling soil erosion and sedimentation.

With respect to the second objective, developing linkages, SMSS has established and worked with more than 20 international organizations and with countless national institutions. Many of the international and regional organizations have supported SMSS sponsored workshops and training courses. Through SMSS initiative and in collaboration with IBSNAT, an ASEAN network (ABSNAT) and an oceanic network (OBSNAT) are being discussed. As a result of the assistance provided by SMSS, many countries are adopting the standards of SCS in their soil survey programs.

Because of difficulties inherent in the program, SMSS has achieved least toward the third objective. Through discussions and lectures, SMSS is encouraging national soil survey organizations to improve the interpretation potential of their soil surveys. SMSS hopes to embark on a soil-crop yield data base.

Probably much of SMSS achievement has centered on the fourth objective. Today more than 30 countries use *Soil Taxonomy* as the primary system of soil classification and an equal number use it in addition to other systems. Another 45 countries use the system in scientific journals. SMSS has eight international committees working to refine *Soil Taxonomy* for its better use in the intertropical countries. It has organized seven soil classification workshops and nine training courses, and produces a number of publications and a quarterly newsletter.

Utilization and Impact

Use of SMSS, that is, the number of technical consultations; its participation in international committees, workshops, and training courses; and the demand for its publications has been extensive and shows signs of accelerating. SMSS has been a very active organization, and has clearly established its visibility and prestige on the international scene as well as its role with AID regional bureaus, USAID country Missions, and with personnel and organizations within the LDCs.

The impact of SMSS has been significant, though difficult to summarize or quantify. The technical consultations have resulted in a large number of specific problem identifications and solutions in target countries; and technology transfer activities have raised levels of professional expertise among scientists of the LDCs, as well as contributed to further refinement and acceptance of *Soil Taxonomy*. An indi-

rect effect of the involvement of SMSS personnel in international activities has been enhancement of the U.S. agroscience system.

The program has shown that major U.S. soil science resources can be tapped and channeled for international assistance in a manner both efficient and beneficial for all concerned. SMSS has established links and opened channels of communication that provide a basis for continued progress worldwide in soil science and in agricultural productivity.

INTRODUCTION

Soil Management Support Services is a project of technical assistance in soil survey and classification and in the use and management of soils, sponsored by the Agency for International Development (AID) and implemented by the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA). The project was created in October 1979 with the purpose of supporting USAID country Missions and through them providing technical assistance to institutions in the LDCs. Conceptually, it was created to strengthen LDC agricultural institutions; operationally it was designed to enhance communication among soil scientists and agrotechnology transfer among or within countries.

SMSS did not just happen; it was born out of a need; its creation was by design. In the early seventies, the Division of Renewable Natural Resources (RNR) of the Office of Agriculture (AGR) of the Bureau for Science and Technology (S&T) of AID provided grants to several land grant universities to develop their expertise in the field of tropical agriculture. This resulted in the Consortium of Soils of the Tropics formed by these universities who pooled their resources and talents to increase the productivity of tropical agriculture. In 1975, SCS published the U.S. System of Soil Classification—*Soil Taxonomy*—and in 1976, the Benchmark Soils Project (BSP) of the universities of Hawaii and Puerto Rico became operational. The main objective of BSP was to test the hypothesis that the soil family category of *Soil Taxonomy* could be used as the basis for agrotechnology transfer. BSP conducted its field experiments in Cameroon, the Philippines, Indonesia, and Brazil, apart from Puerto Rico and Hawaii. BSP also conducted training courses and workshops, and through its newsletters and publications created an awareness of *Soil Taxonomy*.

Soil Taxonomy, because of these efforts and because of its own merits, was being used increasingly in many countries. The FAO-UNESCO legend of the soil map of the world, which was already being used then, enhanced the acceptance of *Soil Taxonomy*, as many of the concepts and definitions in the legend were derived from *Soil Taxonomy*. Further, *Soil Taxonomy* was scientifically challenging as it introduced a completely new way of describing and classifying soils. It forced soil scientists to look at the soil more carefully, and required them to make more measurements; basically, it changed soil survey and classification from an art to a science.

The seventies also saw the greater self-reliance of national organizations in soil survey activities. The FAO-UNESCO soil-map-of-the-world project was coming to an end, and many of the postindependence bilateral or multilateral technical assistance programs for soils were being phased out. However, developmental projects were being accelerated in many LDCs to meet the challenges of the eighties. These projects lacked detailed soil resource inventories as well as the funds, personnel, and time to produce them.

In 1977, at the 10th International Congress of Soil Science at Edmonton, Canada, the president of the International Soil Science Society (ISSS) called for an international soil science institute to meet some of these challenges in the developing countries. At an informal session during the congress, William M. Johnson, deputy chief of the SCS, announced the plans of AID and SCS to develop a program for technical assistance in soil surveys. At that time, SCS had two informal groups, one working to improve the classification of tropical Ultisols and Alfisols with Frank Moormann as chairman and the other on Oxisols with Hari Eswaran as chairman. Johnson indicated that the work of these groups would be formalized and supported through the proposed international program. By then, the University of Puerto Rico, with funding from AID, had already organized two international soil classification workshops.

About 1979, the Soil Science Society of America decided that all experiments reported in its journal should be on named soils and that the soils should be classified according to *Soil Taxonomy*. Consultants on

soil surveys in LDCs were using the system in their reports, initially because it added credibility to the report and later because the system emerged as the defacto international soil classification system. Universities outside the United States soon included *Soil Taxonomy* as part of the soils curriculum. The University of Ghent, Belgium, for example, has taught it from 1966—from the developmental stages of the system—and the University of Malaya has given it as a full course since 1973.

Soil Taxonomy could be used as a cookbook; initially, this was how it was used. It was soon found, however, that soils were being misclassified because, (a) the correct analytical techniques were not available or not being used and (b) its statements were being misinterpreted. More importantly, it was being used only to classify holes in the ground and not as a tool to integrate the disciplines of soil science. Many users, biased by the previous genetic systems, could not appreciate the fact that the purpose of *Soil Taxonomy* was to make and interpret soil surveys; apart from merely classifying a soil, it could serve as a quality control mechanism for the soil survey program and, more importantly, it could serve as a basis for agrotechnology transfer. There was a real need to educate users.

The concerned users raised these questions to SCS, who soon determined that they had no mechanism for servicing international users. The need for a program to strengthen institutions in the LDCs, which were dealing with soil survey and classification, and a need to provide support services to ongoing AID country projects were the motives for the creation of Soil Management Support Services. Accordingly, a scope of work was developed, and SMSS came into being on 1 October 1979 as a participating agency service agreement between AID (RNR/AGR/S&T) and USDA (SCS). The office of International Cooperation and Development (OICD) of USDA was charged with the managerial aspects of the program, while SCS was to conduct the technical aspects.

At present SMSS is five years old. Where has it gone, what has it done, what impact has it had, on whom, and when? These questions will be raised when the mid-term review is conducted. This report attempts to answer some of them and reports not only achievements but also areas for improvement.

This report outlines activities and achievements from 1979 through September 1984, after half a decade of operation. As previous annual reports and the progress report (SMSS: Progress Report, October 1, 1979 to September 30, 1982) at the end of Phase I have reviewed activities during this period, they will only be summarized here; the activities for FY 1983 and 1984 will be elaborated in detail.

SMSS—Operational

The operational success of the program can be attributed to five components which have combined to make SMSS an efficient entity.

1. The Office of the Renewable Natural Resources of AID which, as the project monitor, provides direction for the program and links to the USAID missions. The support activities of SMSS could not have materialized except for the active support of RNR/AGR/S&T.
2. All travel and contractual arrangements are made by the Worldwide Programs of OICD in collaboration with the Office of International Programs of SCS. This eliminates a huge work load from SMSS staff.
3. The support services to SMSS provided by SCS in particular and USDA in general.
4. The soil analytical and consultation services provided by the National Soil Survey Laboratories of SCS is a crucial component of the services rendered by SMSS to developing countries.
5. The valuable guidance provided by the SMSS Advisory Panel is essential to the progress of the program.

A sixth component which SMSS has been fortunate in is the universities and individuals who have so unselfishly devoted their time and energies. Three universities which must be mentioned here are Cornell University, the University of Puerto Rico, and the University of Hawaii.

SMSS activities are outside the United States. Therefore, the last and perhaps the most important component of SMSS is the institutions and individuals in the LDCs, the USAID Missions, and the international agricultural research centers. Establishment and maintenance of links with these institutions is an important role of SMSS. Coupled with all these, the project staff has to maintain scientific and technical credibility.

Maintaining the efficiency of this machinery is the task of the program leader. It includes avoiding or circumventing bureaucratic problems, solving issues without hurting individual feelings, assessing indi-

vidual and national sensitivities, and avoiding involvement in these issues. At the same time the program leader must ascertain that SMSS objectives are met, catalyze national or regional interests and when necessary initiate activities or, when needed, support these activities while maintaining close contact with other national, regional, or international activities so that SMSS collaboration becomes relevant, meaningful, and cost-effective. The leader must maintain and nourish personal contacts, and develop a feedback mechanism to eventually assess the usefulness and impact of SMSS.

Statement of Objectives

The success of a project is generally evaluated in terms of outputs; sometimes the amount of money spent is also used as an indicator. A more meaningful indicator is the kind and magnitude of outputs in terms of staff strength, and also the cost-effectiveness of some of the activities. These coupled with the impact on the recipients and the multiplier effects of critical activities are perhaps the major indicators of the success of a program. These, however, must be evaluated in terms of the objectives of the program, and equally importantly, particularly in the context of developing countries, the constraints to such activities must also be borne in mind.

The objectives of SMSS are:

1. to provide technical assistance to AID and LDCs in problem identification, evaluation of opportunities, and planning and utilization of land resources, especially in the subject areas of soil survey, soil conservation, and soil fertility and management;
2. to develop worldwide linkages for the more efficient utilization of agricultural information for crop production;
3. to improve the interpretation potential of soil surveys for agricultural development in LDCs; and
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.

SMSS Advisory Panel Recommendations (1982)

In 1982, AID requested members of the SMSS Advisory Panel to review the project and make recommendations for future activities. The report of the chairman of the panel is included in Appendix I.

SMSS responses to the specific recommendations of the panel follow.

RECOMMENDATION 5.A. Most of the existing International Committees (ICOMs) were established as a result of recommendations of international workshops or other soil classification forums. The work of one committee (ICOM) is now complete although the report has not been tested and accepted as an approved amendment. The number and range of changes of the existing committees have diluted to some extent the efforts to finalize amendments. SMSS will not encourage the establishment of any new ICOMs by offering financial support, but we believe that it would be counterproductive to actually discourage new initiatives.

RECOMMENDATION 5.B. An International Committee on Aquic Soils (ICOMAQ) is already active, chaired by Dr. Frank Moormann, and is not a new committee. One of the charges of this committee is to prepare a classification of "paddy" soils.

RECOMMENDATION 5.C. We appreciate the panels endorsement of this important issue. A new SMSS position authorized for the National Headquarters Staff of SMSS will specifically deal with this task.

RECOMMENDATION 5.D. This recommendation is fully compatible with the advisory panel's concern for maintaining a strong focus on the properties and classification of soils within SMSS. The needs of important users of the proposed data bases certainly need to be considered but active crop modelling is certainly beyond the scope of SMSS. We fully agree that the pedon data base should include information on past and present use of the pedon environment. We would find it difficult, however, to include such information in the taxa use file since taxa or map units may have many uses in the past.

RECOMMENDATION 5.E. Again, we are pleased to have the panel's endorsement for these important activities. Interpretations related to use of fertilizers and soil testing was what we primarily had in mind when we urged stronger involvement of SMSS in the soil fertility area. We have been emphasizing soil survey interpretations in both soil classification workshops and *Soil Taxonomy* Forums (training courses). There is danger that treating both classification and interpretations at the same workshop may unduly dilute the treatment of either subject. Hence, the suggestion of specific workshops on interpretations is timely and appropriate.

RECOMMENDATION 6. SMSS appreciates this recommendation. We believe that research of this kind should be initiated and guided by the ICOMs. If USAID concurs, we will solicit proposals from the chairmen of ICOMs. (Research on soil moisture regimes, made under the auspices of ICOMORT, was funded by SMSS.) We fully endorse the need for more and systematic data collection to strengthen the scientific basis for *Soil Taxonomy*, especially in intertropical areas.

RECOMMENDATION 7. We fully concur in the thinking behind this recommendation. We believe that all SMSS functions should either serve directly the strengthening of national institutions or have this as a strong secondary objective.

RECOMMENDATION 8. SMSS is in the process of developing training packages and programs that emphasize the interpretive aspects of *Soil Taxonomy*. This is an emphasis item for future training courses.

RECOMMENDATION 9. Encouragement of regional, national and international correlation, and of formation of regional (international) committees to make and review amendments to *Soil Taxonomy*, has been incorporated in the *Soil Taxonomy* update procedures.

RECOMMENDATION 10. SMSS welcomes close linkage with agricultural research networks. Networks should request SMSS assistance through appropriate USAID missions. We believe that the implementation of recommendations 9 and 11 of this panel can best be achieved through cooperation with research networks.

RECOMMENDATION 11. SMSS greatly appreciates the suggestion of preparing monographs on the management properties of major soil taxa. As the panel is undoubtedly aware, it will be difficult to find qualified authors who have the time to prepare more monographs. SMSS will plan to start at least one monograph during this fiscal year. We would like to take advantage of the great experience of the panel for suitable taxa and authors. Most likely, a monograph dealing with important subdivision of a taxon (e.g., some families of several subgroups of a great group) might be most successful.

RECOMMENDATION 12. The Soil Conservation Service has issued procedures for processing amendments that we hope will make the process faster and more efficient. These procedures have been distributed to national and international cooperators who use *Soil Taxonomy* as a primary or secondary system. Presently, the backlog of proposals has been evaluated and revisions have been issued for all except those that were deferred until ICOMs complete their proposals. Proposals for major revisions are being studied by the ICOMs, but to date none of the committees has presented a final recommendation.

Most proposals made from within the United States have been approved; others are being studied by regional *Soil Taxonomy* committees. With the exception of a list of amendments proposed by Guy D. Smith in 1978, all proposals submitted to us from outside the United States have been approved or referred to an ICOM.

One source of proposals that we have not been able to respond to effectively is scientific journal articles. A fairly large number of journal articles, suggesting changes in *Soil Taxonomy*, have been published in the past few years. In the United States, these proposals have subsequently been channeled through National Cooperative Soil Survey procedures. Articles in foreign journals, however, have not necessarily been reviewed and channeled in a similar manner.

In order to improve access to proposals made in scientific journals, SMSS has contracted with the National Agricultural Library to produce a bibliography of *Soil Taxonomy*. This bibliography, to be updated periodically, will capture titles and abstracts of papers that refer to *Soil Taxonomy*, and should enable SCS to improve its response to proposed amendments.

Many proposals made as part of scientific papers are based on the often limited universe that was investigated. Such ideas are extremely useful in stimulating discussion and further research; if they have virtue they will contribute to the body of scientific thought that, eventually, will lead to changes to *Soil Taxonomy*.

RECOMMENDATION 12. This recommendation was restated in the chairman's letter of transmittal of the panel recommendations. We fully agree with this recommendation and the importance attributed by the panel to this issue.

Soil Taxonomy was originally conceived principally as a system for the National Cooperative Soil Survey (NCSS). The original procedures for amending *Soil Taxonomy* were in terms of the NCSS and did not consider adequately the needs of foreign countries. Indeed, the statutes of SCS specifically restrict SCS to work within the United States. Hence, until SMSS was formed, there was no legal means for SCS to address international concerns.

We have revamped the update procedures, the procedures have been reviewed by the chairmen of the ICOMs, and we hope that the new procedures will work better. Also, the computer age has come to our help. All of *Soil Taxonomy* is now on computer from which new editions can be printed cheaply. We have now published the *Keys to Soil Taxonomy* including all amendments, and we are preparing an updated *Keys*.

This, we hope, will ensure uniform use of *Soil Taxonomy* in the future.

We believe that we should be rather conservative in changing *Soil Taxonomy*. The use of *Soil Taxonomy* to provide a means of communication and technology transfer could be seriously impaired if there were too many changes. There should be a great deal of discussion and there must be a true search for basics and a disdain for cosmetic changes. Many of the changes that are under discussion now, while very useful to improve the use of *Soil Taxonomy* in some local areas—and making the system intellectually more appealing to most of us—do little to improve the capability of *Soil Taxonomy* to serve as a practical tool. There has, for example, been very little attention given to improving family criteria in soils; yet family criteria are extremely important to practical application of intertropical areas and the "cool-temperate heritage" of *Soil Taxonomy* is nowhere stranger than at the family level.

There is also the matter of testing. All taxa in the "Green Book," with specifically rated exceptions, were tested against the records of soil series as they are being mapped in the United States. Many taxa in previous approximations were deleted because they were not being mapped in the United States. Internationally, no record equivalent to the 13,000 soil series description of the NCSS exists, and entirely new and by necessity much less rigorous criteria for recognizing taxa must be established. We have tried to build some testing criteria into the new update procedures. Unless *Soil Taxonomy* remains tied strongly to mappable bodies of soil (in contrast to holes in the ground somebody happened to sample) it is in danger of losing its usefulness as one of the tools for "making and interpreting soil surveys."

TECHNICAL ASSISTANCE

Providing technical assistance to developing countries, though the prime objective of SMSS, has been necessarily slow. This is the component of SMSS activities which is perhaps underutilized. Technical assistance requests originate in LDC institutions and are channelled through USAID country Missions. The first task of SMSS was to create an awareness of the SMSS program and of the kinds of assistance available. This was done initially through a brochure and other information means to Missions. For the following reasons response was sporadic.

1. LDC institutions hesitated to make requests for fear of a negative response.
2. LDC institutions were unaware of the channels of approach, and the unique nature of SMSS—providing short-term technical assistance at no cost—was strange.
3. Some Missions hesitated to request in case they had to share costs.
4. Information on SMSS only reached the heads of institutions and not the soil scientists, who are the ones confronted with practical problems.
5. In some instances, though to a very small extent, distrust of the intentions of the program was a factor.

Creating an awareness of the program became an important task. This involved considerable travel for the SMSS staff, and in five years the following countries were visited or personal contacts established.

Visited	*Contacts Established*
Asia	
1. Pakistan	1. Nepal
2. India	2. Singapore
3. Thailand	3. Sri Lanka
4. Malaysia	4. Burma
5. Philippines	5. Taiwan
6. People's Republic of China	
7. Indonesia	
Oceania	
8. Papua New Guinea	6. Solomon Islands
9. Fiji	7. W. Samoa
10. Guam	8. New Caledonia
	9. Other Pacific Islands
Middle East	
11. Morocco	10. Tunisia
12. Syria	11. Algeria
13. Jordan	12. Iraq
14. Lebanon	13. Egypt
15. Somalia	14. Quatar
	15. Saudi Arabia
	16. Arab Emirates
	17. Oman
	18. Yemen
Africa	
16. Nigeria	19. Mali
17. Cameroon	20. Senegal
18. Zambia	21. Zaire
19. Tanzania	22. Upper Volta
20. Rwanda	23. Djibouti
21. Burundi	24. Zimbabwe
22. Sudan	25. Lesotho
23. Kenya	26. Botswana
Central America	
24. Panama	27. Jamaica
25. Costa Rica	28. Honduras
26. Trinidad	29. Mexico
	30. El Salvadore
	31. Belize
South America	
27. Ecuador	32. Colombia
28. Venezuela	33. Argentina
29. Brazil	34. Peru
30. Chile	35. Bolivia
	36. British Guiyana
	37. Surinam

Technical Assistance Requests

In its five years of operation, SMSS has responded to requests from 45 countries, involving about 2100 person-days of TDYs and 157 persons. Table 1 and Figure 1 summarize these activities. Appendix II provides the purpose for each TDY and also lists the persons involved and their institutions. Most of the persons involved in the TDYs were from the SCS-USDA; a few were from other USDA agencies and others were from U.S. institutions. Non-U.S. personnel were also employed when the scope of work required expertise not readily available or when language capability was essential.

SMSS has been very fortunate in being able to tap into the resources of USDA and other institutions in the country. The project has provided the best experts available and as a result both host countries and USAID Missions have been satisfied as well as impressed with the assistance they have received. Further, SMSS has been able to respond at very short notice. The cables we have received from Missions testify to the impressive services that have been provided. The short response time is also a testimony of the commitment of USDA to assisting developing countries.

In many countries, technical competence by itself is insufficient; to communicate effectively a knowledge of the language is essential particularly in Francophone countries. This is a large constraint with no immediate solutions. For this reason, foreign consultants have been used.

As can be seen in Table 1 and Figure 1, the number of TDYs vary from year to year and from country to country, primarily because they are unsolicited. USAID country Missions request only when they have an ongoing soil-related project. National institutions hesitate to request for reasons given earlier and, consequently, in order to make this component of the project effective, SMSS must continually create an awareness. This it does through:

- brochures, publications, and letters;
- briefing of Mission directors and Agriculture Development Officers;
- lectures to national institutions and societies on SMSS.

The summaries of the TDYs given in Appendix II clearly indicate that SMSS is fulfilling its first objective: "To provide technical assistance to AID and LDCs in problem identification, evaluation of opportunities, and planning and utilization of land resources, especially in the subject area of soil survey, soil conservation, and soil fertility and management".

TDY Briefs for FY 1984

Fiji

MISSION: 2 September 1983 to 1 October 1983; 29 days.

PURPOSE: To serve on the Agronomic Panel for the Crop Evaluation and Management Phase of the New Zealand AID Soil Classification and Benchmark Project in Fiji.

COOPERATING AGENCY: Fiji Ministry of Agriculture and Fisheries (MAF).

CONSULTANT: J. A. Silva, Principal Investigator, Benchmark Soils Project, Department of Agronomy and Soil Science, University of Hawaii.

NARRATIVE: Consultant was an overseas member of the Agronomic Panel of the Crop Evaluation and Management Phase (CEMP) of the New Zealand: Fiji MAF Soil Classification, Correlation, and Benchmark Program. The program comprises three distinct but interrelated components. First, detailed soil survey and soil classification of the 10 MAF agricultural research stations; second, national soil mapping, soil correlation, and soil classification; and third, the crop evaluation and management phase. The panel was made up of five overseas consultants and five Fiji staff. Consultant was appointed group leader of the panel and therefore had responsibility for coordinating the activities of the overseas panel members in the preparation of the report.

When the panel was formed it was called the CEMP panel. However, as the focus of the proposed project developed, the emphasis became the evaluation of soils and crops rather than management so the name was changed to Soil and Crop Evaluation Project (SCEP). The objective of the panel was to prepare a report by 30 September which would provide a framework for the SCEP project and include detail in the following areas:

1. Identify important, representative soil series on each agricultural research station on which experiments would be conducted.

TABLE 1.
TECHNICAL ASSISTANCE ACTIVITIES OF SMSS SUMMARY OF FY 80–FY 84

COUNTRY	FY 80		FY 81		FY 82		FY 83		FY 84		TOTALS	
	TDYS	P/D	TDYS	P/D	TDYS	P/D	TDYS	P/D	TDYS	P/D	TDYS	P/D
Belize			1	5							1	5
Bolivia			1	17							1	17
Brazil									2	12	2	12
Burundi	1	4					3	16	2	12	6	32
Cameroon	1	7									1	7
Chile					2	10	2	23			4	33
Costa Rica					3	33	4	50	2	14	9	97
Djibouti					3	63	2	43	1	46	6	152
Ecuador			4	83	4	47	2	19			10	149
El Salvador	2	8					1	2			3	10
Fiji							1	28			1	28
Guam							1	10	1	4	2	14
Guatemala	2	14			1	3	1	7			4	24
Honduras					1	6	1	4			2	10
India			1	45	1	35	5	40	2	6	9	126
Indonesia			2	20	3	45			2	26	7	91
Jamaica	2	28							1	13	3	41
Jordan					1	24			3	20	4	44
Kenya									1	2	1	2
Lesotho							1	20	1	4	2	24
Liberia			1	15							1	15
Malaysia					1	5			1	4	2	9
Mali			1	1	1	25					2	26
Morocco					1	12					1	12
Nicaragua							1	7			1	7
Nigeria									1	4	1	4
Pakistan									3	58	3	58
Panama					1	30	3	17			4	47
Papua New Guinea					2	37					2	37
Peru	3	90									3	90
Philippines	1	30			1	5	3	62	1	4	6	101
Puerto Rico			1	7	1	7					2	14
Rwanda	1	10	3	35	1	30	3	18	2	14	10	107
Senegal	3	56	3	63	1	11			1	11	8	141
Somalia							1	29	3	36	2	65
Sudan			4	59	1	10					5	69
Suriname			1	5							1	5
Swaziland			1	1							1	1
Syria			3	35	1	27					4	62
Tanzania			1	7							1	7
Thailand	2	28	1	40	4	73	4	94	2	29	13	264
Trinidad			1	7							1	7
Tunisia	1	4									1	4
Venezuela			1	7							1	7
Zambia							1	4	1	31	2	35
TOTALS 45	19	279	31	452	35	538	40	493	32	350	157	2113

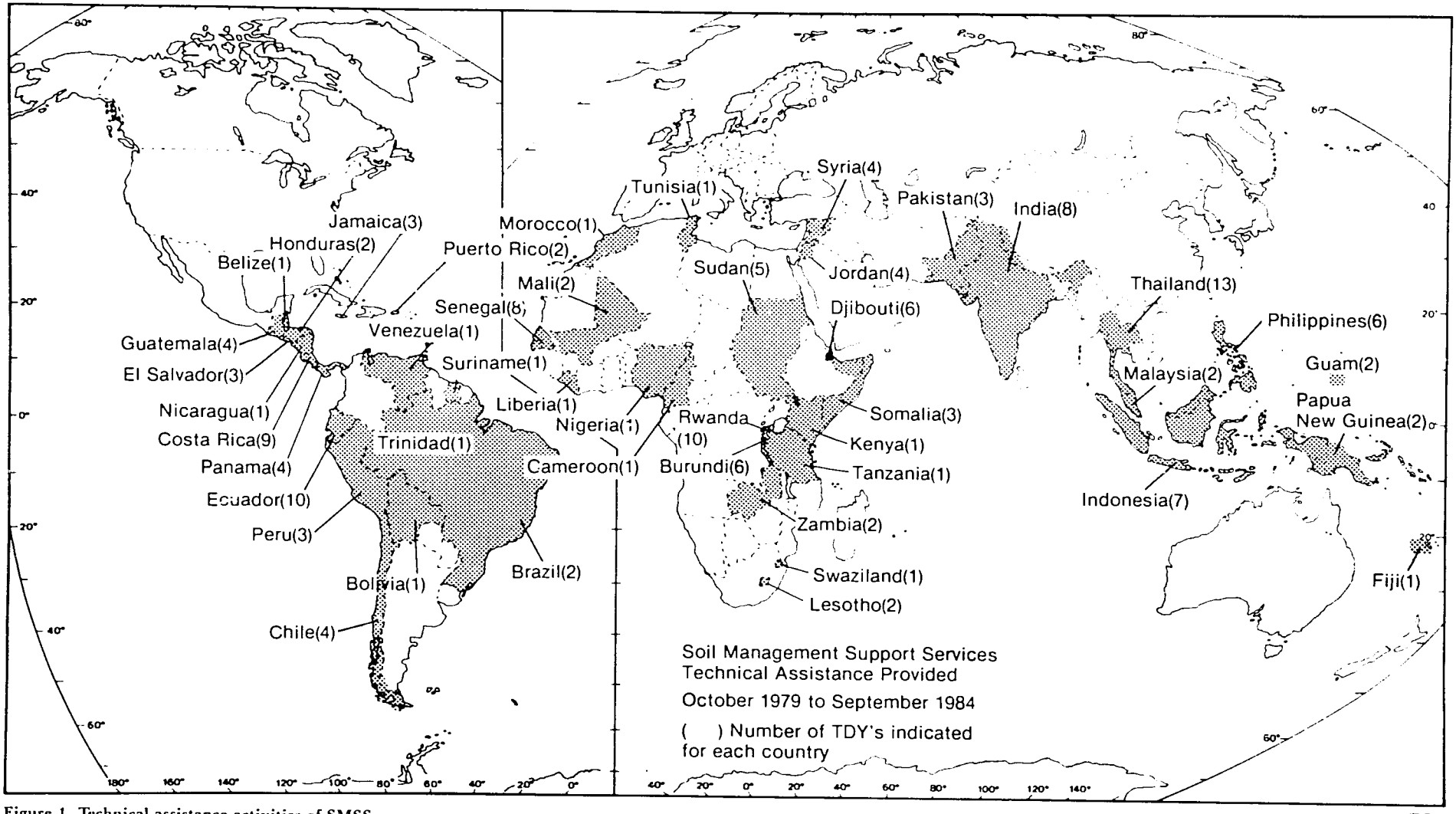

Figure 1. Technical assistance activities of SMSS.

(7/84)

2. Select crops to be evaluated in each experiment.
3. Prepare a detailed description of the trial designs to be used and of the experimental approach to be followed.
4. Prepare a five-year work plan which includes staff requirements, soil and climate monitoring instruments, fertilizer and pesticide requirements, soil and plant analyses needs, and so on.
5. Recommend project coordination and lines of responsibility within MAF and provision for periodic technical reviews.
6. Prepare a five-year budget with detailed itemization of expenditures.

This report would be used as a proposal to solicit funds for the project from various funding agencies.

ACCOMPLISHMENTS: The panel has outlined plans and procedures for the series of experiments to be carried out in the project. It has also selected sites, soil series, and crops and has recommended a priority order for research based on the area distribution, current and potential use of the soil series, and the national importance of the crops. Proposals have also been prepared to ensure effective analysis, interpretation, and publication of the experimental results. The estimated cost of the project over the five-year period, 1984 to 1988, is $1,130,000 (in 1983 Fijian dollars).

The final report was completed in January 1984 and was submitted to potential donor agencies for funding. It will also serve as a model for developing countries to use in establishing their own benchmark soils network for gathering information to transfer to similar soils in the country.

Senegal

MISSION: 1–11 October 1983; 11 days.

PURPOSE: To assess the factors contributing to the degradation of the soils (and agricultural productivity) in the Senegalese Ground Nut Basin.

COOPERATING AGENCIES: U.S. Agency for International Development (USAID); Office of International Cooperation and Development (OICD); Senegalese Agricultural Agencies SODEVA, ISRA, and Eau et Forets; Soil Management Support Services (SMSS).

CONSULTANT: Terry J. Clement, District Conservationist, Soil Conservation Service, Jennings, Louisiana.

ACCOMPLISHMENTS: A review of the problems contributing to the degeneration of the Ground Nut Basin (GNB) was made. Information was gathered from local government technicians, specialists, Senegalese agricultural agencies, and consulting firms such as the Office de la Recherche Scientifique Outre-Mer (ORSTOM). The low organic matter content of the soils appears to be a major factor in decreasing yields and soil tilth. The addition of organic matter by manuring, composting, and crop residues was discussed. The use of the *Acacia albida* tree as a source of organic residue and nutrients was investigated. Results from research sites proved promising as a combination of interplanted *Acacia albida* and peanuts, millet, or cow peas was used.

Observation indicated that erosion was not a serious problem, especially that from rainfall, as much of the GNB is sandy. Cross-slope planting, grassed waterways, and a more permanent crop, such as fruit trees or firewood trees, on the steeper slopes would protect those soils, reduce erosion, and increase water conservation on the upper slopes. Wind erosion could be reduced effectively by introducing efficient and profitable windbreaks, which could also be used for selective firewood cutting.

Increased crop diversity, especially tree crops, could increase profits for local farmers by up to three times, as indicated by those in SODEVA and ISRA.

Other recommendations included crop pest control of nematodes, improved cultivation practices other than use of weak or underfed animals, and the need for field trials on the use and application of lime and commercial fertilizer.

Somalia

MISSION: 4 October to 4 November 1983; 30 days.

PURPOSE: To develop a master plan to optimize the resources of the Juba River Valley.

COOPERATING AGENCIES: U.S. Agency for International Development (USAID); Juba River Valley Development Ministry (MJVD); University of Somalia; Tse-tse Fly Project; United Nations Food and Agricultural Organization (FAO); U.S. Bureau of Reclamations (USBR); U.S. Soil Conservation Service (SCS); Soil Management Support Services (SMSS).

CONSULTANTS: Otto Baumer, Research Soil Scientist, National Soil Survey Laboratory (NSSL), USDACS Lincoln, Nebraska; Val Carter, Regional Soil Scientist, Lower Colorado Region, USBR Boulder City,

Nevada; Marvin J. Voight, Hydraulic Engineer, USBR Bismark, North Dakota.

ACCOMPLISHMENTS: There are three basic components (inputs) required to undertake and implement the master plan:

1. a soils and land classification study,
2. an environmental / socioeconomic analysis, and
3. the development of a master plan through MJVD for the Juba River Valley.

All three components are important, but priorities were determined for integrating and coordinating the inputs. The first priority is two contracts as well as a short-term consultancy for developing the master plan.

From the review of existing data and after field trips, the team concluded that:

1. there are about 267,000 hectares of land that are potentially arable, and
2. highest priority should be given to the upper Juba Valley Region between Fanoole and Baardhere for reconnaissance studies. Little or no data is available for this region.

The project recommendation is that implementation of the studies be through a Participating Agency Service Agreement (PASA), and that the agreement cover both the reconnaissance and the detailed requirements. Estimated personnel costs for the reconnaissance project are US$900,000.

The team met with the Director at USAID/Somalia, Louis Cohen, with the Director General MJVD, and other members of their staffs. Points of discussion included USAID participation in the MJVD project, training and participation of Somali personnel, standards and procedures of USDA and USBR of the proposed reconnaissance, inclusion at parts of the Shabelli Valley flood plain, and coordination of studies and logistics for all parties concerned to complete the project by 1985. These meetings were supported by information and data gathered during several field trips to tse-tse fly projects, areas along the Juba River between Yountoy and Baardhere, a rice project developed by the Chinese near Gelib, a pilot project at Saakow, and other irrigated and dry-farmed areas in the valley.

Rwanda and Burundi

MISSION: 12 September through 18 October 1983; 37 days including travel (20 days in Rwanda and 11 days in Burundi).

PURPOSE: To sample 13 soil profiles in Rwanda, to sample 10 soil profiles in Burundi, and to make a soil survey map of 400 hectares on the Kajondi Farm in Burundi using *Soil Taxonomy*.

COOPERATING AGENCIES: USAID and SCS in collaboration with Carte Pedologique du Rwanda, University of Louvain, and University of Ghent, Belgium, International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT), and in cooperation with the governments of Rwanda, Burundi, and Belgium.

CONSULTANT: B. Arville Touchet, State Soil Scientist, USDA, SCS Alexandria, Louisiana.

ACCOMPLISHMENTS: Contacts were made between USAID Missions in Rwanda and Burundi and Hari Eswaran from USDA, SCS-SMSS. As a result of Eswaran's visit to the two above mentioned countries, plans were made for USAID and SCS-SMSS to assist the two countries in sampling and analyzing soils in preparation for a *Soil Taxonomy* course in French for soil scientists from East African countries with major emphasis on the IBSNAT program.

The in-country(s) activities consisted mainly of sampling soil profiles in every major land resource area, soil profile descriptions, preparation of samples, and field mapping on the Kajondi Farm in Burundi.

During the assignment period 13 soil profiles were described and sampled in Rwanda, 10 soil profiles were sampled in Burundi, and in addition a soil survey was made on 400 hectares of land on the Kajondi Farm in Burundi using *Soil Taxonomy*. Five additional soil profiles were sampled on Kajondi Farm for taxonomic placement. The soil samples were prepared for shipment to the National Soil Survey Laboratory (NSSL) in Lincoln, Nebraska. Four additional soil profiles were described and sampled in Rwanda and included with Rwanda samples for shipment to NSSL by Carte Pedologique du Rwanda personnel.

The field work of the assignment was completed 14 October 1983, and the cartographic work on the Kajondi Farm soil map and the editing of the soil profile descriptions continues.

The training course in *Soil Taxonomy*, in French, is scheduled for 8-19 October 1984 in Rwanda and Burundi.

OBSERVATION AND CONCLUSIONS: During travels in both Rwanda and Burundi, consultant noticed that

the intensive cropping of steeply sloping land, in many cases, causes soil erosion problems. Farming practices in banana and coffee plantations call for mulching. This practice not only reduces erosion, but also enhances soil building.

In Rwanda, soils in the valleys commonly are planted to tea, paddy rice, and sugarcane on large scale operations. This seems very appropriate in most cases. But sugarcane production on organic soils (Histosols) in some of the valleys will probably diminish as the soil subsides, wetness increases, and soil acidity increases. It is the consultant's opinion that paddy rice is better suited to organic soils than sugarcane, especially to reduce the rate of soil subsistence.

Large areas of clayey soils (Vertisols) in the northeast part of Rwanda are not being utilized for farming. In this area the potential for the development of agriculture is high, but the hard clayey soil and wetness make it nearly impossible to till by hand. Large mechanized farming may be a partial solution to realize the potential.

Since the soil map of Rwanda that is being made by Carte Pedologique du Rwanda is being correlated to *Soil Taxonomy*, better utilization of this map is visualized. Agrotechnology transfer utilizing *Soil Taxonomy*, Carte Pedologique, and IBSNAT have great potential here, and with the least amount of additional experimentation.

Erosion data collection is being done in Rwanda through the International Development Program. Collection plots, located throughout the country, should be classified using *Soil Taxonomy* and Carte Pedologique. The plot data could then be extrapolated and the location and extent of problem soils could be realized using the soil map. We should look carefully when integrating these different programs. An evaluation should be made on the possible benefit of a coordinated effort.

Kajondi Farm in Burundi is just beginning to realize its potential for a seed source for varied crops in this area. *Soil Taxonomy*, the soil survey map, and the IBSNAT program integration in this project can only advance this kind of research and application to the head of the agrotechnology transfer line.

All in all, the mission to the two countries was a success. This was not by accident, but by design. The great team effort in both countries deserves all the credit.

Zambia

MISSION: 1 November 1983 to 4 December 1983; 31 days.

PURPOSE: Describe and sample 20 benchmark soils and submit samples to Soil Survey Laboratory in Lincoln, Nebraska, for analysis, and prepare a paper for presentation to soil scientists on "Aspects of Soil Classification." The benchmark soils selected will be used as standards for the classification *(Soil Taxonomy)* of series and future mapping.

COOPERATING AGENCIES: USAID/Zambia, Zambia Ministry of Agriculture, and Norwegian Aid for Development (NORAD).

CONSULTANT: Donald C. Hallbick, State Soil Scientist, Soil Conservation Service, Columbia, South Carolina.

ACCOMPLISHMENTS: SMSS, with the support of USAID, has been working with the Zambia Ministry of Agriculture to provide soils information for agricultural uses. Soil surveys have been completed on many tracts of land in Zambia. A series legend for each province has been used. The series have not been placed in a classification system such as *Soil Taxonomy*. F. R. Moormann, from the Netherlands, suggested in June 1983 that representative benchmark soils be described, sampled, and analyzed so that a soil classification system can be used. By doing this, more complete data can be obtained for these series, they can be classified according to a system, and interpretations for various uses can be obtained. Also, mapping will be uniform throughout Zambia and a national soils map can be developed.

The assignment was to describe, sample, and classify 20 sites of which 10 were on regional research stations. Some of the sites will also be used as part of a training course for soil scientists and other users of soils information. Also, a paper was prepared on "Aspects of Soil Classification" which was delivered to the soil scientists, although not personally because of scheduling problems.

The soil survey in Zambia has mostly been on an individual area (ranch) basis using soil series without any classification scheme. With the start of a systematic scheme of mapping at a scale of 1:100,000, a classification scheme, probably *Soil Taxonomy*, will be used. This will enable the soil maps and the series to be uniform throughout the country. The benchmark sites sampled will enable the soil survey unit to classify the series and help in determining if new series are needed or if some of the present series can be combined.

There will be a need for additional training of the field soil scientists in the use of *Soil Taxonomy*.

Costa Rica

MISSION: 16 October to 5 November 1983; 21 days.

PURPOSE: To sample soils for Centro Agronomico Tropical De Investigacion Y Ensenanza (CATIE) and to participate in the VI International Forum on Soil Taxonomy and Agrotechnology Transfer.

COOPERATING AGENCIES: U.S. Agency for International Development (USAID); CATIE; and University at Costa Rica (UCR).

CONSULTANTS: John M. Kimble, Research Soil Scientist, National Soil Survey Laboratory, USDACS, Lincoln, Nebraska; Mario Valverde, Soil Scientist—Correlation, USDACS, Fresno, California.

ACCOMPLISHMENTS: During the first week 12 pedons were sampled in representative areas for benchmark sites preselected by CATIE and UCR. The forum brought together a variety of soils and agricultural conditions representing major areas of Central America. Participants were from Costa Rica, Panama, Honduras, El Salvador, and Guatemala.

Discussions were also held with David W. Joslyn, Regional Agricultural Development Officer (ROCAP), USAID. A need for a regional laboratory for soil characterization was emphasized. With some modification the laboratory at CATIE would be able to accomplish this task. Also needed is a regional soil scientist for Central America to coordinate and correlate soils as they are used within and among countries. This responsibility would be a major portion of one individual's job. Interest has also been expressed to develop a general soil map of Central America. A regional soil scientist or project leader would facilitate this effort.

Lesotho

MISSION: 5 September to 4 October 1983; 25 days.

PURPOSE: The objectives were (1) to provide technical assistance to the Lesotho Ministry of Agriculture, Conservation Division (soils section) in geomorphology, soil classification, and in developing series concepts in view of recent laboratory data and (2) to photograph soils for possible inclusion in Benchmark Soils of the World.

COOPERATING AGENCIES: Lesotho Ministry of Agriculture, Conservation District (soils section); U.S. Agency for International Development (USAID); Office of International Cooperation and Development (OICD); Soil Management Support Services (SMSS).

CONSULTANTS: P. Matt Cauley, Soil Scientist Adviser, Lesotho Ministry of Agriculture, Maseru, Lesotho, and David E. Lewis, Jr., Assistant State Soil Scientist, Soil Conservation Service, Nashville, Tennessee.

ACCOMPLISHMENTS: The first part of the assignment took place in the field making soil observations of representative pedons of series that are being mapped in Lesotho. Series descriptions prepared by the Lesotho soil survey team and laboratory data obtained from the National Soil Survey Laboratory in Lincoln, Nebraska, were reviewed at each site. Instructions on field techniques for estimating soil properties were demonstrated at several sites for the benefit of the Lesotho survey team. Photographs in black and white and color slides were made of most soil profiles and soil landscapes.

A visit was made to the Range Management Project area near the Selabathebe National Park. The purpose of the trip was to locate the most suitable soil areas for establishing permanent pasture with an objective of demonstrating to the local herdsmen the benefits of managed grazing land.

A review was made of the work in the soil survey office in Maseru. Series descriptions were revised, laboratory data received further consideration, a tentative classification of the soils was developed, and training was provided on developing interpretation records for the soils of Lesotho.

Djibouti

MISSION: 4 February to 22 March 1984; 46 days.

PURPOSE: To assess the capability and functional operation of the Djibouti Soil and Water Laboratory.

COOPERATING AGENCIES: USAID/Djibouti; Djibouti Ministry of Agriculture.

CONSULTANT: George Holmgren, Research Soil Scientist, National Soil Survey Laboratory, USDA, SCS, Lincoln, Nebraska.

ACCOMPLISHMENTS: The assignment, to help make the Djibouti Soil and Water Laboratory operational, was achieved. The laboratory now has the capability to produce data necessary for management recommendations under saline conditions. This capability needs to be merged with a program for collecting

samples, interpreting results, and demonstrating the efficiency of the recommendations.

ROLE OF THE LABORATORY: Agriculture in Djibouti is primarily undertaken on small garden plots irrigated with ground water of marginal quality. Salt and sodium accumulation are the two principal hazards of this type of agriculture. Evaporation of applied water leads to salinization. An unfavorable chemical balance in the water will cause development of a sodium soil with poor physical properties and low infiltration rate.

Both of these conditions can be ameliorated with proper management. Water can be supplied in excess to leach out accumulated salts. If the sodium status of the water is too high, gypsum can be applied to prevent sodium accumulation. Fertilization is also necessary to offset the nutrient losses during leaching.

Quantification of these management techniques is the key to successful agriculture in Djibouti. The Soil and Water Laboratory is now equipped to provide the data required to make these specific recommendations. The laboratory should undertake sampling programs to assess the range of the current problems and make recommendations based on the *USDA Salinity Handbook 60.* In addition, carefully controlled field trials should be undertaken on the government garden plots to refine these recommendations for the Djibouti environment.

Jamaica

MISSION: 29 April to 12 May 1984; 13 days.

PURPOSE: Review operations of the soils laboratory and determine soil fertility needs, set up a framework for soil classification and soil correlation, and explore possibilities for determining soil-water and crop requirements for crop production.

COOPERATING AGENCIES: USAID/Jamaica; Rural Physical Planning Division (RPPD), Jamaican Ministry of Agriculture, and Soil Survey Unit (SSU).

CONSULTANT: Rod Harner, Head, Soils Staff, Midwest-NTC, USDA/SCS, Lincoln, Nebraska.

ACCOMPLISHMENTS: Met at various places and times with staff from the Ministry of Agriculture, RPPD, SSU, USAID, Netherlands Soil Survey Project (NSSP) to discuss the needs and progress of the soil survey in Jamaica. Discussions were also held to assess the need for soil correlation for agrotechnology transfer between countries and within the country for interpretation of soils data for crop production. A review was made of the immediate and long-term needs for assistance in correlation, training in mapping and classification of soils, and improving assistance to farmers in the areas of soil fertility and crop production. Reviewed the procedures used in the soil survey of St. Catherine's Parish, including method and intensity of data collection, plotting soil boundaries, description of taxonomic units, and the use of soil samples for correlation purposes.

A tour of the soil survey laboratory was conducted with lab personnel during which lab procedures and equipment needs were discussed. The Comprehensive Resource Inventory and Evaluation System Project (CRIES) was reviewed to assess the capability to delineate climatic zones significant to agriculture and its relationship to soil moisture regimes in *Soil Taxonomy.* Interpretation of crop suitability and Land Utilization Type (LUT) was discussed as well as the function of the advisory soil fertility officers in interpreting soil fertility tests and making recommendations to farmers.

Met with Bill McClusky, director, Office of Agriculture and Rural Development, USAID, and with staff members to review the findings of the assignment and to recommend needs and future assistance and direction for the SSU.

Pakistan

MISSION: 29 March to 22 April 1984; 23 days.

PURPOSE: To sample Alfisols, Aridisols, Inceptisols, Entisols, and Vertisols for laboratory characterization in support of the Soil Survey of Pakistan (SSP) and in preparation for an International Forum on Soil Taxonomy and Agrotechnology Transfer to be held in 1985 in Pakistan.

COOPERATING INSTITUTIONS: USAID/Islamabad, Soil Survey of Pakistan; Pakistan Agricultural Research Council (PARC).

CONSULTANTS: Terry D. Cook, Soil Management Specialist, SMSS-USDA/SCS, Washington, D.C., and Dennis Lytle, Soil Survey Party Leader, USDA/SCS, Yuba City, California.

ACCOMPLISHMENTS: Twenty-three pedons were described and sampled in Pakistan during the three-

week trip. Samples were collected for both the NSSL at Lincoln, Nebraska, and for the SSP laboratory in Lahore. These samples are in preparation for an International Soil Classification Training Forum to be held in Pakistan in 1985.

A wide variety of soils were sampled from the dry arid regions of Hyderabad to the moist, humid regions of Murree. Young soils to very old soils were included and those with no development to those with strongly developed argillic horizons were described, sampled, and classified. Crops varied widely from irrigated wheat, clover, vegetable, and orchard crops to dryland small grains and other dryland crops.

The soil scientist from SSP had done an excellent job of describing and classifying their soils, using the Soil Survey Manual and the seventh approximation with some amendments. They had been essentially unaided since 1965 when John Douglas of the SCS, Washington, D.C., spent nearly two years assisting in the development of their program. Their success in completing their soil surveys and in maintaining such high standards speaks well for their dedicated efforts. Data from the 23 soils sampled should provide an important benchmark for the SSP and additional work in the future.

Jordan

MISSION: 28 May to 1 June 1984; 7 days.

PURPOSE: To develop a project proposal for assistance to the Government of Jordan for a national soil survey program.

COOPERATING AGENCIES: USAID, National Planning Council (NPC), Ministry of Agriculture (MOA), and the University of Jordan.

CONSULTANT: William M. Johnson, Gleneden Beach, Oregon.

ACCOMPLISHMENTS: In Jordan there is an understanding of the need and value of a national soil survey program. There is a small group of well-trained and skilled soil scientists capable of beginning the development of a national soil survey based on modern soil classification and field cartographic methods.

Critical requirements of a new soil survey program for Jordan include:

1. Authorization of a new agency of the MOA, a Directorate of Soil Survey and Land Classification.
2. Appointment of five qualified soil scientists the first year and nine more staff during the next three years. At least six of these appointees should be supervisors.
3. Assistance from the USDA/SCS Soil Survey Division as advisers during the formative years.
4. Development of a strong scientific and technical training program.
5. Creation of a cooperative agreement with the Jordanian Geographic Centre for cartographic and map services.
6. Establishment of a cooperative agreement for the services of a soil laboratory with the Directorate of Agricultural Research and Extension of the University of Jordan, or both.

A budget for a four-year period was prepared listing personnel, equipment, laboratory needs, training, and contingencies.

TECHNOLOGY TRANSFER

Agrotechnology transfer is defined as the taking of an agricultural innovation from its site of origin to another agroecologically similar environment where it is likely to succeed. SMSS has no mandate to conduct research in agrotechnology transfer and neither is it meant to be involved in such transfer activities. Its objective is to facilitate the transfer by providing the scientific basis for it. The two components of the transfer are:

1. The vertical transfer, which is essentially the transfer of technologies to the small farmer and requires a comprehensive appreciation of the socioeconomic constraints and potentials of the farmer. This is necessarily a task of national institutions.
2. The horizontal transfer, which is the transfer among countries or regions. It involves a good understanding of the agroenvironment of the source and of the potential site and an appreciation of the technology.

In the past, agrotechnologies have been grafted onto countries without a good appreciation of the agroenvironment, producing in many cases unwarranted surprises. The SMSS objective is to minimize failures and maximize successes.

Though there are many variables affecting the success or failure of a transfer, one key factor is the information about soils. SMSS strives to strengthen national institutions and scientists so that they can produce quality soil resource inventories and assists them in the use of a common soil and classification system so that they can be informed of the soil conditions of other areas and receive soil-based agrotechnologies. *Soil Taxonomy*—the U.S. system of soil classification—has been established as the only international system designed for making and interpreting soil surveys and is a vehicle for agrotechnology transfer. In the last five years, SMSS has been involved in activities to create an awareness of the system, to familiarize countries with the system, and to use the system within countries. The following sections document the strategy of SMSS toward its objectives and the successes it has had.

Institutional Linkages

The second objective of SMSS is "to develop worldwide linkages for a more efficient utilization of agricultural information for crop production." A project like SMSS relies heavily on linkages with national, regional, and international institutions for several purposes.

a. To utilize the experience and expertise in these institutions.
b. To act as a broker in the exchange of information from one institution to another.
c. To develop mutually beneficial collaborative activities.

In the past five years, SMSS has had the privilege to work with the following international or regional organizations:

1. International Crops Research Institute for the Semi-Arid Tropics, (ICRISAT), India
2. International Rice Research Institute, (IRRI), Philippines
3. International Institute of Tropical Agriculture (IITA), Nigeria
4. Food and Agriculture Organization (FAO), Rome
5. United Nations Environment Program (UNEP), Kenya
6. International Soil Science Society (ISSS), Netherlands
7. International Soil Research and Information Centre (ISRIC), Netherlands
8. Office de Recherche Scientific et Technique Outre-Mer (ORSTOM), France
9. Algemeen Beschaft voor Ontwikkelings Samenwerking (ABOS), Belgium

10. German Technical Assistance (GTZ), West Germany
11. Norwegian Technical Assistance (NORAD), Norway
12. Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD), Syria
13. World Bank, USA
14. Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE), Costa Rica
15. South East Asian Centre for Research in Agriculture (SEARCA), Philippines
16. Land Resources Division, Ministry of Overseas Development (LRD), Great Britain
17. International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT), Hawaii, United States
18. Australian Centre for International Agriculture Research (ACIAR), Australia
19. International Board for Soil Research and Management (IBSRAM), Thailand
20. Kagera Basin Authority (KBO), Rwanda
21. Food and Fertilizer Technology Centre (FFTC), Taiwan
22. Centro Internacional de la Papa (CIP), Peru
23. Centro Internacional de Agricultura Tropical (CIAT), Colombia
24. International Fertilizer Development Corporation (IFDC), Alabama, United States
25. Asian Development Bank (ADB), Philippines

The collaborative activities within these regional and international institutions range from simple exchange of information to joint activities. Many of the activities are elaborated later.

International Committees

Refining *Soil Taxonomy* for its better use in the intertropical areas was an activity undertaken early by SMSS. Through suggestions from the international scientific community, areas of weakness are being identified, and international committees (ICOMs) under the chairmanship of leading soil scientists are being formed. Much of the work of the ICOMs is done through correspondence, and when the ICOMs have reached a certain stage in their discussions, a workshop is organized to allow the members to discuss the issues. Soil scientists from LDCs are encouraged to participate in the ICOM activities. Their knowledge of the use and management of their soils is valuable input in the efforts to refine *Soil Taxonomy*.

At present there are eight operational ICOMs. Apart from circular letters and SMSS workshops, ICOM members also meet during international conferences or workshops. Examples of such meetings are:

- Classification and Management of Tropical Soils, Malaysia, 1979
- 2nd International Symposium on Acid Sulfate Soils, Thailand, 1980
- International Conference on Aridisols, Israel, 1981
- The International Conference on Soils with Variable Charge, New Zealand, 1981
- The 13th International Congress of Soil Science, New Delhi, India, 1982
- International Symposium on Red Soils, China, 1983
- International Symposium on Volcanic Ash Soils, Canary Islands, 1984

To facilitate the work of the ICOMS, the whole of *Soil Taxonomy* is now on computer. Now it is possible to make changes at any point in *Soil Taxonomy*. The Soil Bureau of New Zealand has developed flow charts for the keys to *Soil Taxonomy*. These charts are distributed internationally and, in addition to being valuable teaching aids, also assist in refining the keys. The University of Minnesota has developed user-friendly software for personal computers and the universities of Hawaii and North Carolina have software for a few Orders.

SCS has established a national committee and developed guidelines for evaluating proposals to change *Soil Taxonomy*. All amendments accepted by the committee have been published in the *Soil Taxonomy News* of SMSS. SMSS has published an updated *Keys to Soil Taxonomy* (Plate 1) which contains all amendments approved to date. SMSS hopes to publish these revised keys at frequent intervals.

The ICOMs and the status of their activities are as follows:

1. International Committee on Classification of Soils with Low Activity Clays (ICOMLAC).
   Chairman: F. R. Moormann (Nederland)
   Established: 1976
   Completion date: 1984
   ICOMLAC has developed a draft proposal which was discussed at a special meeting held

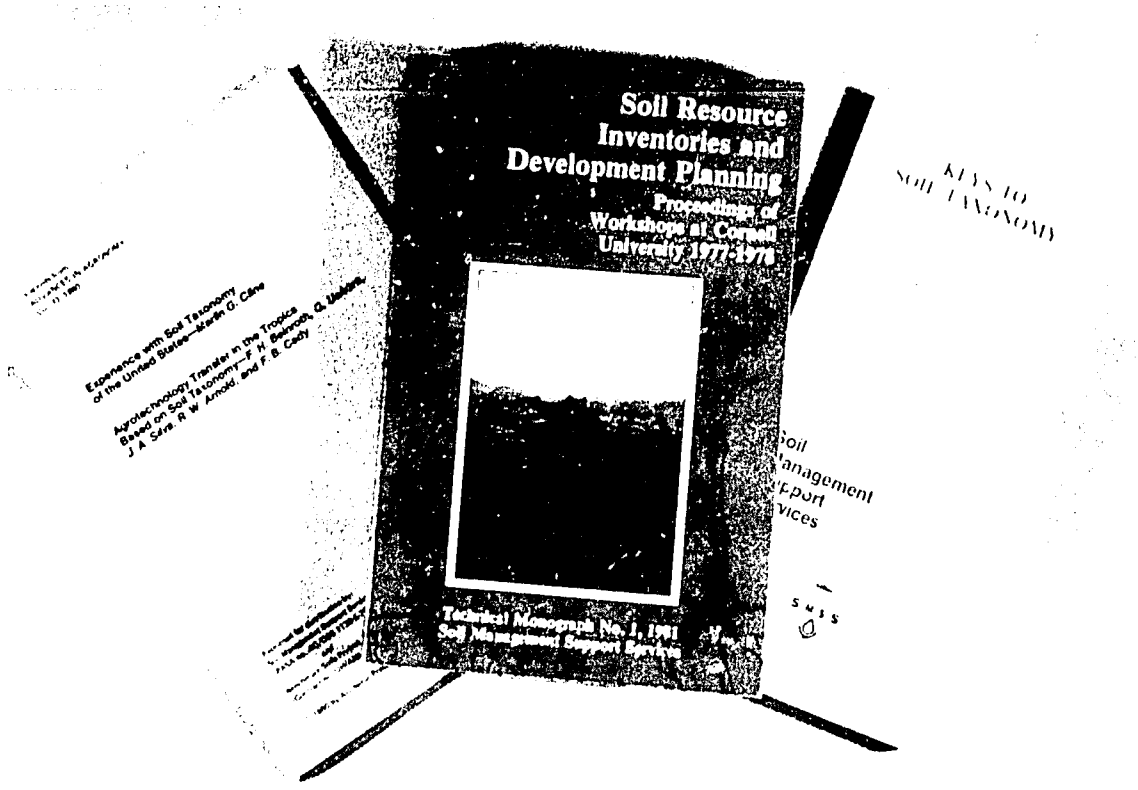

Plate 1. Publications to support technology transfer. At right is the *Keys to Soil Taxonomy* which is the most updated version of the classification system.

in Washington in December 1983 (Plate 2) and which has been distributed internationally for testing. SMSS published Technical Monograph No. 7, *Excerpts from the Circular Letters of ICOMLAC* which gives the rationale and discussions of the ICOM. In November 1984, a symposium will be held in conjunction with the annual meeting of the Soil Science Society of America to discuss the ICOMLAC proposal.

With the publication of the proposal, the task of ICOMLAC is over, and the committee has been disbanded. The chairman will, however, continue to assist SMSS to make the final changes to *Soil Taxonomy* after the international testing phase.

2. International Committee on Oxisols (ICOMOX).

   Chairman: S. W. Buol (North Carolina)
   Established: 1978
   Completion date: 1985

   With the decisions taken by ICOMLAC, ICOMOX is now in a position to firm up its proposals. Much agreement has been reached in the formulation of the higher categories, and ICOMOX will be considering the subgroups soon. A draft proposal is expected at the end of 1985 for testing. A workshop is planned for early 1986, in Brazil, to discuss the draft proposal and make any final changes.

3. International Committee on Soil Moisture Regimes (ICOMMORT).

   Chairman: A. Van Wambeke (Cornell University)
   Established: 1978
   Completion date: 1985

   ICOMMORT is testing its proposals. Through a separate contract with SMSS, calculations of soil moisture and temperature regimes for all countries in the intertropical areas have been made by Cornell University. A model developed by Franklin Newhall (SCS) is used. The University of Ghent, Belgium, has made computations for other parts of the world. The new proposals of ICOMMORT are included in this model, and maps of continents showing the distribution of soil moisture and temperature regimes have been made as a part of the testing phase. The final report of the committee is expected in early 1985.

4. International Committee on Andisols (ICOMAND)
   Chairman: M. L. Leamy (New Zealand)
   Established: 1980
   Completion date: 1986
   ICOMAND has made tremendous progress in its work. In 1981, the New Zealand Soil Science Society, in collaboration with the International Soil Science Society, organized the International Conference on Soils with Variable Charge. This was the first forum to discuss the changes of the committee. ICOMAND had the unenviable task of creating a new Order in *Soil Taxonomy*. To do this, new methods had to be developed, ideas tested, and definitions written. The Bureau of Soils of New Zealand committed a significant amount of its staff time to research and discussions, and with the international contributions, particularly contributions from South America and Japan, ICOMAND now has a working concept. A draft proposal for testing will be distributed in 1986 or earlier.
5. International Committee on Aridisols (ICOMID)
   Chairman: A. Osman (ACSAD, Syria)
   Established: 1980
   Completion date: 1987
   The committee is still in the process of accumulating data, particularly on the soils of the Middle East. Collaboration has been established with the scientists of the People's Republic of China, and a study program will be initiated on the cold desert soils. Concepts for hypercalcic and hypergypsic horizons have been developed and distributed for testing. Although not directly related to its mandate, the committee has made proposals, which have already been incorporated in *Soil Taxonomy*, to permit gypsic horizons in soils with xeric soil moisture regimes.
6. International Committee on Vertisols (ICOMERT)
   Chairman: J. Comerma (CENIAP, Venezuela)
   Established: 1981
   Completion date: 1986
   The chairman spent a year's sabbatical leave from his office to work at Texas A & M University. During this period, he travelled widely to discuss with soil scientists and to collate information on Vertisols. A first draft report will be submitted in late 1985.
7. International Committee on Classification of Soils with Aquic Soil Water Regimes (ICOMAQ)
   Chairman: F. Moormann
   Established: 1982
   Completion date: ?
   ICOMAQ had its first meeting during the 7th International Soil Classification Workshop in the Philippines in March 1984. The concept of the Aquic soil water regime was discussed and other related kinds, particularly those water regimes induced by man, were evaluated. At the workshop (Plate 3), the problem areas were outlined, and the chairman called for more detailed characterization of such soils. Information on the state and duration of the water table was lacking, and the need for such measurements was emphasized. The Japanese members have agreed to develop and test the field methods to determine reduction conditions in the soil.
8. International Committee on Spodosols (ICOMOD)
   Chairman: T. Miller (Pennsylvania)
   Established: 1982
   Completion date: ?
   ICOMOD has just distributed circular No. 1 which is a collation of all data on Spodosols and associated soils with spodic characteristics.

Plate 2. Chairman F. Moormann (far right) of ICOMLAC presents his report to SMSS and SCS staff.

In addition to these ICOMs, SMSS also supports other investigations which help to refine *Soil Taxonomy*. B. Hajek, of the University of Alabama, used his sabbatical leave to work on problems associated

Plate 3. Participants of 7th Workshop in Philippines are briefed on a loamy rice-growing soil.

with the Family category. This was the result of two symposia organized by the Soil Science Society of America (SSSA) with the cooperation of SMSS. SMSS also collaborated with SSSA to organize a special symposium in honor of the late Guy D. Smith. The symposium was held in Anaheim, California, in 1982, and the guest of honor was Madam Yolanda Smith. The proceedings of this symposium will be published in fall 1984. At the SSSA annual meeting in Las Vegas in November 1984, the society will be organizing a special symposium on LAC soils in collaboration with SMSS. A similar symposium is planned for next year on Oxisols. The purpose of these SMSS initiated symposia is to enhance greater participation of U.S. soil scientists in the work of the ICOMs and to inform them of the international contributions to *Soil Taxonomy*.

International Soil Classification Workshops

To support the work of the ICOMs, international soil classification workshops are conducted. Each workshop is designed for one or more of the ICOMs. Preparation of the workshops commence a year or two in advance. During a first visit to the country, the initial plans are discussed, the field sites to be visited during the workshop are determined, and arrangements are made to sample the sites. The purpose of the workshops is to provide a forum for the members of the ICOMs at which they may meet and discuss. In each of the workshops, the chairman of the ICOM provides the technical leadership, while F. Beinroth, of the University of Puerto Rico, and the host country handle the logistics.

To date, seven international soil classification workshops have been held. Figure 2 and Table 2 show locations and collaborators. The workshops are organized under a subcontract with the University of Puerto Rico (UPR). The logistical success of these workshops is due to the dedicated services of Fred Beinroth of the University of Puerto Rico. For his assistance to SMSS, he was presented with a distinguished service award by the OICD of USDA (Plate 1).

Background

Soil Taxonomy, the U.S. system of soil classification, was published in 1975 after having gone

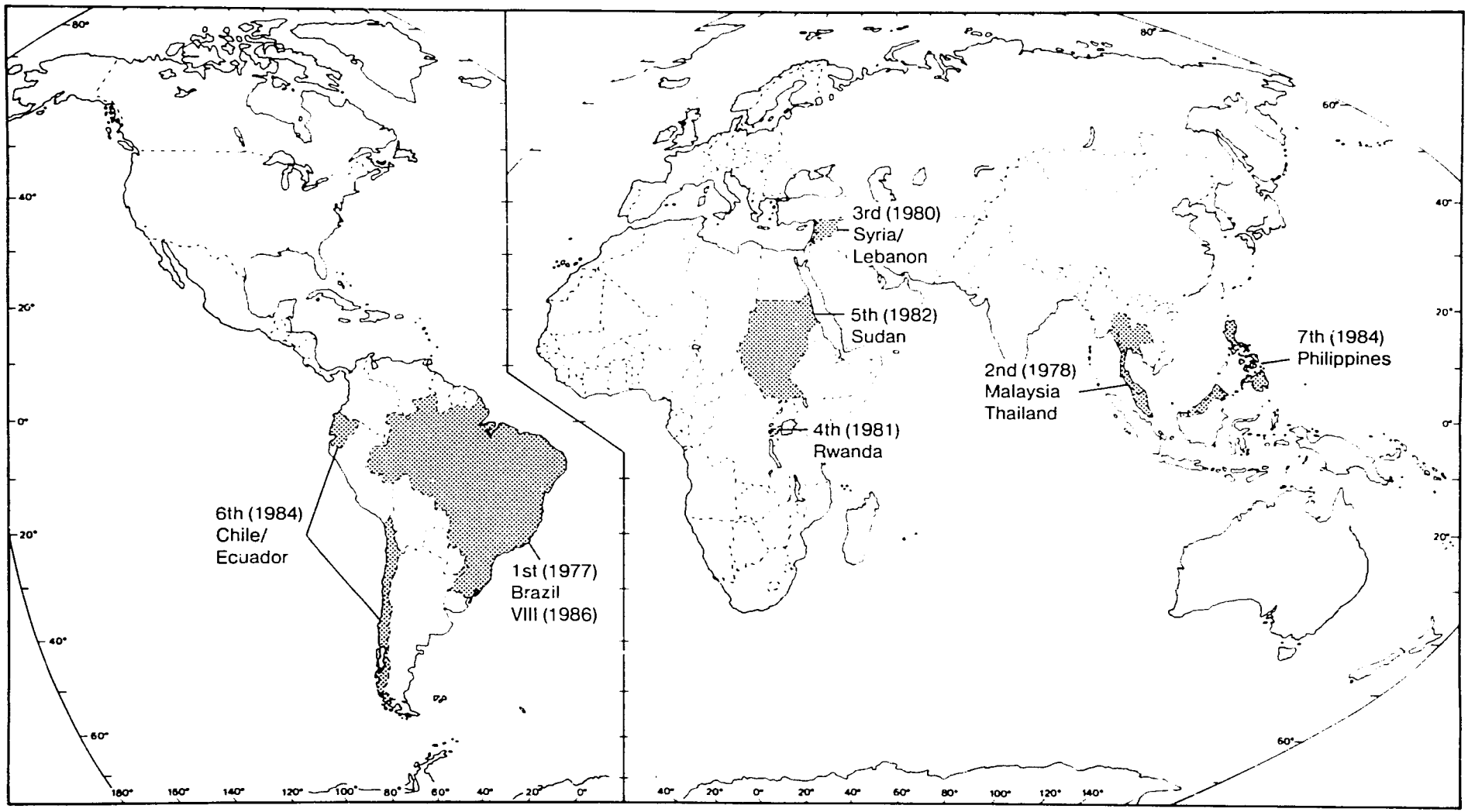

Figure 2. Countries which have hosted the international soil classification workshops.

TABLE 2.
WORKSHOPS AND THEIR ORGANIZERS

WORKSHOP NO.	YEAR	COUNTRY	COLLABORATING INSTITUTIONS/ICOMs
1st	1977	Brazil	EMBRAPA; ICOMLAC
2nd	1978	Malaysia	Ministry of Agriculture; Malaysian Soil Science Society; ICOMOX
		Thailand	Department of Land Development; SEARCA (Philippines); ICOMLAC
3rd	1980	Syria Lebanon	ACSAD; ICOMID; ICOMMORT
4th	1981	Rwanda	Ministry of Agriculture; ABOS (Belgium); ICOMLAC; ICOMOX; ICOMAND; ICOMMORT
5th	1982	Sudan	Soil Survey Administration; Ministry of Agriculture; ACSAD; ICOMID; ICOMERT; ICOMMORT
6th	1984	Chile	Ministry of Agriculture; Universities; Chilean Society of Soil Science; ICOMAND
		Ecuador	Ministry of Agriculture; Ecuadorean Society of Soil Science; ICOMAND
7th	1984	Philippines	IRRI; Bureau of Soils; ICOMAQ, ICOMERT

NOTE: The main organizer for all the workshops (except No. 7) was the University of Puerto Rico. Workshops 1 and 2 were organized before the formation of SMSS.

through a sequence of seven approximations. The transition from the tentative, soft-cover "7th Approximation" to the very substantial, hardcover *Soil Taxonomy* conveyed a distinct notion of finality. Yet, by intent and design, *Soil Taxonomy* is a dynamic, open-ended system that is subject to change as knowledge of soils expands. Its authors anticipated that inadequacies in the current taxa and differentiae would transpire as more was learned about soils, particularly those of the lower latitudes.

The need for such changes and refinements became obvious as *Soil Taxonomy* was applied in more and more countries of the tropics and subtropics. In response, the SCS of the U.S. Department of Agriculture established, in 1975, the first of seven international committees (ICOMs) with the common objective of adapting and refining *Soil Taxonomy* with respect to the soils of the tropics and subtropics. The first ICOM was the International Committee on the Classification of Alfisols and Ultisols with Low Activity Clays (ICOMLAC). F. R. Moormann, then at the International Institute of Tropical Agriculture (IITA), was appointed chairman. At the same time the UPR was concerned with the improvement of *Soil Taxonomy* relative to tropical soils under a grant from the USAID. It seemed logical, therefore, for both entities to join refining efforts.

Previous Workshops

In 1976 preliminary discussions were initiated with Moormann and E. G. Braun, of the Servico Nacional de Levantamento e Conservacao de Solos (SNLCS) of the Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA), which led to the idea of holding a workshop and field tour in Brazil with the intent to provide ICOMLAC members with the opportunity for personal interaction and study of key examples of the soils under scrutiny in the field. The idea was presented to T. S. Gill of AID who concurred with the workshop and with its financial support—funds from grant AID/csd-2857 to UPR. With the excellent cooperation of SNLCS, UPR then organized the 1st International Soil Classification Workshop which was held in Brazil from 20 June to 1 July 1977 with conference sessions in Rio de Janeiro and field trips in the states of Rio de Janeiro, Paraná, Sergipe, Alagoas, and Pernambuco.

The Brazil workshop was an outstanding success. Among other accomplishments, it stimulated the establishment of further ICOMs (ICOMOX, ICOMMORT) which, in turn, led to further workshops. There thus evolved a pattern and strategy that resulted in a series of workshops which facilitated the discussion of the issues under study by seven ICOMS established by SCS. In chronological order, they are the International Committee on the Classification of Alfisols and Ultisols with Low Activity Clays (ICOMLAC), the International Committee on the Classification of Oxisols (ICOMOX), the International Committee on Soil Moisture Regimes of the Tropics (ICOMMORT), the International Committee on the Classification of Andisols (ICOMAND), the International Committee on the Classification of Aridisols (ICOMID), the International Committee on the Classification of

Vertisols (ICOMERT), and the International Committee on the Classification of Soils with Aquic Moisture Regimes (ICOMAQ). Conforming to the respective mandates of these committees, workshops were held in Brazil in 1977, Malaysia and Thailand in 1978, Syria and Lebanon in 1980, Rwanda in 1981, Sudan in 1982, Chile and Ecuador in 1984, and in the Philippines also in 1984 (Figure 2). The workshops dealt with the taxonomy and management of Alfisols and Ultisols with low activity clays, Oxisols, Aridisols, high-altitude soils of the tropics, Vertisols, Andisols, and wetland soils, respectively.

It should be mentioned that the Aridisol workshop in Syria and Lebanon was marred by the fact that political instability in the area at the time of the meeting prevented AID-supported participants from travelling to Syria. Nonetheless, the host institution, the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), decided to conduct the workshop under its own auspices. A small follow-up meeting to the workshop was held, however, in Athens in May 1980.

The first three workshops were funded largely by AID through separate grants to UPR. Beginning with the Rwanda workshop, SMSS provided most of the funds, in part through contracts to UPR which continued to be centrally involved in the planning and organization of the meetings, except for the Philippines workshop which was cosponsored and organized by the International Rice Research Institute.

As an example, a more detailed narrative account of two of the recent workshops is presented later. Summary data on the workshops are provided in Appendix VIII.

Present Efforts

There are definite plans to hold a ICOMOX workshop in Brazil and discussions with the SNLCS of EMBRAPA are currently in progress. The purpose of this workshop will be to convene key members of ICOMOX in Brazil to finalize the proposal for the revision of Oxisols. This meeting will mark a departure from past practice in that attendance, as well as "pomp and circumstance," will be kept to a minimum in order to foster a productive work environment conducive to tangible outputs.

The 6th Workshop: Chile-Ecuador

The 6th International Soil Classification Workshop was held in Chile and Ecuador from 9 to 20 January 1984. It was a joint endeavor of the Socie-

Plate 4. Fred Beinroth (left) receives a plaque from Daniel Amstutz (center), Under Secretary for International Affairs and Commodity Programs, USDA, and Joan Wallace (right), Administrator for OICD, USDA.

dad Chilena de la Ciencia del Suelo and the Sociedad Ecuatoriana de la Ciencia del Suelo (both acting in behalf of various national institutions), Soil Management Support Services (SMSS) of the USDA-SCS, the University of Puerto Rico (UPR), and USAID. Walter Luzio and Fausto Maldonado served as chairmen of the Chilean and Ecuadorian organizing committees, respectively. They and their committee members must be highly commended for an exceptionally well-organized meeting.

The Chile/Ecuador workshop was the first in a series of workshops that were partially funded by AID and organized by UPR and SMSS in cooperation with host country institutions. As with the previous ones held in Brazil, Malaysia and Thailand, Syria and Lebanon, Rwanda, and the Sudan, the Chile/Ecuador workshop formed part of an international effort to refine *Soil Taxonomy* with respect to the soils of the lower latitudes.

The general theme of the workshop was the taxonomy and management of soils developed in volcaniclastic materials. In *Soil Taxonomy* such soils are currently classed in the suborder Andepts of the Inceptisols. This grouping appears unsatisfactory, however, as the Andepts have properties that set them apart from all other soils. It was proposed, therefore, to recognize these soils as Andisols at the order level and to establish an International Committee on the Classification of Andisols (ICOMAND). The primary purpose of the workshop was to provide a forum for discussion of the issues under consideration by ICOMAND and to allow the examination of critical kinds of Andisols in the field. In addition to a varying number of soil scientists from the host countries, 36 prominent pedologists from 16 countries the world over participated at the workshop.

During four days of conference meetings, 28 invited papers were presented in 12 technical sessions. In accordance with the workshop theme, most papers dealt with various aspects and problems associated with establishing and defining taxa of Andisols, but four presentations addressed the management of Andisols for different agricultural and nonagricultural land uses.

Once more, the field trips were the highlight of the workshop. There were three days of excursions in Southern Chile (Valdivia-Lanco-Valdivia, Valdivia-Antillanca, Antillanca-Puerto Varas) and three in Ecuador (Quito-Machachi-Quito, Quito-Santo Domingo, Santa Domingo, Quevedo-Quito). A total of 16 pedons were studied in the field—9 in Chile and 7 in Ecuador. They encompassed a wide variety of temperate and tropical Andisols in contrasting climatic and geomorphic settings at altitudes that ranged from sea level to 3600 m (11,800 feet). The discussions in the field were enhanced by huge and easily accessible soil pits—particularly in Chile (Plate 5)—and by the complete characterization data provided in the tour guide compiled by the USDA, SCS.

The soils studied during the field trips provided test cases for the Andisol proposal developed by ICOMAND and disseminated in ICOMAND Circular Letter No. 5. According to this proposal, Andisols must have either "andic" or "vitric" properties or both. Most of the soils inspected in Chile clearly had andic characteristics. The soils examined in Ecuador, however, failed to meet the criteria for andic materials and, on the basis of the data contained in the tour guide, could not be positively identified as vitric. Happily, additional mineralogical and micromorphological studies, performed in New Zealand, of the sand fraction of some Ecuadorian soils evidenced some glass and sufficient glass coatings on crystalline particles to satisfy the requirements for vitric material. By extension, all Ecuadorian pedons studied were assumed to have vitric properties and thus to qualify for Andisols.

The necessity to resort to nonroutine laboratory techniques in order to ascertain definite taxonomic placements obviously raises a question about the operationality of the proposed differentiae. Moreover, there appears to exist an ill-defined gray area, or perhaps even a "black hole," between andic and vitric. Various proposals were advanced to fill this gap; none met with unanimous approval. Other problems that transpired but remained unresolved included the andic/vitric/entic transition and the proposed suborder of Allands. On the other hand, most participants agreed that the "Trop" concept should not be applied to taxa of Andisols.

Among various other items, the workshop participants also recommended that

- ICOMAND establish an international data base of pedons in volcaniclastic materials. The data base should be set up in New Zealand with provisions for user-friendly access by organizations in other countries, some of which do not have sophisticated computer facilities; and that
- SMSS prepare and distribute a manual for the field and laboratory characterization of Andisols. This

Plate 5. Participants of the January 1984 4th International Soil Classification Workshop on Andisols, held in Chile and Ecuador, examine the Puerto Fonk soil. It is located in southern Chile on the banks of Lake Puyehue near Nilque. This ash deposited soil is classified as a medial, mesic Typic Dystrandept in *Soil Taxonomy* or as a Hapludand as proposed by the International Committee on Andisols (ICOMAND).

manual should include soil description, soil sampling, sample preparation and the various physical, chemical, mineralogical, and micromorphological methods. SMSS is also encouraged to develop simple field tests for the identification of Andisols.

Although the workshop inevitably could not resolve all of the problems and arguments that surround the Andisol proposal, it did much to converge opinions, shape agreements, and approximate consensus regarding some of the major issues—perhaps more than could be realistically expected. Much of the credit for this technical success must go to Michael L. Leamy, the chairman of ICOMAND, who led or moderated the discussions.

Finally, the workshop tours exposed the participating ICOMAND members to the Andean Andisol scenario, many of them for the first time. This pedologic experience precipitated a revised, postworkshop Key to Andisols which was circulated among ICOMAND and presented by Leamy at the International Panel on Volcanic Ash Soils held in Tenerife, Canary Islands, Spain, in July 1984.

The 7th Workshop: Philippines

The 7th International Soil Classification Workshop entitled, "Characterization, Classification and Utilization of Wetland Soils" was held in the Philippines from 26 March to 6 April 1984. The workshop was organized in collaboration with the Bureau of Soils, Philippines, and the International Rice Research Institute (IRRI) and was attended by 60 participants from 22 countries.

The workshop was unique in a sense as it was one of the first times that pedologists and specialists in soil survey and classification had met with their counterparts in the fields of soil fertility and management. The former were represented by the International Committee on Classification of Soils with Aquic Soil Water Regimes (ICOMAQ), one of the eight international committees of SMSS, while the latter were represented by the International Network on Soil Fertility and Fertilizer Evaluation for Rice (INSFFER) of IRRI.

About 35 technical papers were presented during the first four days of the workshop. The subject matter ranged from processes, characterization, and classification to fertility and management of wetland soils. Subsequent to this, the ICOMAQ and INSFFER groups met separately to discuss more specific issues.

From Friday, 30 March, to Tuesday, 3 April, a field tour was organized to study the wet soils in the field (Plate 6). For the site visits 16 pedons were sampled and analyzed beforehand by the National Soil Survey Laboratories of the SCS. All pedons were located close to INSFFER trials, and so, in addition to pedological information, data on fertility were also available for discussion.

After the field tour, the participants were divided into four groups to discuss and provide recommendations on the following subject areas:

Group A. Characterization of wetland soils and needed research in relation to better utilization.

Group B. Processes in wetland soils and needed research in relation to better utilization.

Group C. Classification of wetland soils and

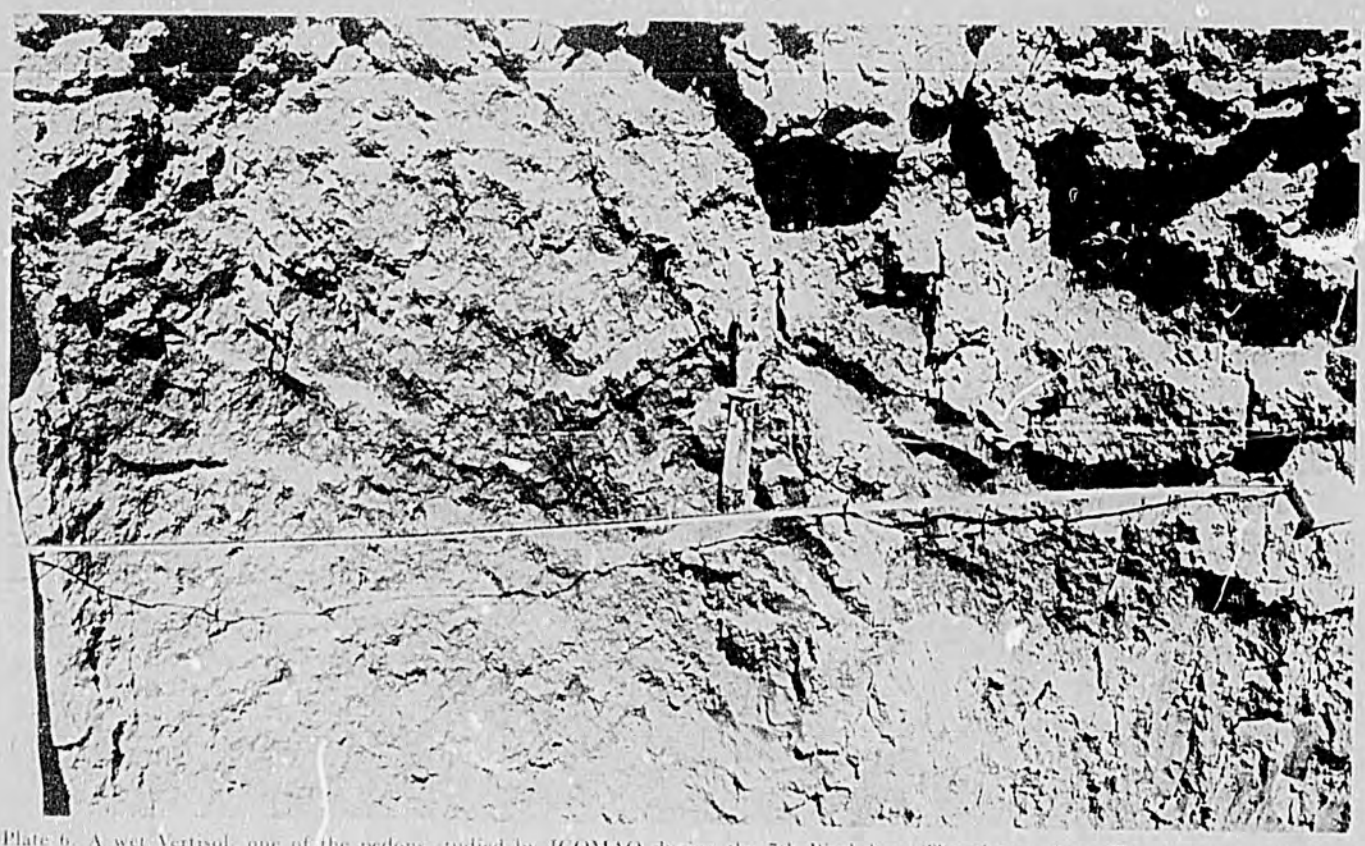

Plate 6. A wet Vertisol, one of the pedons studied by ICOMAQ during the 7th Workshop. The picture shows Bow-structures, a micro expression of gilgai.

needed research in relation to better utilization.

Group D: Fertility of wetland soils in relation to soil classification.

The reports of the group will be published within a few months and distributed to interested persons. The proceedings will be published by early 1985 and may be obtained from IRRI, SMSS, or the Bureau of Soils.

The workshop was the first meeting of ICOMAQ. At this meeting Frank Moormann, Chairman of ICOMAQ, explained the charges of the committee and reviewed the problem areas. Man-induced wetness of soils, particularly as a consequence of rice cultivation, was the subject of major discussions, and such soils were highlighted during the field tour. On the last day of the workshop Moormann summarized the discussions and elaborated on the areas which need more study and data. His report "Future Activities of ICOMAQ" is included here.

Training: International Forums

The workshops are not designed for the training of soil scientists in LDCs. Therefore, the purpose of the training courses, or the International Forums as they are called, is to reach a large number of soil scientists in LDCs to inform them of recent developments in soil survey, classification, and the use and management of soils. The program addresses the new generation of soil scientists who have not had the benefit of a western education.

The International Forums on Soil Taxonomy and Agrotechnology Transfer have become so very popular that the demand is straining the capabilities of SMSS. Table 3 and Figure 3 show the forums that have been conducted or are planned for the immediate future. Figure 4 shows the number of participants at each forum and the number expected for future forums. About five hundred participants would have been trained by FY 1985. A significant number of women attend these forums (Plate 7), particularly in Asia. Although the focus is on *Soil Taxonomy*, attention is paid to other aspects of soil science and related sciences (Plate 8), and particular attention is given to management of crops important for the region or country.

Audiovisual materials have been prepared and continue to be prepared for these training activities. A 16 mm movie entitled, "Soil Taxonomy: A Technical Language of Soil Science" was filmed in

TABLE 3.
FORUMS ON *Soil Taxonomy*.

FORUM NO.	YEAR	COUNTRY	SERVING THE REGION/ COUNTRY
I	1981	Fiji	Pacific
II	1982	Morocco	North Africa
III	1983	Cameroon	Cameroon
IV	1983	Thailand	Southeast Asia
V	1983	Papua New Guinea	Pacific
VI	1983	Costa Rica	Central America
VII	1984	Philippines	Philippines
VIII	1984	Jordan	Middle East
IX	1984	Guam	Pacific
X	1985	Rwanda/ Burundi	Central Africa
XI	1985	Pakistan	Pakistan
XII	1985	Panama	Central America
XIII	1985	Zambia	Southern Africa

Forums II and X are in French, and Forums VI and XII are in Spanish.

Puerto Rico and New York (Plate 9). A slide set (Plate 10) on the same subject has also been developed.

Although SMSS organizes these forums, their success is due to the efforts of the host institutions and other cooperating national, regional, and international organizations. It is a pleasure for SMSS to recognize these collaborators. The list is given in Table 4. Many of the collaborators have provided financial support to the forums. In fact, the travel and per diem of all participants has come from non-SMSS funds.

The programs of the forums follow a set pattern with classroom lectures (Plate 11) and site visits (Plate 12). The first three days of the forum are devoted to *Soil Taxonomy* and are followed by a five- to six-day field trip. In the last three days, aspects of soil management and agrotechnology transfer are considered.

The feedback we obtain from the participants enables us to evaluate the success of the forum. A forum evaluation exercise is also conducted on the last day of the forum. Appendix IV is an example of a participant's report to his office; Appendix V gives examples of forum evaluation by participants and Appendix VI by organizer. In Appendix VII, an example of forum follow-up activities is given.

The VII International Forum: Philippines

The Philippines, through the Philippine Council for Agriculture and Resources Research and Development (PCARRD), hosted the VII International Forum on Soil Taxonomy and Agrotechnology Transfer held at Los Baños, Laguna, from 12–23 March 1984. This forum was planned and organized by PCARRD, the Philippine Bureau of Soils, and Soil Management Support Services (SMSS). There were 31 participants, most from the Bureau of Soils and the rest from various universities and colleges in the Philippines, the Philippine Bureau of Plant Industry, the Philippine Coconut Authority, and the Philippine Sugar Commission. There were also 11 observers from the Bureau of Soils and PCARRD.

The forum consisted of six days of classroom sessions and five days of field tour. In the first three days the participants received an intensive course on *Soil Taxonomy* before going out to the field to classify 11 pedons. A report on each pedon was written by the participants and submitted at the conclusion of the forum. This report will form part of the forum proceedings. The participants also presented some recommendations during the closing ceremonies. One of these suggested that participants classify the soils of their respective stations with the assistance of SMSS on soil analysis. Most of the participants work in research stations which are part of the PCARRD network. PCARRD, as a collaborator of IBSNAT, is expected to play a major role in promoting the use of *Soil Taxonomy* in the Philippines.

One of the anticipated impacts of this forum is the widespread teaching of *Soil Taxonomy* in the Philip-

Plate 7. Women in LDCs play an active role in soil surveys and soil management. Forum I in Fiji.

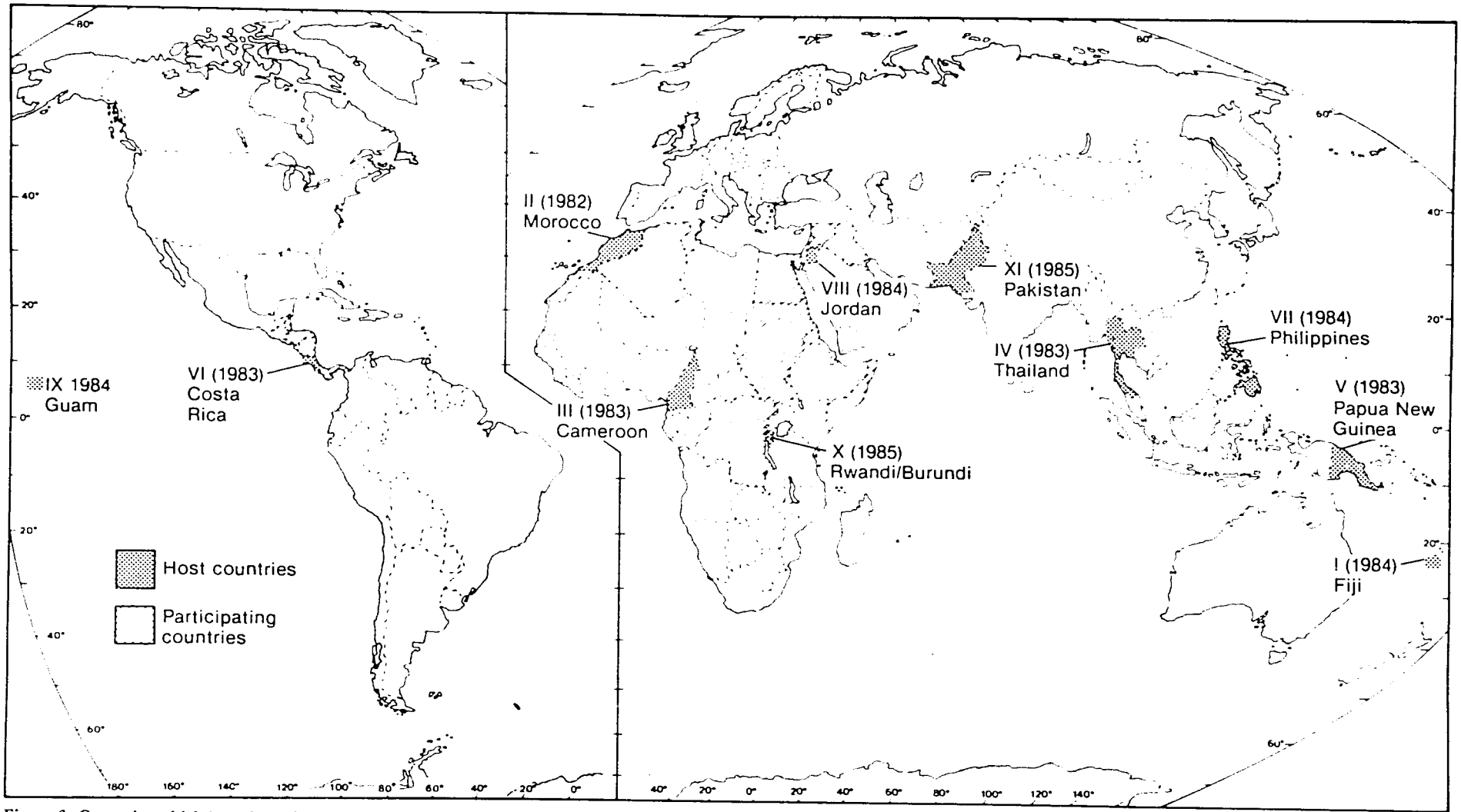

Figure 3. Countries which have hosted the forums.

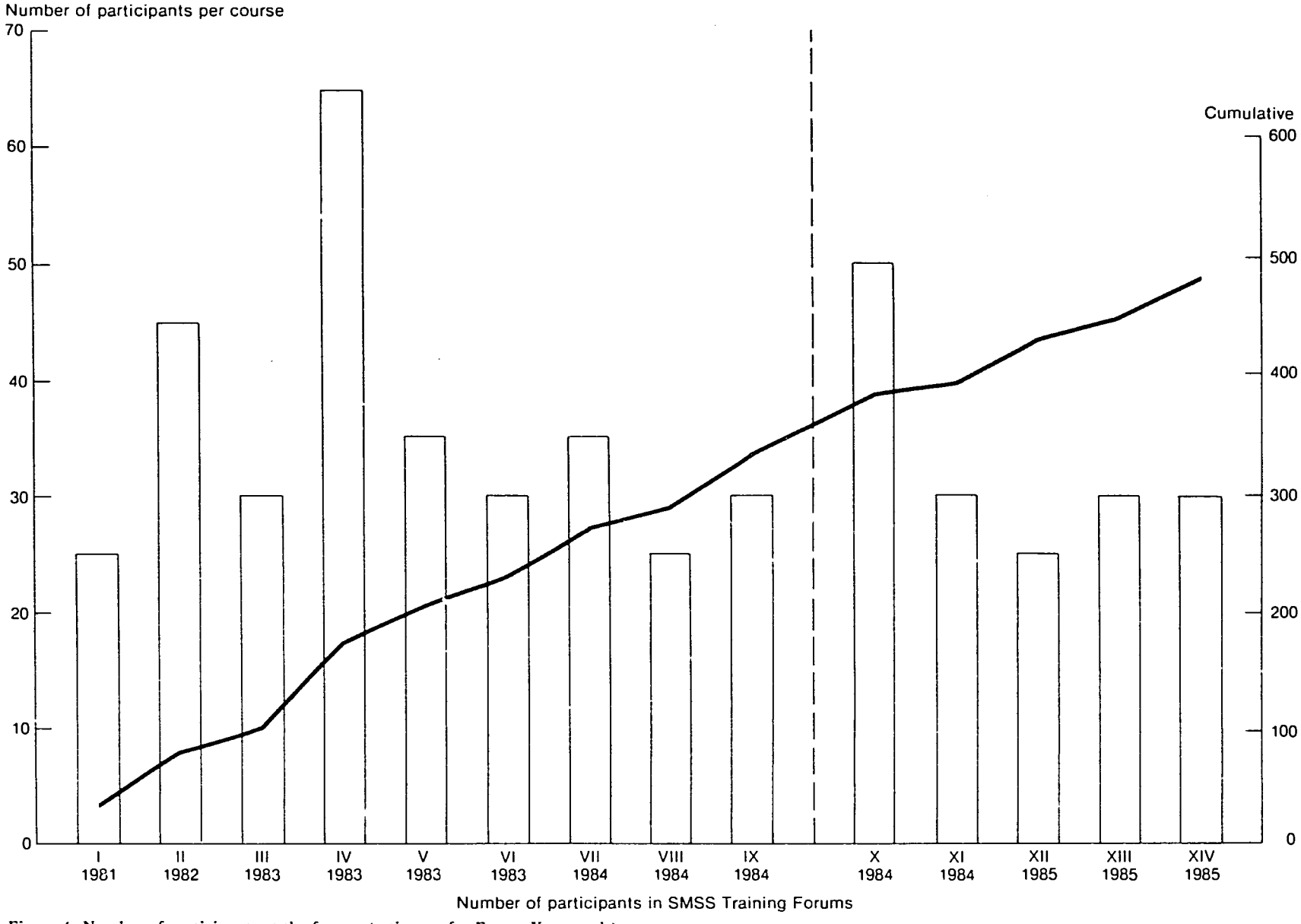

Figure 4. Number of participants at the forums (estimates for Forum X onwards).

Plate 8. Desert pavement and arid geomorphology are the subject of discussion at Forum II in Morocco.

pines. A number of the participants are affiliated with agricultural universities and colleges that have students majoring in soil science. SMSS operates as a project on the basis that soil-based agrotechnology transfer can be accelerated with the use of *Soil Taxonomy*. SMSS provides the catalyst for such transfer to take place through its participation in organizing and conducting international forums and training workshops on soil classification. Before SMSS was established as a program the Benchmark Soils Project provided the initial impetus for workshops in *Soil Taxonomy* and agrotechnology transfer in the Philippines, Indonesia, and Cameroon. Four such workshops were conducted in these countries between 1977 and 1983.

Hari Eswaran, SMSS program leader, moderated the program for the Philippine forum. He was assisted in the lectures on various topics of *Soil Taxonomy* and soil interpretation by Ron Yeck, soil scientist, Soil Conservation Service, Lincoln, Nebraska; B. G. Cagauan, Jr., research associate, International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT), University of Hawaii, presented four lectures on the principles and concepts of agrotechnology transfer, the Benchmark Soils Project, and IBSNAT itself. There were also Philippine scientists and specialists who participated as resource persons and lecturers during the forum, namely: Modesto Reed, soil research evaluator, and Alex Baloloy, chief of operation of the Agricultural Land Management and Evaluation Division, both of the Bureau of Soils; Martin Raymundo, former project leader of the Benchmark Soils Project on temporary duty with IRRI as a consultant; L. R. Oldeman, IRRI visiting scientist; E. Hombre-Bueno, scientist, Philippine Sugar Commission; and R. Badayos, W. Cosico, and G. San Valentin, all assistant professors at the University of the Philippines at Los Banos (UPLB). Cris Alcalde, supervising soil technologist and former co-project leader, Benchmark Soils Project, served as a resource person during the field tour. Amado Maglinao, PCARRD director of the Farm Resources and Systems Research Department was responsible for coordinating all the forum activities. Hari Eswaran, on behalf of SMSS, expressed his appreciation and gratitude for the excellent preparation and arrangements made by PCARRD and gave mention of various PCARRD employees who made the workshop successful.

VIII International Forum: Jordan

The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), through its project the soil map of the Arab world, is planning to commence the soil map of Jordan. As part of the soil map project, ACSAD, in collaboration with SMSS, earlier had organized the II International Forum in Morocco. The VIII Forum, the second in the Arab region, was organized for the English-speaking Arab countries and included participants from Syria, Jordan,

Plate 9. Making a movie on soils and agriculture—an innovation for teaching.

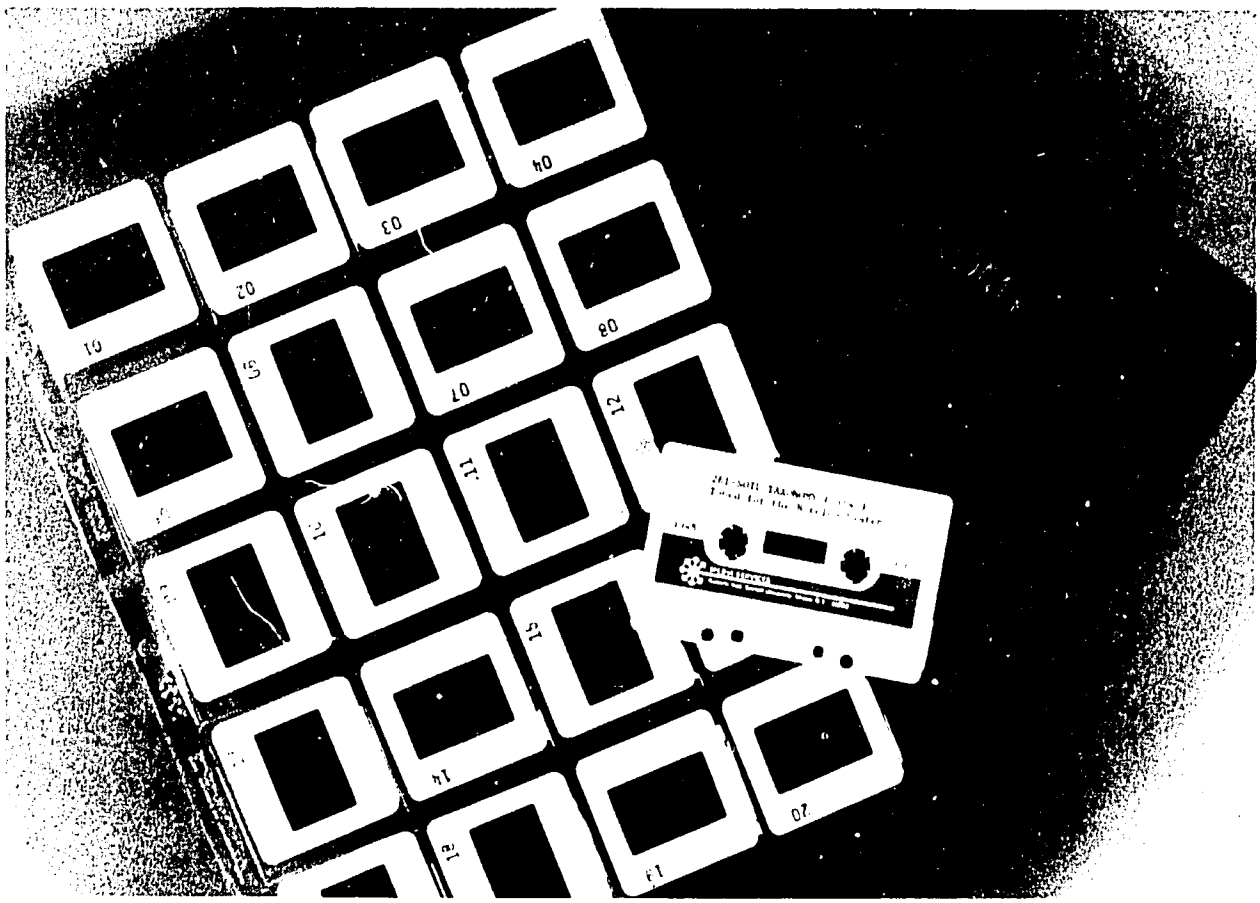

Plate 10. Audiovisual slide sets. Training packages for the forums.

Sudan, Kuwait, the Yemens, and the Emirates. Organized by the Ministry of Agriculture and the University of Jordan in collaboration with SMSS and ACSAD, it was funded by the Near East Bureau of AID.

The format of the VIII Forum was similar to that of the previous forums but focussed on the potentials and constraints of agricultural development in the region. A five-day field trip covered almost the entire country from Aqaba in the south, to the Dead

TABLE 4.
COLLABORATORS FOR SMSS FORUMS

FORUM NO.	COLLABORATING INSTITUTIONS
I	University of South Pacific, Fiji
	Department of Agriculture, Fiji
	South Pacific Council, New Caledonia
	Soil Bureau, DSIR, New Zealand
	ORSTOM, France
	USAID/SUVA
II	Institute National Recherche Agronomique, Morocco
	University Hassan II, Morocco
	University of Ghent, Belgium
	FAO, Rome
	Arab Centre for the Studies of Arid Zones and Dry Lands, Syria
	Benchmark Soils Project, universities of Hawaii and Puerto Rico
	USAID/Rabat
III	Institute National Recherche Agronomique, Cameroon
	Benchmark Soils Project, universities of Hawaii and Puerto Rico
	FAO, Cameroon
	ORSTOM, France
	USAID/Yaounde
IV	Department of Land Development, Thailand
	IBSNAT, universities of Hawaii and Puerto Rico
	FAO, Rome
	Rubber Research Institute of Malaysia
	Other Thai Organizations
	USAID/Bangkok
V	Department of Primary Industries, PNG
	IBSNAT, universities of Hawaii and Puerto Rico
	Soil Bureau, DSIR, New Zealand
	Soils Division, CSIRO, Australia
	University of South Pacific, Fiji
	USAID/SUVA, American Embassy, PNG
VI	CATIE, Costa Rica
	CIAT, Colombia
	Kellogg Foundation, USA
	University of Costa Rica
	ROCAP/San Jose
VII	PCARRD, Philippines
	IRRI, Philippines
	USAID/Manila
VIII	Department of Agriculture, Jordan
	ACSAD, Syria
	University of Jordan
	USAID/Jordan
	Near East Bureau, AID/W
IX	University of Guam, Guam
	University of South Pacific, Fiji
	ACIAR, Australia
	Commonwealth Foundation, Great Britain
	GTZ, West Germany
	USAID/SUVA

Sea in the west, the eastern deserts, and the northern areas with xeric soil moisture regimes. Fifteen presampled and characterized soil pits served as materials for teaching and discussion. The highlight of the tour was the soils of the Jordan Valley, which are situated between 100 and 300 m below sea level. The variations over short distances in soil properties and soil moisture regimes impressed the participants. The north-south transect brought out the necessity of considering soil moisture regimes as soil properties.

Some very knowledgeable soil scientists were present to serve as resource personnel for the forum. These included Rene Tavernier (University of Ghent, Belgium), Frank Moormann (University of Utrecht, Netherland), Bill Johnson (retired Deputy Chief of SCS), Fred Beinroth (IBSNAT), Ahmad Osman (ACSAD), and others from ACSAD and Jordan.

At the conclusion of the forum, four participants evaluated it stressing the need for such activities in the region. Later, during the session on recommendations, it was agreed that ACSAD and SMSS would try to organize a forum in Yemen with the general theme, "Soil Taxonomy and Methods of Soil Analysis" and another in Sudan with the theme, "Soil Taxonomy and Soil Fertility."

The IX International Forum: Guam

Utilizing the theme of "The Role of Soil Survey in Agricultural Development," the University of Guam hosted the IX International Forum of SMSS (3–14 September 1984). The forum was the third of its kind to be organized in the Pacific region; the others

Plate 11. Ron Yeck of the National Soil Survey Laboratory (SCS) discusses soil survey interpretation at the VII Forum in the Philippines.

Plate 12. The soil can only be studied in the field. Large soil pits enable participants to observe what they have been taught in the classroom. Forum VII, the Philippines.

were in Fiji and Papua New Guinea. All three of the forums of the region were organized in collaboration with the University of South Pacific. The cosponsors of the IX Forum were:

- Agency for International Development (AID, USA),
- Australian Centre for International Agricultural Research (ACIAR),
- Deutsche Stiftung für Internationale Entwicklung (DSE, W. Germany),
- Commonwealth Foundation (U.K.), and
- International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT, USA)

The forum was attended by 24 participants. Those from Guam were: J. Barcinas, F. Cruz, R. Gomez, V. Santos, C. T. Tseng, P. R. Melyan, C. Bjork, J. Cruz, C. Noquez, C. Saruwatari, and G. Yamanaka. The other participants were: M. Andrew (Papua New Guinea), C. Anderson (Yap), G. Cornelius (Kosrae), A. Kadoi (W. Caroline), S. Halavatau (Tonga), T. Lauofo (American Samoa), I. Mikel (Truk), M. Malala (American Samoa), J. Phillip (Ponape), B. Ratieta (Kiribati), I. Sagaga (Western Samoa), S. Henry (Ponape), P. Taufatofua (Tonga), and V. Seru (Fiji).

Resource persons for the forum were from SCS-USDA (P. Bartlett, J. Perry, L. Langan, F. Young), University of Guam (J. Demetrio, J. Cope, R. Muniappan), IBSNAT (I. Ikawa, G. Uehara), University of South Pacific (John Morrison), CSIRO-Australia (H Nix, P. Blecker), DSIR-New Zealand (D. Leslie), U.S. Navy (D. Sala), IRRI-Philippines (C. Mamaril), and ORSTOM (A. Beaudou).

The 12-day forum was comprised of 8 days of classroom lectures and 4 days of field trips. After studying selected soils of the island the participants spent 2 days mapping the proposed site for a new experimental station of the university. The highlight of the forum was the discussion on the Oceanic Benchmark Sites Network for Agrotechnology Transfer (OBSNAT). A draft proposal prepared by regional scientists was discussed and plans were developed for future activity. The proposal will be submitted to the meeting of the Directors of Agriculture organized for November 1985 by the South Pacific Council.

The forum received tremendous coverage from the local news media. It was opened by Ricardo J. Bordallo, Governor of Guam, and the opening ceremony was attended by members of the legislature and other local dignitaries. The closing dinner was hosted by the Governor of Guam at the Governor's Mansion. First Lady Madeline Bordallo presented certificates of attendance to all the participants.

SMSS was also honored at this closing dinner. The First Lady presented a plaque to Program Leader Hari Eswaran, with the following inscription:

In Appreciation to
The Soil Management Support Services, SCS, USDA
For furthering the cause of agriculture in Oceania
Presented at the
IX International Forum
Soil Taxonomy and Agrotechnology Transfer
Guam, September 3–14, 1984
Ricardo J. Bordallo
Governor of Guam

* * *

Soil Analysis and Research

The soil analysis and research component of the project is conducted by John Kimble at the SCS National Soil Survey Laboratories (NSSL). The objectives of this work include:

1. to test methods of soil analysis suitable for soils of the tropics;
2. to develop or modify methods which utilize few chemicals and minimal equipment so that LDCs can use them;
3. to standardize laboratory techniques and provide interlaboratory cross-checks to assist LDCs to improve the quality of their work; and
4. to characterize soils of LDCs which are used in the SMSS workshops and training courses.

World Benchmark Soils Project (WBSP)

Reliable soils data frequently is not available in LDCs and, in addition, information required by *Soil Taxonomy* is less frequently available. Developing a data base to support the ICOM is one of the objectives of WBSP. In the process SMSS hopes to provide standardized descriptions and analyses of soils in a country to enable the country to calibrate itself. In a few countries, the only complete description and analysis of some soils is that provided under SMSS-WBSP.

Tables 5 and 6, and Figure 5, show countries where soils have been sampled. By the end of FY 84, soils from 34 countries will have been characterized. In each of the countries, soils belonging to the more important agriculture research stations have also been sampled (Figure 6).

The ultimate objective of WBSP is to develop a soil-crop yield data base which will help improve the understanding of soil productivity and the effects of management practices on it in LDCs. The data base will also help improve understanding of the benefits of soil conservation and the adverse effects of not using conservation practices. We hope to get LDCs to collaborate in this project as the data base will contain data needed to

a. analyze the productive potential of the country's land;
b. analyze the impact of soil erosion on crop yields, so that the value of and need for soil conservation can be determined; and
c. improve the accuracy of crop yield data as related to management, weather, and soil (in collaboration with IBSNAT).

Publications

Because of the need to provide up-to-date information to soil scientists in the developing countries, a program of publishing and distributing technical materials has been a very important part of the work of SMSS. Universities and research institutions in the LDCs generally do not have foreign exchange to buy books. Library shelves are bare, and as a result students and researchers do not have the opportunity to improve themselves. International technical assistance programs have seldom considered this sufficiently important to warrant attention. The only time many of these institutions receive books is when a religious mission or a foundation donates them. SMSS publications attempt, therefore, to supply this need. The need, however, is far too great to be satisfied by the limited funds available to SMSS.

A resumé of some of the publications that have been produced and a few that have been planned is given here.

Soil Taxonomy News (Plate 13)

This is the semitechnical newsletter of SMSS which is published quarterly, beginning in October 1981. The newsletter is designed to attract a range of readers. Emphasis is, of course, on *Soil Taxonomy* including technical details of the system, amendments if any, and international use. The newsletter is not designed for pedologists alone but also for other workers in soils and for USAID Mission staff; short notes are prepared for these persons.

Currently, SMSS produces about 2,500 copies of each newsletter, most of which are distributed to people in LDCs. At the end of 1982 requests exceeded supply by twofold. Many of the requests have come from within the United States and the Western countries; SMSS is searching for a mechanism to respond to these.

Soil Resource Inventories and Development Planning

National, regional, and even local planning for agricultural purposes requires accurate information on 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 ways 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.

Soil Taxonomy and Technology Transfer

The guiding principle of SMSS is that *Soil Taxonomy*, the U.S. system of classification, is the vehicle for international agrotechnology 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 and jointly with BSP, has reprinted the articles for free distribution.

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

Soil Taxonomy Keys

The International Soil Museum in the Netherlands published in 1980 a *Field Extract for Soil Taxonomy*. This contains the keys, up to the Great Group, and the book is designed to be small enough to be carried in the field. SMSS has developed a similar booklet called *Soil Taxonomy Keys*, which contains all the keys up to and including the Family category.

TABLE 5.
PEDONS CHARACTERIZED BY SMSS

PROJECT NAME	PROJECT NUMBER	NO. OF PEDONS	NO. OF SAMPLES	SAMPLES RECEIVED	DATA OUT
		FY 1979			
Syria-Lebanon	CP79-FN204	27	120	79/07/30	80/12/05
		FY 1980			
Senegal	CP81-FN060	3	15	80/12/02	81/08/13
		FY 1981			
Rwanda	CP81-FN122	16	90	81/12/02	81/05/21
Syria	CP81-FN137	11	39	81/03/03	81/07/31
Brazil	RP81-FN155	1	4	81/03/10	81/09/21
Sudan LAC study	RP81-FN185	5	35	81/04/21	81/09/17
Senegal	RP81-FN206	4	19	81/08/31	81/12/08
The Gambia	RP81-FN293	5	34	81/09/28	82/04/16
		FY 1982			
Sudan Workshop	CP82-FN090	28	193	82/01/07	82/06/01
Mali	CP82-FN099	10	49	82/01/25	82/08/06
Morocco	CP82-FN131	4	16	82/03/22	82/04/05
Thailand	CP82-FN138	19	107	82/04/02	82/08/27
Indonesia	CP82-FN139	4	32	82/04/13	82/09/10
Philippines	CP82-FN145	3	20	82/04/13	82/09/10
CATIE	CP82-FN151			82/05/18	82/09/10
Guatemala 2 pedons		2	9		
Honduras 4 pedons		4	16		
Costa Rica 2 pedons		2	9		
Yemen	CP82-FN162	3	14	82/06/07	82/07/09
Jordan	CP82-FN187	14	83	82/09/10	83/03/16
Lesotho	CP82-FN191	15	96	82/06/18	83/04/29
India	CP82-FN210	5	41	82/07/13	83/01/10
Hawaii Benchmark sites	CP82-FN223	4	32	82/08/03	84/06/06
Papua New Guinea	CP82-FN240	16	86	82/09/10	83/03/08
Puerto Rico Benchmark sites	CP82-FN253	2	13	82/09/23	83/10/12
		FY 1983			
CATIE	CP83-FN021			82/11/04	83/09/23
Panama		2	4		
Costa Rica		4	21		
Honduras		2	11		
Panama	CP83-FN078	15	80	83/01/03	83/12/09
Indonesia	CP83-FN088	18	57	83/01/17	84/03/02
Kenya	CP83-FN095	2	10	83/01/21	83/12/09
New Zealand	CP83-FN096	1	22*	83/01/25	84/05/03
Mauritania	CP83-FN097	11	43	83/01/26	84/02/10

PROJECT NAME	PROJECT NUMBER	NO. OF PEDONS	NO. OF SAMPLES	SAMPLES RECEIVED	DATA OUT
Cameroon	CP83-FN124	3	20	83/03/26	84/03/09
Ecuador	CP83-FN128	13	85	83/03/18	83/12/15
Chile	CP83-FN129	13	91	83/03/23	83/12/15
Guatemala	CP83-FN131	12	51	83/03/24	84/02/14
Honduras	CP83-FN133	7	38	83/03/25	84/05/27
Cameroon	CP83-FN135		24**		84/05/24
El Salvador	CP83-FN136	6	27	83/03/28	84/04/03
Costa Rica	CP83-FN147	2	10	83/04/22	83/03/05
Nicaragua	CP83-FN200	10	50	83/07/13	84/07/15
Papua New Guinea	CP83-FN259	2	12	83/09/20	84/04/06
		FY 1984			
Philippines Workshop	CP84-FN022	26	152	83/02/11	84/03/02
Venezuela IBSNAT sites	CP84-FN068	6	28	83/12/20	84/12/21†
CATIE Costa Rica	CP84-FN074	12	65	83/11/30	84/12/28†
Burundi	CP84-FN077	16	74	84/01/10	85/01/11†
Rwanda	CP84-FN091	17	106	84/02/02	85/02/01†
Zambia	CP84-FN132	20	123	84/04/26	85/04/05†
Pakistan	CP84-FN150	23	183	84/06/15	85/06/15

*Extra volcanic samples collected for methods comparison between New Zealand and the NSSL.
**Samples for CEC check not complete characterization.
†Project due date.

TABLE 6.
ANNUAL SAMPLING RATE

SUMMARY BY YEAR		
FY 1979	27 pedons	120 samples
FY 1980	3 pedons	15 samples
FY 1981	42 pedons	221 samples
FY 1982	135 pedons	816 samples
FY 1983	123 pedons	656 samples
FY 1984	120 pedons	731 samples
TOTAL	450 pedons	2559 samples

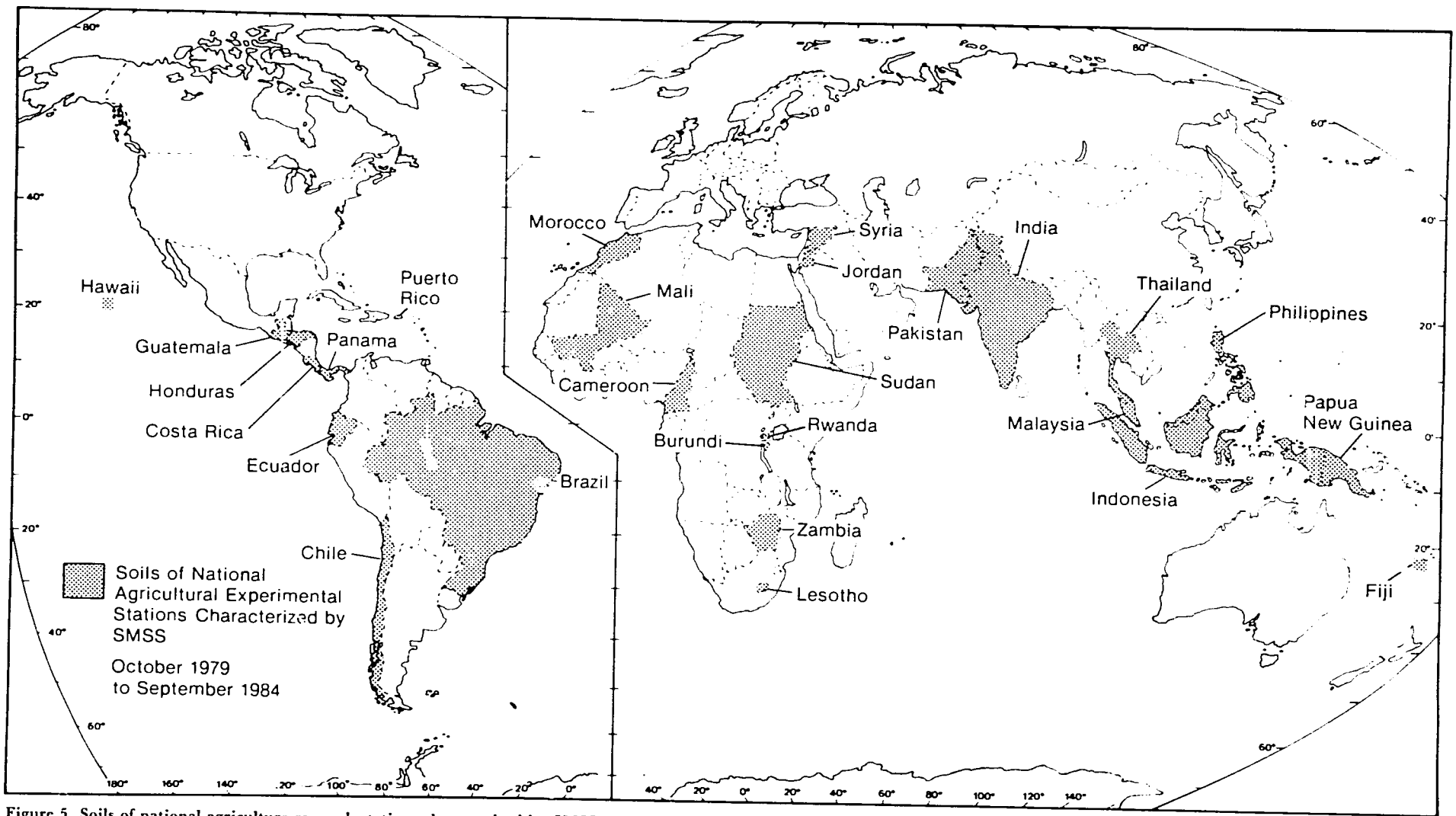

Figure 5. Soils of national agriculture research stations characterized by SMSS.

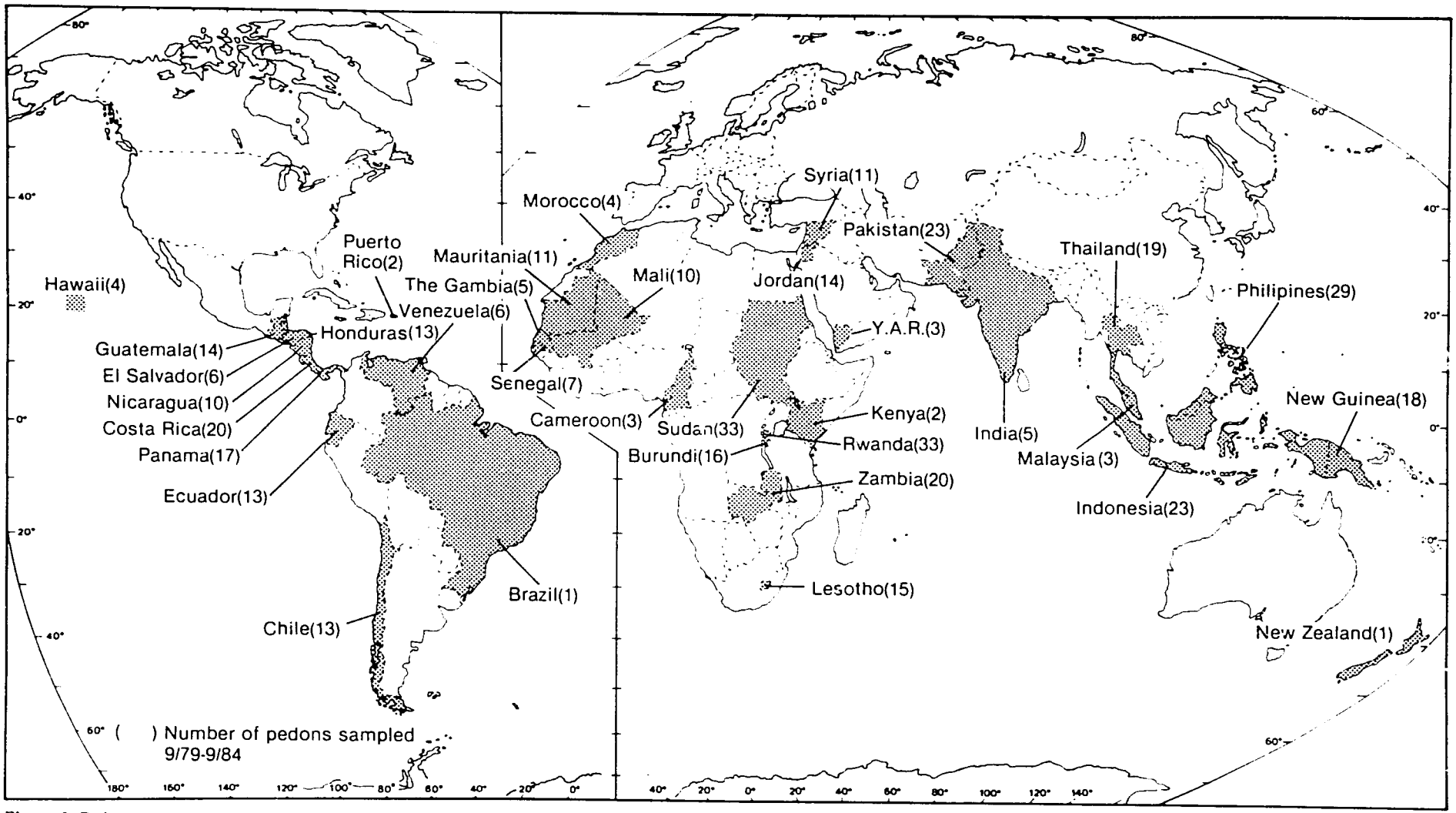

Figure 6. Pedons sampled by SMSS under WBSP.

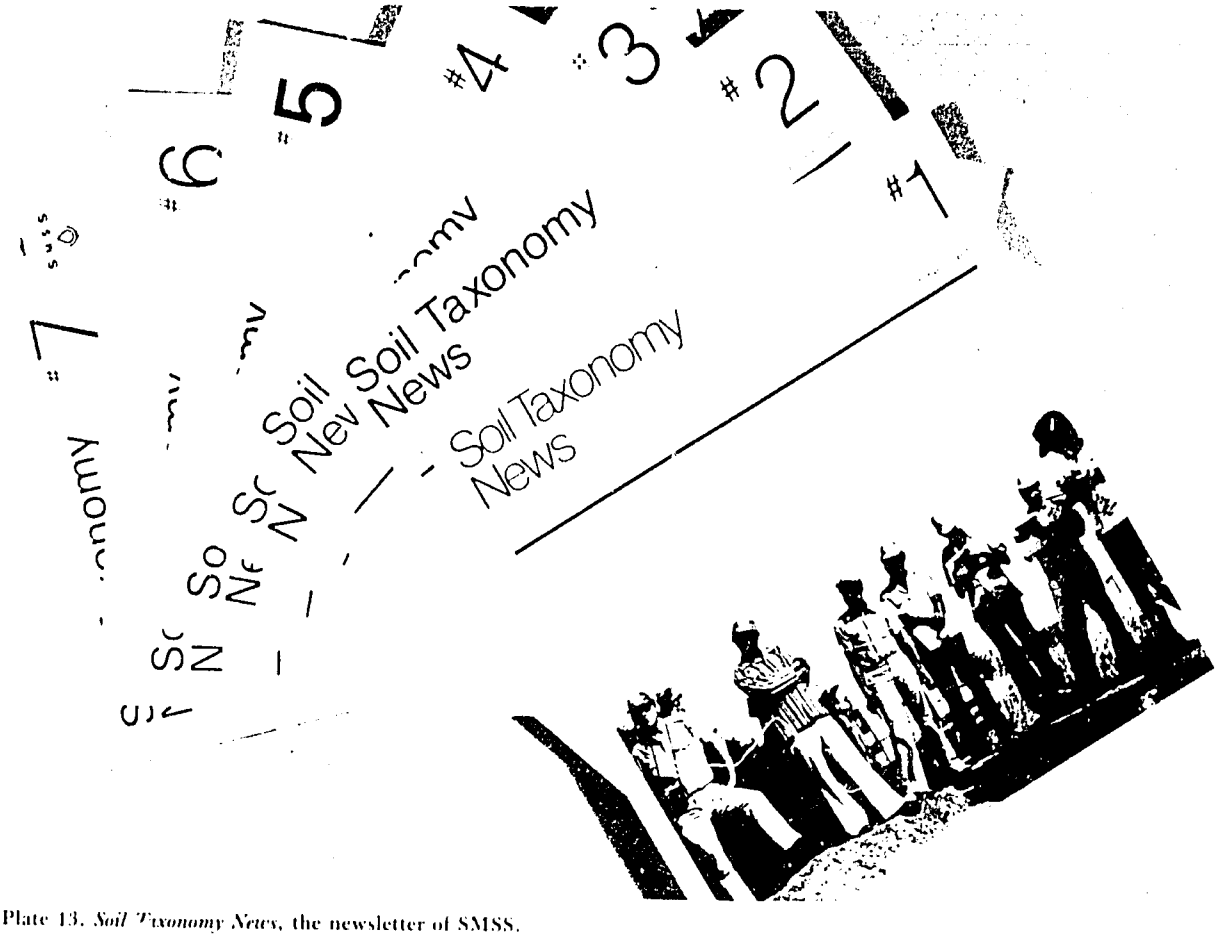

Plate 13. *Soil Taxonomy News*, the newsletter of SMSS.

In addition, *Soil Taxonomy; Keys* carries the most recent approved amendments. Now that *Soil Taxonomy* is on computer and SCS has the software to transfer the information directly to a typesetter, it is possible to publish amended keys whenever desired.

Soil Moisture Regimes in South America (Plate 14)

Written by Professor A. Van Wambeke, Cornell University, this monograph uses a model developed by the SCS to calculate the soil moisture and temperature regimes. The monograph also includes a map giving their distribution.

A companion monograph on the soil moisture and temperature regimes in Africa has been published and those for Asia and the Middle East are being prepared. These monographs give some of the basic information necessary for technical assistance and technology transfer (Figure 7).

Guidelines for Soil Resource Inventory Evaluation (Plate 15)

Soil resource inventories vary greatly in methodology, quality, and manner of presentation. Previously, few procedures were available to evaluate these inventories. This was the subject of investigation of the Agronomy Department of Cornell University. Published by Cornell University and SMSS, this monograph discusses methods of evaluation, and highlights areas in the operational aspect of an inventory that need attention. It also indicates how quality control can be maintained at each stage of the development of an inventory.

Soil Analysis for Soil Taxonomy

This monograph, in preparation at the end of 1985, deals with the kinds of analyses needed for soil classification. It is a companion document to the one entitled *Methods of Soil Analysis* published by the SCS.

Scientific Articles

Staff of SMSS have also published a number of technical papers in scientific journals. A list of these is presented in Appendix III.

Bibliography of Soils of the Tropics and on Soil Taxonomy (Plate 16)

This bibliography was compiled for USAID by A. C. Orvedal as Technical Bulletin No. 17 of

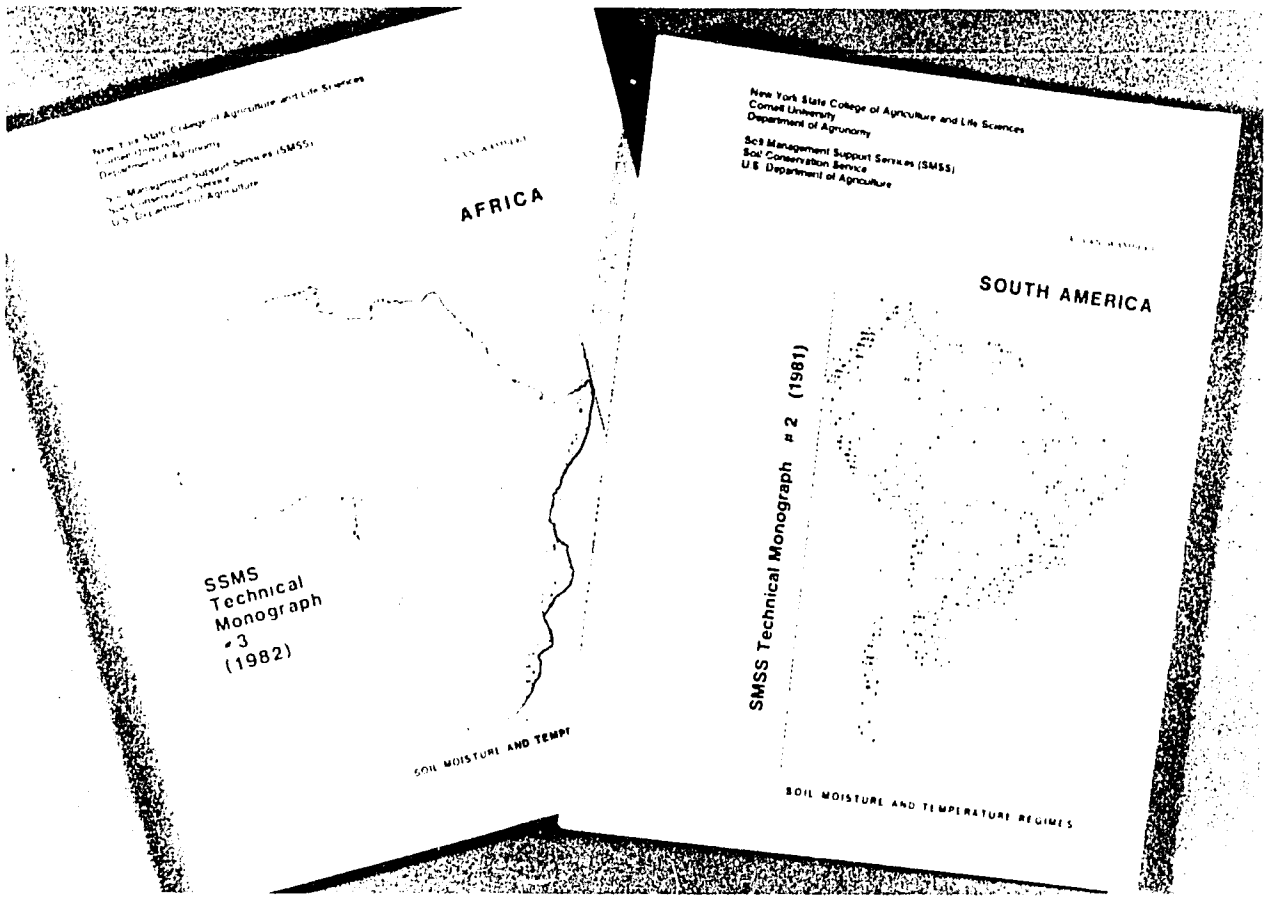

Plate 14. SMSS data base in soil moisture regimes.

the Agency for International Development. The succeeding volumes are published by SMSS. Volumes, I, II, III, IV, and V have been published and Volume VI is being considered.

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.

Translations

Soil Taxonomy is now used all over the world. To date, the U.S. Government Printing Office (GPO) has printed 19,000 copies. Under an agreement between SCS and Soil Survey of India, an Indian edition has been published and about three thousand copies sold. About one thousand copies of an Italian edition published in Rome by Italian soil scientists 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 completed (Plate 15) and the French translation is being planned.

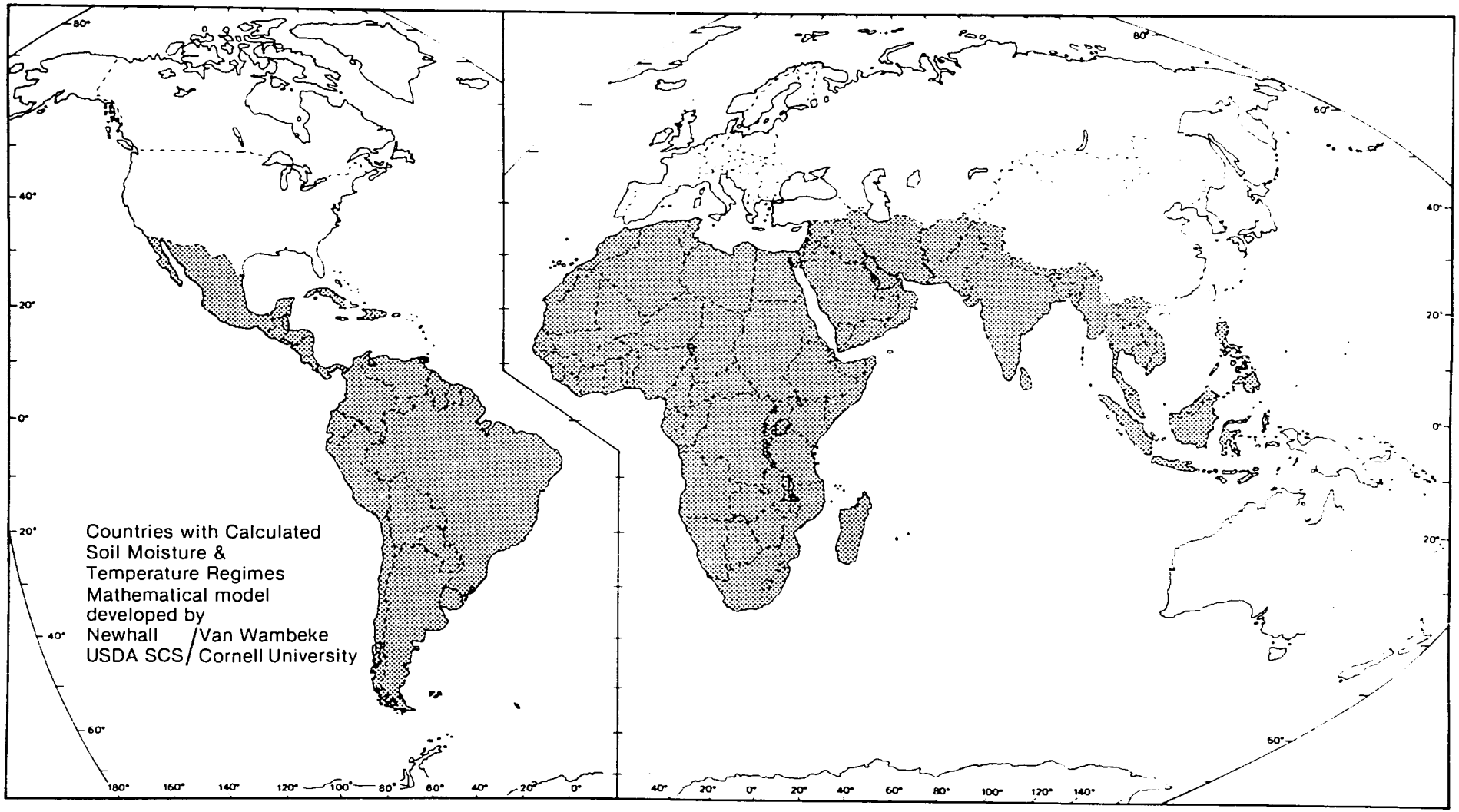

Figure 7. SMSS coverage of computed soil moisture regimes.

Plate 15. SMSS technical monographs.

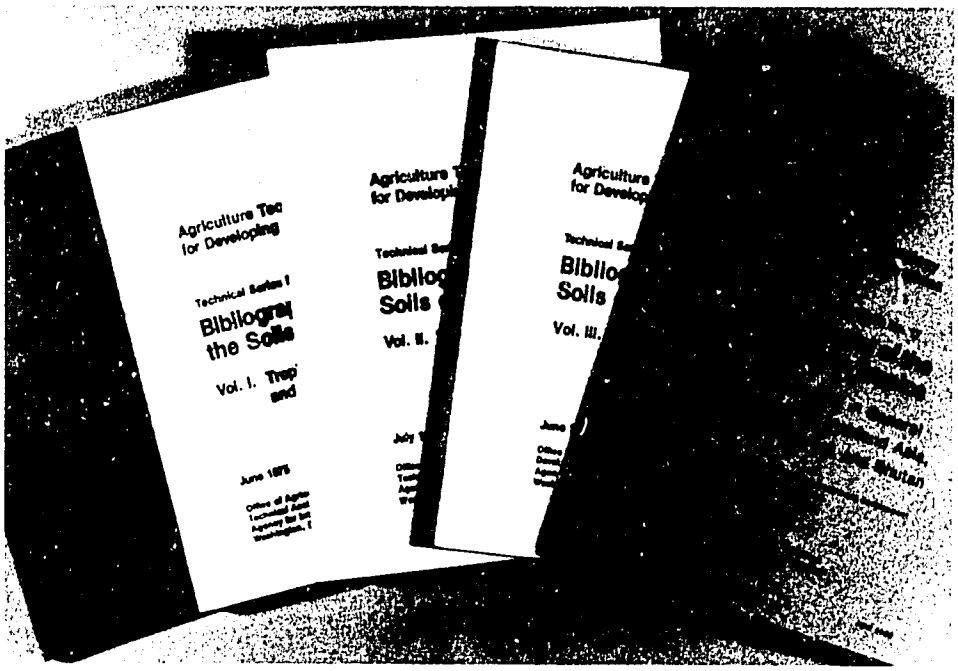

Plate 16. Documentation on the soils of the tropics.

UTILIZATION AND IMPACT

This progress report summarizes the activities and achievements of SMSS over five years. Both are impressive and have been lauded. However, questions still remain as to the impact of the project on LDCs. Is the project useful to the LDCs? Is it cost-effective or can we achieve the same by other less expensive means? Has the $4 million spent so far been productive, or should the funds be channelled to other assistance programs? In many project reviews, such questions are seldom asked, but SMSS feels that these are relevant and important questions which need to be satisfactorily answered before a project is permitted to continue.

For the first four years, SMSS was run by the program leader and his secretary. SMSS did not wish to succumb to Parkinson's law. It adopted the policy of cost-sharing in order to make its activities cost-effective; it succeeded in many instances and failed in a few. The international forums and to a lesser extent, the workshops, are the best examples of cost-sharing. The fact that other countries, institutions, and donor organizations are willing to invest in SMSS activities is probably the best reward SMSS can expect. This is an indication that they believe SMSS is a serious project, that they are convinced it is a useful investment, that they share the opinion it is an efficient way to provide technical assistance to LDCs, and, more importantly, that they are assured of results and success. The fact that other countries or institutions work toward the objectives of SMSS and assist SMSS to attain these objectives, is indication of the validity of our goal. The translation of *Soil Taxonomy* into Thai by the Thais, into Chinese by the Chinese, into Bahasa Indonesia by the Indonesians, into Arabic by the Arabs, into Spanish by the Latinos, into French by the Francophone countries, into Italian by the Italians, is a credit to the system and to the efforts of SMSS. The fact that the New Zealanders, the Thais, the Malaysians, the Chinese, the Arabs, the Fijians, the Guamanians, the Vietnamese, the Sudanese, the Indians, the Cameroonians, the Colombians, the Argentinians, the Chileans, and other regional and international groups organize scientific meetings, in collaboration with SMSS or on their own, on *Soil Taxonomy* is evidence of their commitment to the work of SMSS. The fact that Rwanda and Zambia made fundamental changes in their soil survey program by introducing the concepts of the SCS is the best evidence for the impact of SMSS. The fact that scientists around the world spend their time and money to either serve as chairmen of the ICOMs or participate actively in the work of the ICOMs is a sign of their commitment to the work of SMSS. The fact that presidents, prime ministers, ministers, ambassadors, and other high ranking government officials attend SMSS meetings in their countries is evidence of the importance they attach to these activities. The fact that these same officials receive the program leader in their offices and discuss with him national concerns is an honor to SMSS. The fact that USAID country Mission directors and staff collaborate and request SMSS assistance is clear indication of the usefulness of the project to them. The fact that SMSS publications are exhausted soon after publication, and that they are cited in international journals and abstracts, and that they are reproduced for local use is ample testimony to the cost-effectiveness of the publication program.

SMSS has built a rapport with LDC institutions which is probably unmatched by other projects or programs. The demand for our technical assistance, the fact that some of the TDY consultants are invited to return, and the fact that the suggestions or recommendations are operationalized, gives a special satisfaction and is a credit to the quality of SMSS consultants.

The above examples of utilization and impact are subjective, but there are specific examples which we wish to cite. Although these examples are a credit to SMSS, they are also a credit to the countries and institutions with which SMSS has worked as they are the ones who have striven to realize the goals. It is for this reason we cite them.

Figures 8 to 12 show the international use of *Soil Taxonomy*. Even at the time of publication of *Soil Taxonomy* in 1975, several countries had already begun to use it (Figure 8). India was one of the first countries to use it in the national program, and to enable their scientists to use the system they published an Indian edition of *Soil Taxonomy*. The situation in 1979 (Figure 9), when SMSS started, is based on a questionnaire prepared by M. G. Cline of Cornell University. The situation in 1981 and 1984 (Figure 10 and 11) is based on surveys and interviews conducted by SMSS. There are bound to be discrepencies in these maps. They will be corrected as we obtain more reliable information. They do, however, show the increasing use of *Soil Taxonomy*. Figure 12 is a summary of the number of countries using the system. In 1984, about 30 countries used it as the national system, an equal amount used it in addition to another system, and about 40 countries referred to it in their scientific publications.

How much is *Soil Taxonomy* being used in the scientific world? G. D. Bailey of SCS and Modesto Recel of the Philippines searched the AGRICOLA data base of the U.S. National Agriculture Library (NAL) and also went through national journals (which are not indexed by NAL). The data they generated are underestimates, as indexing was done only by the title of each article. Table 7 shows the distribution by countries and years of the number of articles published on *Soil Taxonomy*. Figure 13 shows the number as a function of the regions (for the period 1960–1983), and Figure 14 shows the trend as a function of the year of publication. The apparent decrease in 1982 and 1983 is because the data was compiled in 1983 and not all published articles were cited in AGRICOLA. (For some LDC journals it may be two or three years before they are included in a data base). The increasing use of the system is evident. In total, more than 92 countries have used *Soil Taxonomy* in their scientific publications.

In its five years, SMSS has been hyperactive. It clearly has established its visibility and prestige on the international scene, with AID Regional Bureaus and country Missions, and, more importantly, with national institutions and scientists. SMSS was indeed honored when the Minister of Agriculture of Thailand, H. E. Chuan Leekpai, presented SMSS with a plaque for the contributions of SMSS to Thailand and more recently, Governor Ricardo Bordallo of Guam honored SMSS for its work in Oceania.

SMSS has shown that major U.S. soil science resources can be tapped and channelled in a manner that is efficient and beneficial both to the LDCs and to the United States. SMSS has shown that networks and ribbon projects are not paper concepts but can be made operational. SMSS has established links and opened channels of communication, all in a spirit of confidence and cooperation, and these provide a firm basis for continued progress in this vital work.

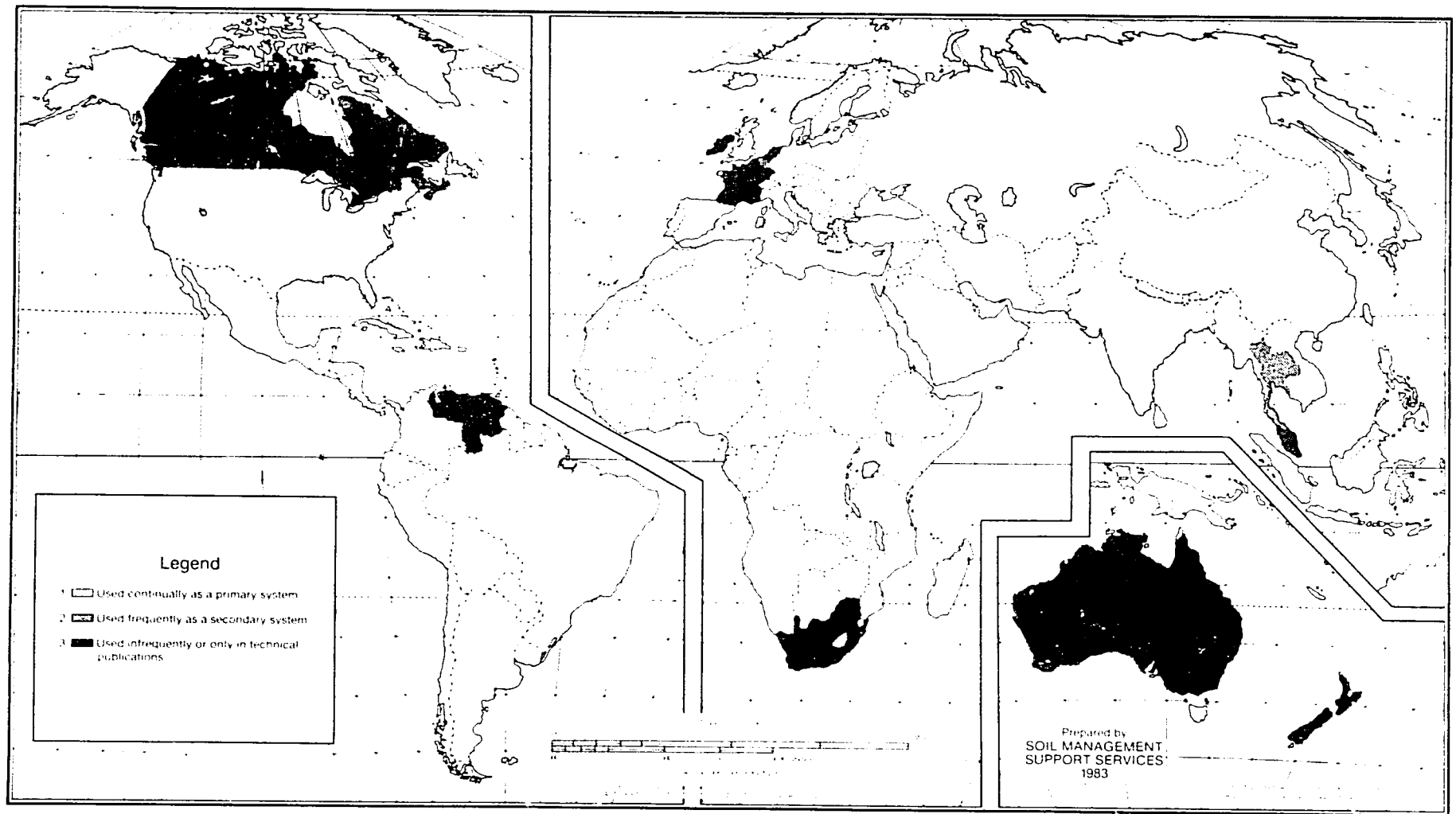

Figure 8. International use of *Soil Taxonomy* (1975).

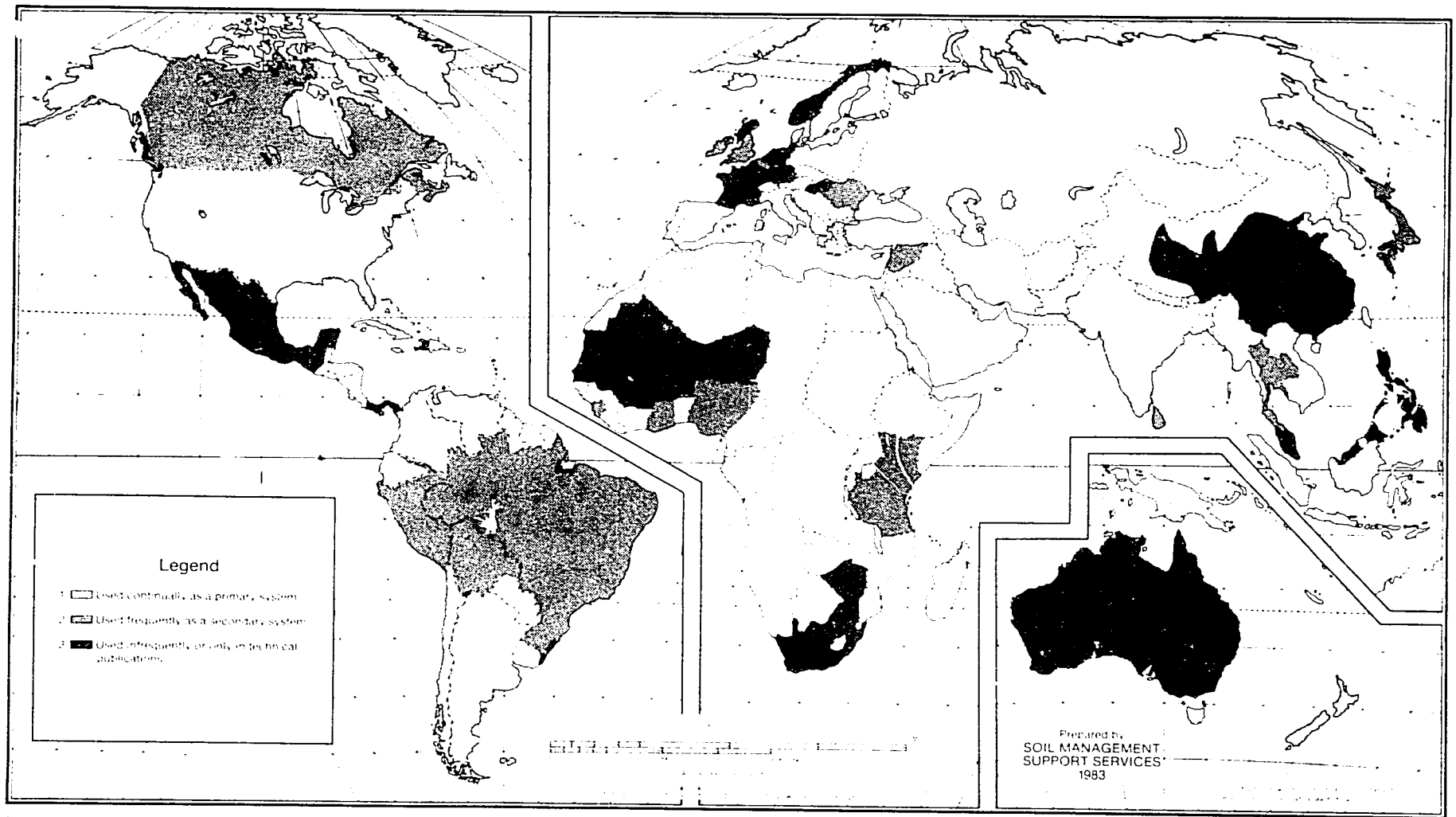

Figure 9. International use of *Soil Taxonomy* (1979).

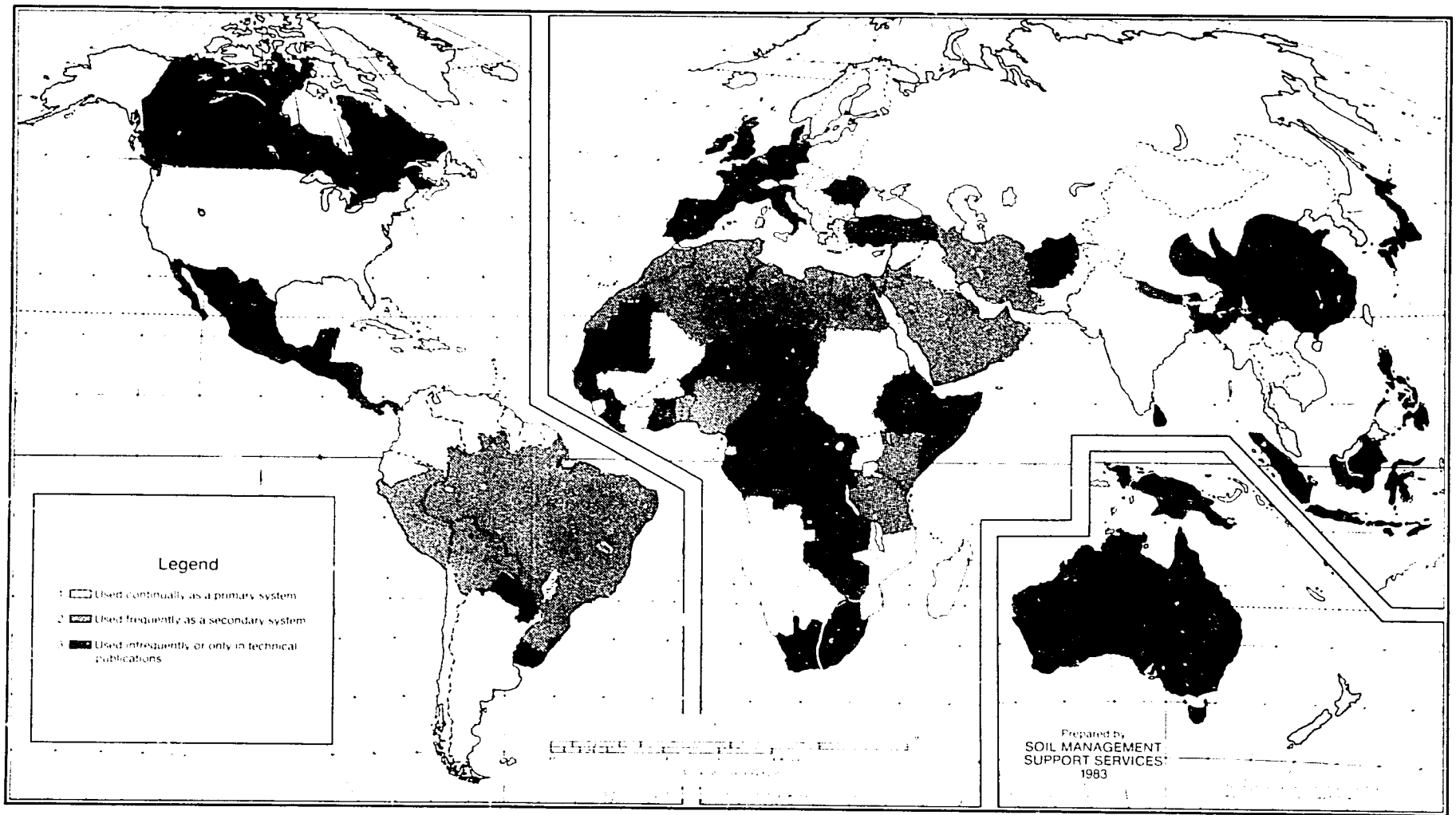

Figure 10. International use of *Soil Taxonomy* (1981).

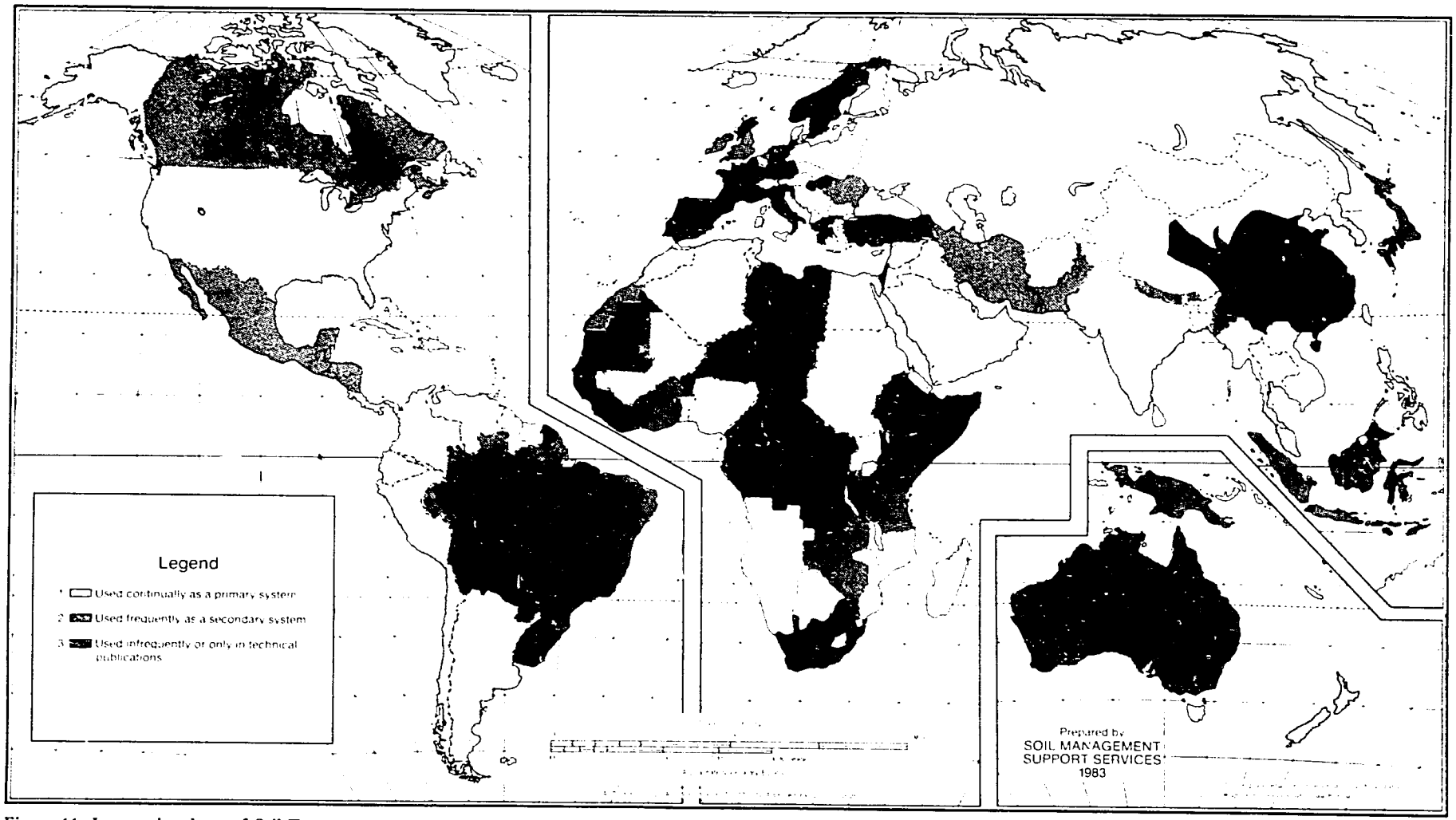

Figure 11. International use of *Soil Taxonomy* (1984).

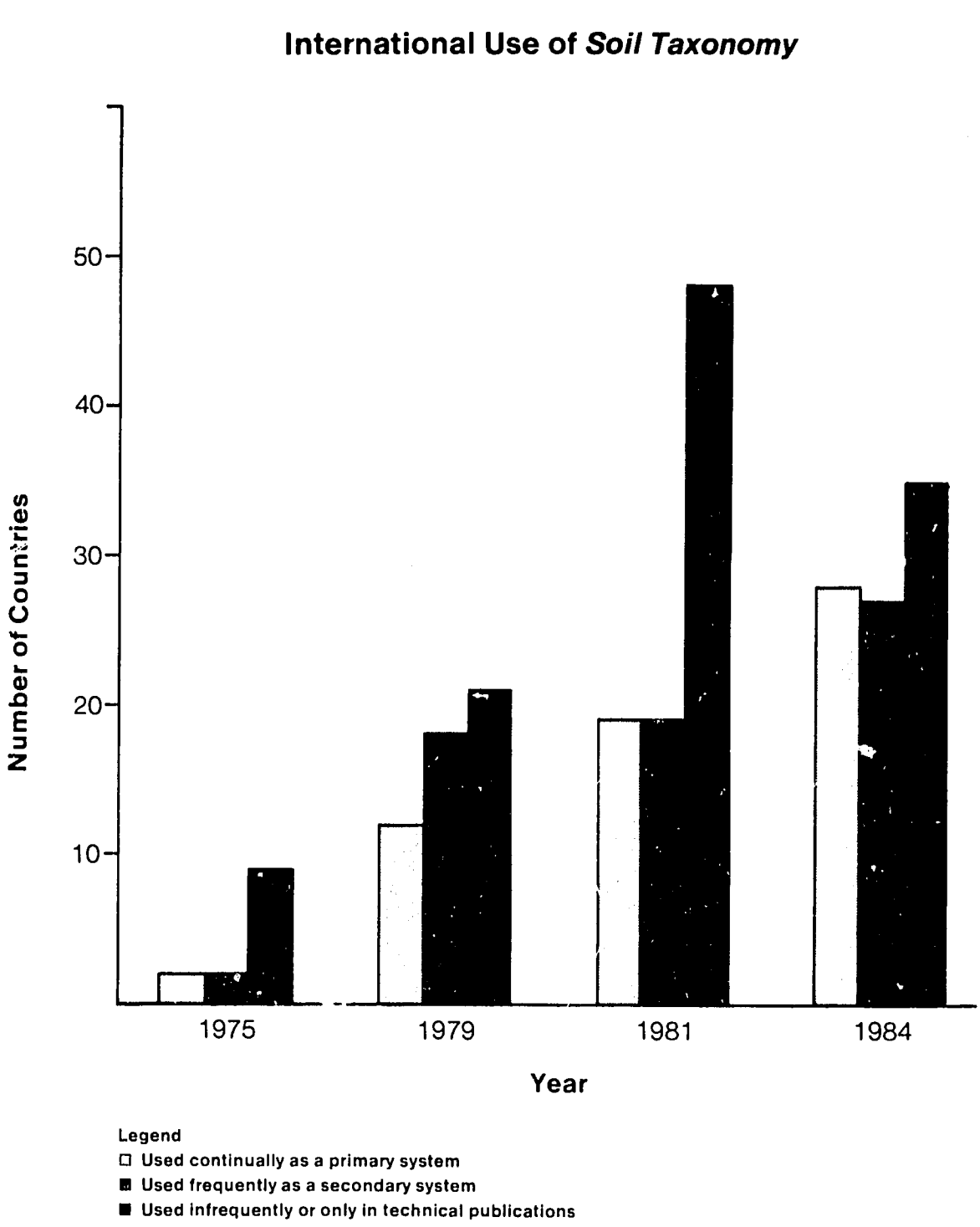

Figure 12. International use of *Soil Taxonomy*.

TABLE 7.

GEOGRAPHIC DISTRIBUTION OF THE USE OF *Soil Taxonomy*, 1960–1983 (NUMBER OF ARTICLES PUBLISHED)

COUNTRY	1960–1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
South America																				
Argentina												1	1		1				8	11
Brazil							1	2	2		4	6	:	10	4	11	11	11	9	72
Bolivia															2		2	1		5
Chile												4	1	1	1	3	2	3	1	16
Colombia	2		1	1			1			2	2	2			2	8			1	21
Ecuador								1	1											2
French Guinea												1								1
Galapagus									1											1
Guatamala															1					1
Nicaragua						1	1	1					1							4
Peru														1	2	1				4
Puerto Rico	1									1				2	4		1	5		14
Surinam											1									1
Venezuela						3	1	3		1	3	1	2	1		4	1	2	1	23
South America–unspec.										1	1		1	1	1					5
Uruguay										1										1
TOTAL	3	0	1	1	0	4	4	7	4	6	11	15	7	16	18	27	17	21	20	182
North & Central America, Caribbean Islands																				
United States	41	7	16	10	7	2	1	2	4	7	11	11	5	22	63	91	109	79	33	521
Caribbean Isles–unspec.						1														1
Canada	2					1	2			1	1		2	3		7	4	5	2	30
Costa Rica							2	3	1	3				4	3	2	4			22
Jamaica										1							1			2
Mexico									1				2			1				4
Trinidad & Tobago						2	1				1								1	5
Central Amer.–unspec.												2								2
Tropics–unspec.	1		3					1				1		3	7	6	5	7	4	38
TOTAL	44	7	19	10	7	6	6	6	6	12	12	13	9	32	73	107	113	91	40	619

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TABLE 7.
CONTINUED

COUNTRY	1960–1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
Africa																				
Angola											1									1
Egypt				1		1										2	1	1		6
Ethiopia								1			1									2
Kenya					1	1		1			1			1						5
Lebanon									1											1
Liberia															1					1
Libya																			1	1
Morocco									1					1	1					3
Mozambique								1			1									2
Natal								1	1											2
Nigeria										1		1	5	3	13	9	7	3	3	45
Rwanda	1																			1
Sierra Leone																	1			1
Somalia																		1		1
South Africa				2				1			1							2		6
Sudan						3	1	1		1					1	1				8
Syria																	1			1
Tanzania								1	1											2
Togo													1							1
Upper Volta						1														1
Zaire										1	1	1		1	1	1	1	1		8
Zimbabwe (Rhodesia)										1										1
Central Africa–unspec.		2		1			1													4
North & Western Africa								1				1		1	1					4
Eastern Africa–unspec.															1	1		1		3
Africa–unspec.							1				1		1	1	1		1			7
TOTAL	2	0	2	3	2	6	2	9	4	4	7	3	7	8	20	14	12	9	4	118

Europe																				
Belgium	2				1	1				3	1					1				9
Denmark																		1		1
France	2							1		1		3	1		2	1				12
Greece																		2	3	5
Germany, West																		1		1
Netherlands	2	4		2		2	1	1								1		5		18
New Zealand															1	1	1		2	5
Norway																1				1
Portugal	1		1	1																3
Romania			5						2	1					1	1		1		11
Spain & Canary Isles					3			2	2	3	3	7	7	17	10	9	16	9	1	89
Sweden	1																			1
Turkey														1	1					2
United Kingdom									2	1		1		2	2	2				10
USSR	17										1		1							19
Yugoslavia									1	1					1	1		1	1	6
West Europe–unspec.	1	3														1				5
East Europe–unspec.															1					1
Ireland (Eire)					1			2												3
Italy	1	1	1	1										1						5
Poland											1									1
TOTAL	7	8	7	4	5	3	1	6	7	10	6	11	9	21	19	19	17	20	7	207

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TABLE 7.
CONTINUED

COUNTRY	1960–1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
Asia and Oceania																				
Afghanistan												1								1
Bangladesh											1	1			1					3
Chinese Peoples Rep.																		1		1
India	1			2		5	3	7	4	8	5	9	11	18	16	13	15	26	15	148
Israel															1	1	2	1	2	7
Japan		1		2			1	4						1	1	2	1	1	1	15
Kampuchea													1							1
Korea, South														1		1				2
Malaysia			1		1	1	1	3	1	3	5	4	6	8	2	2	2	6	1	47
Taiwan																			1	1
Sri Lanka																		1		1
Saudi Arabia																		1	1	2
Thailand								1							6			7		14
United Arab Republic				1															1	2
South & SE Asia–unspec.																1				1
Iraq										1								1		2
Iran															2	3		1		6
Australia	4		1							1		1		1	1	1		3		13
Indonesia								1			1				2		1	2		7
New Zealand																15	12	15	12	54
Papua New Guinea			1												1			1		3
Philippines													1		1	2		3	1	8
South Pacific															1		5	6		12
TOTAL	5	1	2	6	1	6	5	16	5	13	12	16	19	29	35	41	38	76	35	351
Annual Grand Total	81	16	31	24	15	25	18	44	26	45	48	58	51	106	165	208	197	217	106	1,391

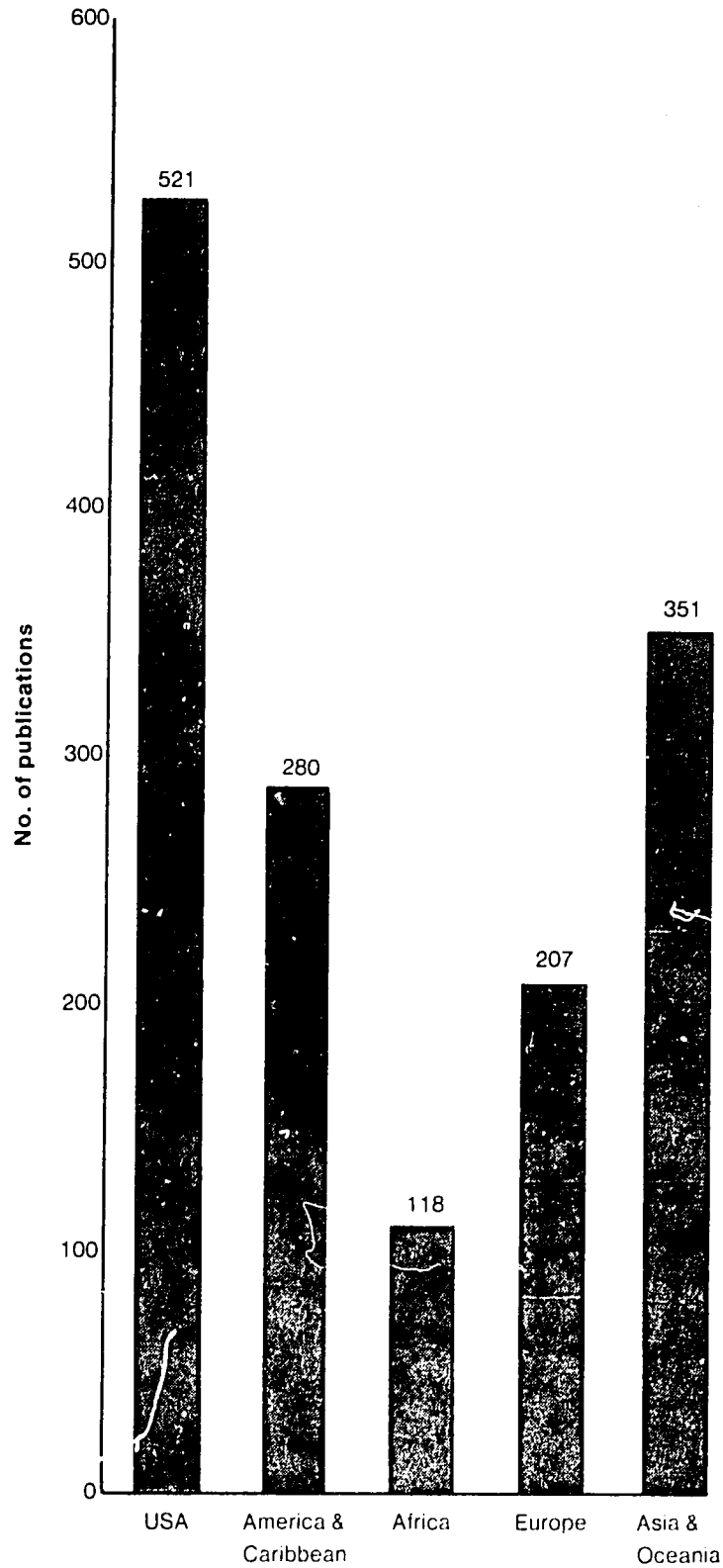

Figure 13. Total number of publications using *Soil Taxonomy* in and outside the United States (compiled in 1983).

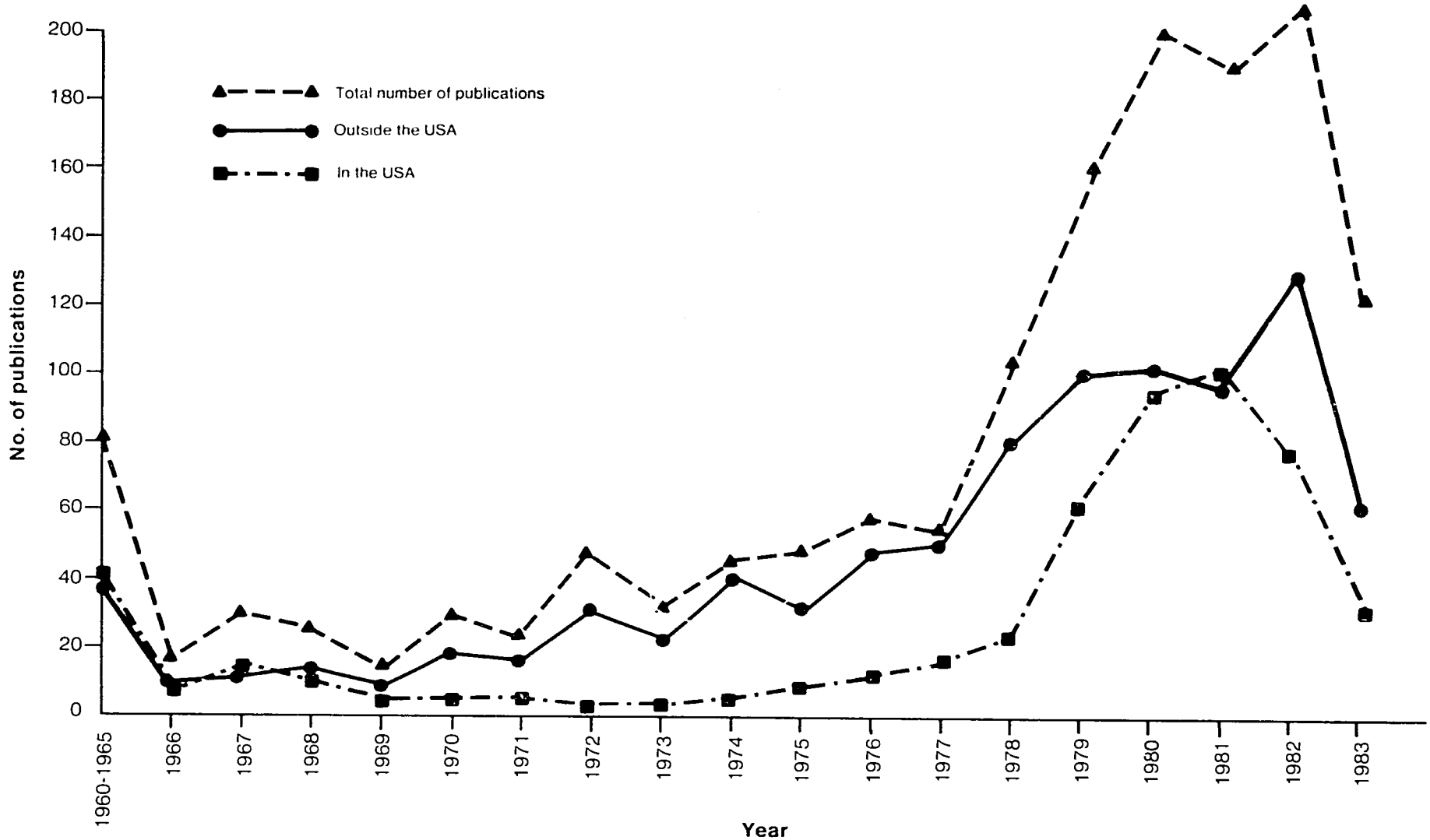

Figure 14. Total number of publications using *Soil Taxonomy*.

APPENDIX I.
Soil Management Support Services Advisory Panel Meeting Minutes

Panel sessions on 30 November 1982 and
3 December 1982
Anaheim, California

Members attending:
A. Van Wambeke, chairman

G. N. Alcasid	R. Fauck
D. Greenland	W. H. Judy
E. Kamprath	H. Luken
D. Muljadi	B. Okigbo
G. Paez	D. Plucknett
A. J. Smyth	L. D. Swindale
R. Tavernier	

1. Dr. R. McCracken welcomed the panel members at Anaheim.
2. Dr. K. Flach, principal investigator, submitted the SMSS progress report for the period October 1, 1979 to September 30, 1982. It covers the two components of the project: technical assistance which consists of short term assignments on specific problems in LDCs, and the technology transfer component, which is a long term program aiming primarily at the refinement of *Soil Taxonomy*.
3. The panel commended SMSS and the cooperating agencies for the excellent performance, the impressive output and initiatives taken during the first three years, in line with the recommendations of the previous panel.
4. Dr. Flach presented for consideration by the panel a set of possible activities and strategies for accomplishing the objectives of the SMSS project during the next five years:
   a. He expressed his concern about the lack of awareness on soil conservation issues in LDCs and in development agencies. He suggested a series of SMSS activities to correct this situation. The panel gave preference to collaborative programs with national institutions in LDCs, and recommended to operate primarily through personal contacts and visits to USAID missions and government institutions in order to stimulate interest.
   b. He described the capability of the Soil Conservation Service to provide technical assistance, and suggested to give it more visibility. Its efficiency should be enhanced by improving access to literature available in the U.S. and elsewhere, by establishing closer linkages with LDCs and by informing them in a more effective way about the organizational structure of the SCS fields of expertise.
   c. On various occasions Dr. Flach indicated that SMSS wishes to engage in a broader spectrum of activities related to soil conservation and soil fertility issues. The panel felt that given the limited resources available to SMSS, and considering the need for further refinement of *Soil Taxonomy*, and recognizing its increasing usefulness in technology transfer, that SMSS continue to concentrate on the refinement of *Soil Taxonomy*. The technology transfer component should be SMSS' first priority and the emphasis should be placed on making *Soil Taxonomy* more precise and more reproducible so that it provides a true scientific language for technology transfer. In this way *Soil Taxonomy* would serve in a more effective way the related fields of agricultural development by providing a better basis for interpretative groupings dealing with management.
5. The panel specifically recommended:
   a. No new International Committees (ICOMs) be supported by SMSS before the contributions of the first ones which have been terminated have been evaluated and considered satisfactory with respect to the specific objectives of their mandates.
   b. In spite of (a) above, that SMSS explore ways and means to initiate as soon as possible work on the classification of paddy soils.
   c. SMSS contribute to strengthen the capability of LDCs to create soil data banks, by developing compatible data processing systems on pedons, soil series, and other taxa. In this way information on soil taxonomic and mapping units can readily be made available for testing of changes to *Soil Taxonomy*, and develop interpretative groupings.
   d. SMSS contribute to the collection of reliable data

on soil units in LDCs to be entered in the system described under 5 (c) in cooperation with national institutions. SMSS should also maintain close contacts with crop performance data banks, and crop modeling projects in order to be in a position to respond to requests from these groups. It was not found necessary that SMSS engage in crop modeling itself, but rather restricts its data processing work to the development of a soil data base. The latter should include information on past use of the land, as well as cropping systems descriptors of the pedon environment. A necessary component of the data base is the geographic distribution of the major units.

c. That SMSS encourages the development of interpretative systems which will contribute to the increased use of *Soil Taxonomy* in activities such as the use of fertilizers, protection of soils against erosion, soil testing, crop adaptation, etc. These systems should give special attention to the water regime of the soil, its water storage capacity, water acceptance characteristics, etc. In addition, the panel recommends to organize workshops on interpretation.

6. The panel recognizes the need of research on soil genesis as well as the intensified collection of data to test changes to *Soil Taxonomy*. It agrees that small grants to serve precisely defined objectives be considered by SMSS to assist the ICOMs in reaching their objectives.
7. The panel considers that SMSS activities should be directed towards the strengthening of national institutions in the LDCs. The programs should be adapted to the needs of the individual countries. Training sessions should be selective and complement national programs rather than replace them. Regional approaches are recommended. Technical assistance should always be delivered in cooperation with the national institutions.
8. The panel recommends that the subject matter taught during training sessions should take into account the level that the individual regions have reached. In case of advanced knowledge of *Soil Taxonomy*, the emphasis should be placed on interpretation methodology rather than on taxonomy itself.
9. Soil correlation is an application of *Soil Taxonomy* which needs to be developed. SMSS is recommended to act at national, regional and international levels upon request of soil survey institutions. The panel agrees that SMSS explore ways and means to assist the ASEAN (Association of South East Asian Nations) countries in their soil correlation efforts.
10. The panel recommends SMSS to seek close linkages with agricultural research networks. Several have been mentioned at the panel sessions: IBSNAT, INSFFER, TROPSOILS, CATIE, etc. Others have contacted SMSS for assistance in classification, correlation, etc. The panel recognizes that SMSS has been an excellent catalyst to national institutions, and sees similar advantages from closer cooperation with coordinated regional programs.
11. The panel is aware that the technology transfer component of SMSS has not directly dealt with actual soil management problems. It considers that the name of the project implies that SMSS is to provide supporting services to soil management, and not direct soil management advice. It was suggested SMSS prepare monographs on the management properties of the major soil taxa in tropical areas; this would greatly increase the impact of *Soil Taxonomy* in matters related to land use.
12. The panel invited the chairman of the advisory panel to write to Dr. McCracken to request quicker responses by the Soil Conservation Service to proposals to changes in *Soil Taxonomy*. It recognizes the efforts made recently to improve the situation, and hopes that the processing of the requests will be accelerated in the future.
13. The panel expresses its appreciation of the excellent cooperation SMSS received from collaborating institutions in the U.S. and abroad, and invites SMSS to convey this expression to the institutions which have contributed to the success of the SMSS program during the first three years of operations.

A. Van Wambeke
Chairman
SMSS Advisory Panel
January 20, 1983

APPENDIX II. ACTIVITIES OF SMSS

TT—Technology Transfer
TC—Technical Consultation
TA—Technical Assistance

September 1979	Establishment of Soil Management Support Services. Richard L. Guthrie appointed as Acting Director.
October 1979	Conference on Soil Information Systems. Ottawa, Canada. Richard L. Guthrie. 5 days.
January 1980	ASIA/TR/ARD. Review Proceedings of ASEAN Workshop on Watershed Conservation and Management. Richard Guthrie and Robert Hartung. 4 days.
March 1980	USAID/El Salvador. Information on Soil Conservation Practices.
TC	Richard Guthrie and Arnold King. 4 days.
April 1980	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	USAID/Senegal. Soil Survey for fuelwood production. Project AG/SEN—685-0219. James Brown. 14 days.
April 1980	SMSS Brochure published.
April 1980	Follow-up meeting of 3rd International Soil Classification Workshop, Athens, Greece. R. W. Arnold and K. W. Flach. 6 days.
April 1980	Conference on International Reference Base for Soil Classification. Sofia, Bulgaria. R. W. Arnold and K. W. Flach. 7 days.
April 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 1980	USAID/Senegal. Soil Survey for fuelwood production. James Bower and James Brown. 21 days.
June 1980	USAID/Rwanda. Develop legend of national soil map. Armand Van Wambeke. 10 days.
June 1980	USAID/Philippines. Review national Soil Classification Program. Richard Arnold. 30 days.
June 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 1980	USAID/Tunisia. Provide LANDSAT imagery.
TC	Richard Guthrie. 4 days.
July 1980	Hari Eswaran appointed as consultant to SMSS 75 days.
August 1980	USAID/Thailand. Evaluation and upgrading of soil, water, and conservation organizations, projects, and practices. Victor Link and W. Austin. 14 days.
September 1980	USAID/Jamaica. Soil survey, land use, and soil classification training.
TC	Richard Guthrie and Arnold King. 14 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 soil classification to GOM official. John Witty. 1 day.
October 1980	Symposium on Paddy soils, Nanjing PRC. Klaus W. Flach. 11 days.
October 1980	USAID/Sudan. Evaluating training and laboratory equipment needs for soil survey and classification. Hari Eswaran and John Kimble. 14 days.

October 1980 DS/AGR. Expert consultation on soil correlation and 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 project.
James Brown, Lawson Spivey, Donald McDaniels. 27, 18, 18 days, respectively.

November 1980 Rwanda. Planning meeting for 4th International Soil Classification Workshop.

TT Hari Eswaran and Fred Beinroth. 14 days.

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.

TC 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 (soil erosion) program.

TC Luis Daniel. 32 days.

January 1981 USAID/Swaziland. Request for soil management publications.

TC Richard Guthrie. 1 day.

January 1981 USAID/Syria. Review possible technical assistance to ACSAD in soil survey and classification.

TC Klaus Flach. 7 days.

January 1981 USAID/Sudan. Assist in soil sampling for Soil Classification Workshop.

TC W. D. Nettleton. 21 days.

January 1981 USAID/Ecuador. Develop long-term soil management program.
Jesse Hicks, Paul Britt, and Jerry Dutchober. 17 days each.

January 1981 Venezuela, Trinidad.

TT Guy Smith consultations. 14 days.

January 1981 John Kimble. Sampling trip to Puerto Rico.

TT

January 1981 Symposium on Acid Sulfate Soils. Thailand, Malaysia.

TT Hari Eswaran, John Witty, Warren Lynn. 14 days each.

February 1981 USAID/Bolivia, Evaluate soil erosion.

TC Van K. Haderlie. 17 days.

February 1981 USAID/Thailand. Assistance in soil conservation.

TC Gerald Latshaw. 40 days.

February 1981 Conference on soils with variable charge, New Zealand.

TT Hari Eswaran, Richard Arnold. 17 days each.

February 1981 Three chapters of new Soil Survey Manual mailed out to international cooperators (350).

TT

March 1981 *Soil Classification* 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 National Work Planning Conference. Washington, D. C.

TT 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.

TT James Silva. 7 days.

May 1981 USAID/Indonesia. Assistance in evaluation of transmigration program of GOI.

TC Gary Margheim and Rich Duesterhaus. 10 days each.

June 1981 4th International Soil Classification Workshop, Rwanda. 28 out of 62 participants funded by SMSS.

TT Richard Arnold, John Kimble, and Hari Eswaran. 15, 15, 21 days, respectively.

June 1981 USAID/Syria. Training course on erosion under arid conditions, organized by ACSAD.

TC Gordon Stroup and Steve Rawlings. 14 days each.

July 1981 USAID/India. Assistance in irrigation project of GOI.

TC Ray Meyer. 45 days.

August 1981 USAID/Sudan. Assistance in planning workshop.

TT Hari Eswaran. 10 days.

August 1981 International Working Meeting on Soil Micromorphology. London.

TT Hari Eswaran. 8 days.

October 1981 USAID/Bangkok. Assistance in developing soil conservation program.

TC	Jack P. Kanalz. 25 days.
October 1981	USAID/Damascus. Assistance to ACSAD on soil map of Syria.
TC	Roy M. Smith. 27 days.
October 1981	ROCAP/CATIE. Application of Soil Taxonomy in ROCAP region.
TC	Oliver W. Rice. 17 days.
October 1981	ROCAP/CATIE. Application of Soil Taxonomy in ROCAP region.
TC	Richard W. Arnold. 6 days.
October 1981	USAID/Bamako. Assistance in soil survey project.
TC	Hubert J. Byrd. 25 days.
October 1981	Thailand, Indonesia, Malaysia. Mission to organize training course.
TT	Hari Eswaran. 15 days.
November 1981	Fiji. Training Course.
TT	Richard W. Kover, Goro Uehara and Hari Eswaran. 15 days each.
November 1981	USAID/Dakar. Assistance in soil survey of fuel wood project.
TT	James H. Brown. 11 days.
November 1981	USAID/Djibouti. Evaluation of soil survey laboratory.
TC	Allen R. Hidlebaugh. 12 days.
December 1981	Morocco. Planning meeting for training course.
TT	Hari Eswaran. 12 days.
January 1982	USAID/Panama. Evaluation of national soil survey and conservation program.
TC	Reuben Nelson. 30 days.
January 1982	Technical Monograph No. 1 entitled "Soil Resource Inventories and Development Planning" mailed out.
TT	
February 1982	Thailand. Sampling of soils for training program.
TT	Maurice J. Mausbach. 30 days.
February 1982	India. 13th International Congress of Soil Science.
TT	Klaus W. Flach, Richard L. Guthrie, Steven C. Holzhey, and John M. Kimble, Hari Eswaran. 12–25 days each.
February 1982	Indonesia, Philippines. Sampling of Benchmark soils.
TT	Maurice J. Mausbach. 10 days.
February 1982	USAID/Quito. Assistance in soil conservation program.
TT	Eddie Wood and John Caviness. 12 and 25 days, respectively.
March 1982	Jordan. Sampling of soils for training course.
TT	Eddie Spencer. 24 days.
April 1982	Morocco. Training Course in *Soil Taxonomy*.
TT	Arville Touchet and Hari Eswaran. 16 days each.
May 1982	Thailand, Papua New Guinea. Planning meeting for training course.
TT	Hari Eswaran. 25 days.
May 1982	Orlando, Florida. Participation in S. Regional Work Planning Conference.
TT	John Kimble. 5 days.
June 1982	USAID/New Delhi. Assistance in characterizing benchmark soils of India.
TC	Dewayne Williams. 35 days.
June 1982	Puerto Rico. To make movie on *Soil Taxonomy*.
TT	Hari Eswaran. 7 days.
June 1982	Sudan. Planning meeting for 5th Workshop.
TT	Fred Beinroth. 10 days.
June 1982	North Carolina. Discussion with Indonesian delegates on soil management project.
TT	Hari Eswaran. 7 days.
July 1982	Brazil. Conference on laterites.
TT	Steve Holzhey. 15 days.
July 1982	USAID/Djibouti. Project evaluation.
TC	Allen Hidlebaugh. 21 days.
July 1982	USAID/Djibouti. Training staff on lab analyses.
TC	George Holmgren. 30 days.
July 1982	Hawaii. Discussion on IBSNAT-SMSS Cooperation.
TT	Hari Eswaran. 10 days.
July 1982	Technical Monograph No. 3 entitled "Soil Moisture and Temperature Regimes—Africa" mailed out.
TT	
August 1982	USAID/Kigali. Assistance in geomorphological evaluation.
TC	Robert Ruhe. 30 days.
August 1982	USAID/Jakarta. Assistance in soil survey evaluation.
TC	Darwin L. Newton. 35 days.
August 1982	Papua New Guinea and New Zealand. Preparation of training course.
TC	John Kimble. 30 days.
August 1982	Washington, D. C. SMSS expert consultation meeting on Soil Fertility.
TC	
August 1982	Technical Monograph No. 4 entitled, "Guidelines For Evaluating the Adequacy of Soil Resource Inventories" mailed out.
TT	
August 1982	Costa Rica. To develop cooperative program with CATIE
TC	Hari Eswaran. 7 days.

September 1982	Ecuador and Chile. Planning meeting for the 6th workshop.
TC	Hari Eswaran and Fred Beinroth. 20 days.
September 1982	Washington, D. C. End of Soil Management Support Services Phase I.
October 1982	USAID/Somalia. Soil survey assistance.
TA	Otto Baumer. 21 days
October 1982	Panama. Soil sampling.
TT	John Kimble. 12 days.
November 1982	5th International Soil Classification Workshop-Sudan.
TT	K. Flach, R. Guthrie, D. Pendleton, D. Nettleton. 11 days.
November 1982	Temple, Texas. Discuss development of a general agricultural management model (EPIC, CERES).
TT	H. Eswaran. 4 days.
November-December 1982	ASA Meetings. Anaheim, California.
TT	H. Eswaran, K. Flach, J. Kimble. 5 days.
January 1983	Costa Rica.
TA	Gilberto Acevedo. 21 days.
January 1983	Cameroon. III International Forum on Soil Taxonomy.
TT	H. Eswaran, R. Guthrie. 10 days.
February 1983	Djibouti. Soil survey assistance.
TA	A. Hidlebaugh. 23 days.
February 1983	Thailand. IV International Forum on Soil Taxonomy and Agrotechnology Transfer.
TT	H. Eswaran, M. Mausbach, A. Van Wambeke. 18 days.
March 1983	Djibouti. Soil survey laboratory assistance.
TA	G. Holmgren. 19 days.
March 1983	India. IBSNAT-SMSS-ICRISAT Symposium on Minimum Data Sets for Agrotechnology Transfer.
TT	R. Arnold, A. Jones, P. Dyke, C. Williams, H. Eswaran. 5 days.
April 1983	Australia. Visit soils laboratories.
TT	J. Kimble. 14 days.
April 1983	Papua New Guinea. V International Forum on Soil Taxonomy and Agrotechnology Transfer.
TT	J. Kimble, H. Eswaran. 13 days.
May-June 1983	Rwanda/Burundi/Zambia. Develop plans for 1984 training forum.
TA	H. Eswaran. 14 days.
June 1983	Chile. Preparations of program for 6th International Soil Classification Workshop.
TT	F. Beinroth. 5 days.
June 1983	Panama/Costa Rica. Plans for *Soil Taxonomy* training forum.
TA	H. Eswaran, F. Beinroth. 10 days.
June 1983	Belgium. Preparation for Rwanda/Burundi training forum.
TT	H. Eswaran. 5 days.
August 1983	Philippines. Soil sampling for 7th International Soil Classification Workshop.
TT	R. Haberman, R. Yeck. 21 days.
September 1983	Washington, D. C./Lincoln, Nebraska. Study of soil family classes in *Soil Taxonomy*.
TT	B. Hajek. 180 days.
September 1983	Fiji. Soil classification and IBSNAT project.
TA	J. Silva. 28 days.
September 1983	Lesotho. Soil sampling.
TA	E. D. Lewis. 25 days.
September 1983	Thailand. Follow-up on IV International Training Forum.
TA	H. Eswaran. 7 days.
September 1983	Australia, Guam, Philippines. Australia: soils workshop; Guam: organize training forum; Philippines: plans for 7th International Soil Classification Workshop.
TT	H. Eswaran. 20 days.
September 1983	Ecuador. Preparation of tour for 6th International Soil Classification Workshop.
TT	F. Beinroth. 4 days.
September 1983	Washington, D. C. Review SMSS activities.
TT	H. Eswaran. 7 days.
September-October 1983	USAID/Lesotho. Provide assistance in geomorphology, classification, and soil series concepts and photograph soils for *Benchmark Soils of the World*.
TA	David Lewis. 25 days.
September-October 1983	USAID Rwanda/Burundi. Sample 23 soil profiles for characterization in preparation for a training forum and make a soil survey on 400 hectares.
TA	Arville Touchet. 27 days.
October 1983	USAID/Senegal. Land regeneration and agricultural intensification in the ground nut basin.
TA	Terry Clement. 11 days.
September-August 1983-1984	Review of the Family Category in *Soil Taxonomy*.
TT	Ben Hajek. 157 days, including 27 days in Great Britain, West Germany, Belgium, and Netherlands.

October-November 1983	USAID/Somalia. Soil Survey and assessment of an irrigation project.
TA	Otto Baumer. 30 days.
October 1983	Jordan. Planning meeting for forum.
TA	Hari Eswaran. 7 days.
October 1983	Bulgaria. Workshop on International Reference Base.
TT	Richard Arnold. 5 days.
October-November 1983	USAID/Costa Rica. Sampled 12 soil profiles for characterization for CATIE and participate in the VI International Training Forum on *Soil Taxonomy* and Agrotechnology Transfer.
TA	John Kimble and Mario Valverde. 21 days.
November 1983	China. Participate in international conference on Red Soils.
TT	Hari Eswaran. 14 days.
November-December 1983	USAID/Zambia. Sample 20 benchmark soils for the Zambia Ministry of Agriculture and prepare a paper on "Aspects of Soil Classification."
TA	Don Hallbick. 31 days.
December 983	Washington, D. C. International Committee meeting on Low Activity Clays (ICOMLAC).
TT	Richard Guthrie, Stan Buol, John Kimble, Terry Cook, Hari Eswaran, Dick Arnold, Richard Fenwick. 2 days; Frank Moorman. 5 days.
January 1984	Pakistan. Preliminary planning assistance for *Soil Taxonomy* Training Forum.
TA	Hari Eswaran. 10 days.
January 1984	Chile and Ecuador. 6th International Soil Classification Workshop—Classification and Management of Andisols—ICOMAND.
TT	Richard Arnold, Richard Fenwick, Fred Beinroth, Bob Wack. 14 days; Terry Cook, John Kimble. 18 days.
January 1984	India. Assistance for ICRISAT.
TA	Hari Eswaran. 4 days.
February-March 1984	Djibouti. To assess the capability of their soils laboratory.
TA	George Holmgren. 46 days.
February 1984	Jordan. Planning assistance for *Soil Taxonomy* Training Forum and project proposal for rainfed areas of Jordan.
TA	Hari Eswaran. 6 days.
February-March 1984	Somalia. Discussion on the general soil map of Somalia.
TA	Hari Eswaran. 6 days.
March 1983	Rome. Discussion with FAO representatives on collaborative projects.
TT	Hari Eswaran. 3 days.
March 1984	Thailand. Program meeting for the ASEAN general soil map.
TA	Hari Eswaran. 3 days.
March 1984	Philippines. VII International *Soil Taxonomy* Training Forum.
TT	Ron Yeck, Hari Eswaran. 14 days.
March-April 1984	Philippines. 7th International Soil Classification Workshop on the Management and Classification of Wetland Soils—ICOMAQ.
TT	Ron Yeck, Hari Eswaran. 14 days.
March-April 1984	Pakistan. Sample 23 soil profiles for characterization in preparation for training forum and Benchmark reference sites.
TA	Terry Cook, Dennis Lytle. 24 days.
April 1984	Australia. Testing and examining proposals for the International Committee on Vertisols—ICOMERT.
TT	Juan Comerma. 13 days.
April 1984	Nigeria. IITA—Discussion on IBSRAM Network on Land Clearing.
TA	Hari Eswaran. 4 days.
April-May 1984	Jamaica. Assistance in soil classification, correlation, laboratory needs, soil water and crop requirements, and soil fertility needs.
TA	Rod Harner. 13 days.
April-May 1984	Kenya. ICRAF—Discussion on collaborative training forums.
TA	Hari Eswaran. 1/2 day.
May 1984	Burundi. Planning for *Soil Taxonomy* Training Forum.
TA	Hari Eswaran. 4 days.
May 1984	Rwanda. Planning for *Soil Taxonomy* Training Forum.
TA	Hari Eswaran. 4 days.
May 1984	Jordan. VIII International *Soil Taxonomy* Forum. Hari Eswaran. 16 days.
May 1984	Texas. Combined Western and Southern Regional National Cooperative Soil Survey Work Planning Conference. John Kimble. 6 days.
May-June 1984	Jordan. Develop a proposal for a soil survey of Jordan.
TA	Bill Johnson. 7 days.
June 1984	Thailand. Assistance in computerization of soil survey information.
TA	Armand Van Wambeke. 21 days.
June 1984	Massachusetts. Northeastern Regional National Cooperative Soil Survey Conference. Terry Cook. 6 days.
June 1984	Thailand. ASEAN Soils Conference.

TT	Richard Arnold, Hari Eswaran. 13 days.
June 1984	Malaysia. Planning for *Soil Taxonomy* Training Forum.
TA	Hari Eswaran. 4 days.
July 1984	Philippines. Farming systems project for PCARRD.
TA	Hari Eswaran. 4 days.
July 1984	Guam Planning for *Soil Taxonomy* Training Forum.
TA	Hari Eswaran. 4 days.
July 1984	California/Oregon. Field test and examine proposals for the International Committee on Vertisols—ICOMERT.
TT	Terry Cook. 12 days.
August 1984	Hawaii. IBSNAT Conference.
TT	Richard Arnold, Hari Eswaran. 5 days.
September 1984	Guam IX International Forum.
TT	Hari Eswaran and Lou Langon. 14 days.

APPENDIX III. PAPERS PUBLISHED BY SMSS STAFF

Arnold, R. W. 1984. Criteria for intergrades between Andisols a id other orders. Presented orally and to be published in the proceedings of the 6th International Soil Classification Workshop, Chile and Ecuador, 9–20 January 1984.

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Cook, T. D. 1984. Field identification and mapping of some soils with andic or vitric properties. Presented orally and to be published in the proceedings of the 6th International Soil Classification Workshop, Chile and Ecuador, 9–20 January 1984.

———. 1984. International activities of Soil Management Support Services. Presented orally and to be published in the proceedings of the Northeast Cooperative Soil Survey Conference, Amherst, Massachusetts, 10–15 June 1984.

Eswaran, H. 1981. Scanning electron microscopy as applied to soil research. Proceedings of the VI International Working Meeting on Soil Micromorphology. London.

———. 1982. Alfisols and Ultisols. Pages 115–124 *in* Proceedings of the South Pacific Forum on *Soil Taxonomy*, R. J. Morrison and D. M. Leslie, eds. Institute of Natural Resources, Univ. of the South Pacific., Suva, Fiji.

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———. 1983. Recent efforts to refine *Soil Taxonomy* for the classification of the soils of the tropics. Proceedings of the Soils Workshop, IBSRAM. Townsville, Australia.

———. 1983. Use of *Soil Taxonomy* in identifying soil-related potentials and constraints for agriculture. Proceedings of the Workshop on Soil-Related Constraints in S. E. Asian Agriculture. Bangkok, Thailand.

———. 1984. SMSS-IBSNAT: A linkage for agrotechnology transfer. Submitted to Workshop of IBSNAT, Hawaii.

Eswaran, H., and R. W. Arnold 1982. Soil Management Support Services and internationalization of *Soil Taxonomy*. Pages 31–44 *in* Proceedings of the South Pacific Forum on *Soil Taxonomy*, R. J. Morrison and D. M. Leslie, eds. Institute of Natural Resources, Univ. of the South Pacific, Suva, Fiji.

Eswaran, H., and T. D. Cook. 1984. Classification of wet soils in *Soil Taxonomy*. Submitted to Seventh International Soil Classification Workshop, Philippines, 11–24 March 1984.

Eswaran, H., and R. Tavernier. 1980. Classification and genesis of Oxisols. Pages 427–442 *in* Soils with Variable Charge, B. K. G. Theng, ed. New Zealand Soil Science Society.

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Eswaran, H., H. Ikawa, and J. M. Kimble. 1983. Oxisols of the world. Proceedings of the Symposium on Red Soils. Beijing, People's Republic of China.

Eswaran, H., A. Osman, and M. Iliawi. 1982. Mineralogy and micromorphology of Aridisols. Proceedings of the 3rd International Soil Classification Workshop, Damascus, Syria.

Eswaran, H., S. Paramanathan, N. Daud, and N. Mokhtar. 1983. An evaluation and application of the concept of soil performance. Proceedings of the 5th International Forum on *Soil Taxonomy*. Papua New Guinea.

Fenwick, R. W., H. Eswaran, and R. W. Arnold. 1983. Diagnostic surface horizons: epipedons. III International *Soil Taxonomy* Training Forum, Cameroon. 6–15 January 1983.

Flach, K. W., and O. W. Rice. 1980. Principles of classification as applied to paddy soils. Pages 381–386 *in* 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. Pages 411–426 *in* Soils with

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Guthrie, R. L. 1980. Analytical requirements for placement in *Soil Taxonomy* and methods used. Pages 199-204 *in* Proceedings of the 3rd International Soil Classification Workshop. Syria.

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Holmgren, G. S. and J. M. Kimble. 1983. Field estimation of amorphous aluminum with 4NKOH. Soil Science Society of America Journal.

Kimble, J. M. 1981. Analytical techniques for soils with variable charge. Presented at the 4th International Soil Classification Workshop, Rwanda.

Kimble, J. M., and T. D. Cook. 1984. International committees activities. Presented orally at the Northeast and Combined Southern and Western Regional Soil Survey Conferences and to be published in the proceedings of the Northeast Cooperative Soil Survey Conference, Amherst, Massachusetts, 10-15 June 1984.

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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., and W. D. Nettleton. 1984. Analytical characterization of Andepts and Andisols. Presented orally by Kimble and to be published in the Proceedings of the 6th International Soil Classification Workshop, Chile and Ecuador, 9-20 January 1984.

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APPENDIX IV. REPORT OF MR. VICTOR ASIO

VISAYAS STATE COLLEGE OF AGRICULTURE
Baybay, Leyte

April 10, 1984

Dr. Hari Eswaran
Project Leader
Soil Management Support Services
Soil Conservation Service
United States Department of Agriculture
Washington, D. C.

Dear Sir Hari:

I am sending you a copy of my report to our chairman of the Department of Agronomy and Soil Science, VISCA, Baybay, Leyte about the 7th International Forum on Soil Taxonomy and Agrotechnology Transfer in Los Banos Laguna.

I would like also to notify you that I am now ready to describe the pit dug near my PCARRD-funded experiment just a kilometer from our school campus. In just a few days time, I will be sending my samples to the Bureau of Soils in Manila.

I would like also to thank you for sending me the transcript of the meeting on Soil Classification and Soil Fertility which I requested last February. I received it shortly after I arrived from the training which your project sponsored.

Thank you for that very good training and thank you for your willingness to give assistance to us.

Sincerely yours,

VICTOR B. ASIO

VISAYAS STATE COLLEGE OF AGRICULTURE
Baybay, Leyte

April 10, 1984

Dr. Rodolfe G. Escalada
Head
Department of Agronomy and Soil Science
Visayas State College of Agriculture (VISCA)
Baybay, Leyte

Sir:

I would like to report the activities we had during the 7th International Forum on Soil Taxonomy and Agrotechnology Transfer held at PCARRD Headquarters, Los Banos Laguna last March 12-23 which was sponsored by the Soil Management Support Services (SMSS) of the Agency for International Development, PCARRD, and the Bureau of Soils.

During the first 3 days of the training, we received very comprehensive lectures on soil taxonomy. We were also taught on how to classify soils following the guide "Keys to Soil Order", and how to interpret based on the classification.

To follow-up what we have learned during the lectures, we had our field tour to some provinces in Luzon. In here, we examined and classified 11 pedons. During this tour also, we were divided into groups and each group was assigned to classify one pedon. This arrangement gave the participants the chance to classify on their own (although under close supervision by Dr. Hari Eswaran, the project leader of SMSS) and this enhanced full participation among the participants.

After the field tour, the last 4 days was devoted to lectures on Agrotechnology transfer and other related topics.

During the closing ceremony, the participants requested for follow-up activities. One of these is that each participant will describe and classify a pedon in his own experimental station. Sometime at the end of the year, Dr. Eswaran and some staff of the Bureau of Soils will visit each of the participants to review the description and make the final classification. The results will then be published by PCARRD. In my case, I am now ready to describe the pit dug near my research (PCARRD 158) in Pangasugan, Baybay Leyte. In a few days, I will be sending my soil samples to the Bureau of Soils in Manila.

Before ending this report, I wish to thank you for sending me to this kind of training. I feel that the exposure that I had (not to mention the confidence I gained) and the materials given to us by the SMSS like Munsell color chart, soil taxonomy books, and handouts will really help me in teaching soil survey and classification.

More power to you!

Very truly yours,

VICTOR B. ASIO

cc
Dr. Hari Eswaran, SMSS, USDA

APPENDIX V. FEEDBACK ON FORUM VII[1]

Participants' Reports

Raul Lara[2]

I would like to express my satisfaction on the result of this Forum. I did not expect that it would be as intensive as this and loaded with much information.

The training module was expertly designed to meet the training needs of the participants. Lectures as well as practical and field identifications and applications were so provided to give us a well-rounded skill and knowledge about soil taxonomy and agrotechnology transfer.

The resource persons were experts and authorities in the assigned subjects they delivered. With this training we hope we will not reach their present age before we become as confident as they are in soil taxonomy and agrotechnology transfer.

We also had an excellent accommodation and a well-arranged field trip.

I enjoyed the company of my fellow participants. They were fast and enthusiastic in the lectures and field work.

HOWEVER, I feel that the forum is too short to enable us to digest fully the things given out (not the food). The lectures should have been longer, and more exercises in the soil survey interpretation. As I see it, we only worked on interpretation of some laboratory data. It would have minimized misinterpretation of some terms for there are times that we DO NOT agree on some terms especially in the key to *Soil Taxonomy*. It will also enable us to be more confident on soil survey interpretation.

On field tours the pits were mostly in rice areas. Other fields should have been included particularly on problem soils of rainfed areas of which it represents a big hectarage of the country's cultivated areas.

Furthermore, in order for us to be able to formulate and implement proposed projects related to the things we learned in this forum, there is a need for a similar session for our office heads (not the Bureau of Soils). This will make them better appreciate and evaluate our projects and for them to be more supportive to our work on this aspect.

Lastly, thank you very much organizers, speakers, and to all of you who were involved on this fruitful forum. We will return to our respective work and rest assured we will always do the best of what we can to our mission.

Rebecca Cagmat[3]

The participants from the different colleges and universities are grateful to the organizers, resource persons, and most especially to the lecturers who did their best in sharing their skills and knowledge in *Soil Taxonomy* and Agrotechnology Transfer. We positively believe that these skills and knowledge we gain in the forum would be of great help in upgrading our respective capabilities in our threefold function: instruction, research, and extension. The field activity was very useful to us in instruction because we usually base our classification on theoretical description without actual observation and field descriptions. This may be due to several drawbacks in the system. In most cases manpower and physical development is concentrated on other fields of soil science like fertility and microbiology and taxonomy usually fall in the last priority for development. The topics on agrotechnology transfer and its relationship to soil taxonomy is quite new to us, and we were able to appreciate its importance especially in our extension activities. We are also thinking of incorporating this topic in our soil taxonomy courses.

In general the forum was well-organized and the topics are very informative and varied. However, the group feels that the two week period is quite short to discuss the topics extensively, that some are suggesting for another forum of this kind to include detailed explanation in the actual profile description and in the interpretation of the data gathered.

The forum must include the first part/phase of soil survey, (i.e., establishment of mapping units discussed in

[1]Comments and recommendations presented during the closing ceremony of the VII International Forum on Soil Taxonomy and Agrotechnology Transfer held at PCARRD, Los Baños, Laguna, Philippines on 12-23 March 1984.

[2]Agronomist, Ilagan Experiment Station, Bureau of Plant Industry, Ilagan, Isabela.

[3]Assistant Professor, Central Mindanao University, Musuan, Bukidnon.

detailed exercises). The soil survey interpretations are chopped into different lectures instead of a continuous one to two days lecture. Following up of topics is quite difficult if there are topics discussed in between.

Profiles/pits for field trips must be both upland and wetland (less profiles on upland were observed).

The number of speakers are very limited in such a way that one speaker is assigned to discuss several topics. Although the speakers are authorities in their respective fields, it tends to limit the participants' exposure to a number of speakers.

Ernesto Alvarez[4]

My task now is to give you the feedback on this very important training program which is a cooperative effort of PCARRD, SMSS, and Bureau of Soils. It will be very difficult for me to precisely convey to you the individual reactions of each and every one of the participants but based from my personal interviews with them I have come up with general assessment or recommendations that would hopefully be helpful in the future training similar to this one. But before I go further, I would like to take this opportunity to express my gratitude to the supporting agencies in general and to the distinguished resource speakers in particular for making our stay both pleasant and rewarding.

PCARRD secretariat was very successful in attending to our personal needs during the entire period of the training program. This personal comfort I believe is very important in any training program since this will affect the physical and mental health of the participants and consequently their learning efficiency.

The subject matters presented or discussed were very comprehensive and the resource speakers are very competent in their own respective fields.

The field trip was remarkably good and did not only give the participant an opportunity to have a direct contact with the soil and have general grasp of field problems concerning profile description but also gave us a chance to see beautiful places or spots like those in Baguio.

The sequence of subject matter presentation was generally good. However, it would have been better if the participants were given lectures on soil analysis and soil survey interpretation before the field tour since these two important topics have a very close relevance to profile description and soil classification.

We are in concurrence that there is a need for a follow-up program (Phase II). This will deal more with soil analyses, soil survey, and interpretation (including map making) and management aspects of the soil. Moreover, this program would give us a chance to assess its impact on our respective research programs and discuss the problem related to our research activities during the period.

I hope the above comments or recommendation would greatly contribute to the success of future programs similar to this one that we have.

Finally, in gratitude to all the benefits the participants have received in this program, we assure you that these experiences and knowledge we have shared with the resource speakers will reach the real beneficiaries (farmers) in due time in terms of management packages that would be responsive to their welfare and needs. Although I would say this will be a long and tedious process. That is all and I thank you.

Nestor T. Merjilla[5]

As one of the participants of this VII International Forum on Soil Taxonomy and Agrotechnology Transfer, I would like to extend my heartfelt gratitude, appreciation, and thanks to the management and staff of PCARRD, the SMSS and the BS, to the foreign and local resource persons for technical support and assistance and to my mother agency, the Bureau of Soils, who sent me to this fruitful cause in the upliftment of my capability in the performance of my duties as a soil surveyman.

With the help of our abled and energetic lecturers, we were enlightened on various topics discussed. It seems we have just started the session yesterday, but barely twelve days has past in which to me is very short period indeed. It was really a fruitful gathering wherein the bright ideas were shared to the participants especially to me, a neophyte on the system of taxonomic classification.

In my stay in the Bureau of Soils as a soilsman, I have learned a lot about soil taxonomy but now I realized its importance as well as the methodology on proper approaches on the system.

Inasmuch as twelve days is a short period to gain knowledge about soil taxonomy, it could be of great help to each and everyone if a follow-up forum will be conducted in the near future, and that todays' batch of participants should be kept updated with techniques and methodologies.

We, the participants, are aware of development, innovations, and possibilities in our fields, and with this little knowledge learned from the forum, we will be able to develop a working knowledge on our job as soil surveyor.

It is indeed worthy to know and classify our soils so as to determine in its maximum use (for agriculture or non-agriculture). This could then be of great contribution to us and to the nation.

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[4]Science Research Specialist III, PTRTC, Batac, Ilocos Norte.

[5]Junior Soil Technologist, Bureau of Soils, Manila, Philippines.

***Lilia Oguis*[6]**

This group is as dynamic and active as the politicians of this country. Why? It is because while we are busy classifying different soils from various areas in Luzon, politicians are also busy classifying or identifying their candidates for the incoming election on May 14. However, it seems that the politicians job is a bit simple since political aspirants are classified only into two main categories—whether one is in or one is out of the group. On the other hand, our job is more complicated since we have to classify soils into five categoric levels; from the soil order to its family classification.

Well, ladies and gentlemen, my task this morning is to give you the researchers' experience in this forum. So my piece is entitled "Reflections." A word which is not common to researchers. But before that, let me give you some background information about myself as a researcher.

My first love was soils. Not only because my father was a farmer but because my major in my BSA degree was Soil Science. I was simply drawn into it by more curiosity of trying to know more about this word which is regarded as a dirty job. But during those times, I was very young and naive then, that learning the different terms especially taxonomic terms were nothing but a mechanical exercise—just like learning the basic concept of mathematics every time the professors talk about it. What registered in my mind was how I'm going to memorize it to enable me to give it back to them during exams. Just like other students I would like to pass the course by giving the professor a dose of their own medicine.

But mind you gentlemen and ladies I passed my BS with "flying colors." Fortunately, I landed on a job as a researcher in the soil and agronomy division of PCA in Davao which have the opportunity to further nurture my first love. During those times the taxonomic terms that I've learned during undergraduate work started to be meaningful. I now regarded soils as a dynamic system which is affected to a large extent by the way man uses it.

Before I came here, I thought that most of the participants are composed of men since we usually associate soil classification as related to survey work which is definitely a man's job. I also thought that this type of training will be focused mainly on soil taxonomy. I was so excited that I have to travel again to different places—free, not expecting that we have to go down those sticky, and muddy pits and be exposed to penetrating heat of the sun, which we discovered to be the fastest way to get tan.

The first part of the training were so arranged that we have to know first the theories, principles and logic of what soil taxonomy is all about. Being a coconut researcher at that, I have never expected that we have to characterized this muddy field which were planted to rice. As our field practice ended on the fourth day I have more or less a clear view of what *Soil Taxonomy* is. In the coconut researches that we are doing now soil is not given so much emphasis because leaf analysis are use as the determining factor in assessing the fertility status of the soil—based on the critical level of different nutrients. With the different interaction that we have in the field among ourselves and trainers, some significant changes have occurred.

1) attitude towards *Soil Taxonomy;*
2) knowledge; and
3) skills.

But what then? What proofs do I have that I really gain out of this forum? How do I relate this knowledge and skills to the agency institutions where I'm working? If ever I'm successful how do I relate this research result to my co-workers or to other organizations and further how can we pool this research result for the maximization of research?

Recommendation/Suggestions:

1. Monitor/evaluate the day to day progress of the training; a built-in feedback mechanism might be able to improve the teaching and learning process both beneficial to trainees and trainers.
2. Include exposure of trainees to laboratory work for them to actually observed, crystallize how some of the data were obtained.
3. Include on the last part a workshop where all participants (trainees and trainers) could come up with bright ideas on how to operationalized vertical and horizontal linkages. I believe that we could do a lot if we share and pool our resources. The effects of this training need not fade into oblivion. It must be sustained. This is the challenge to all of us.

Thank you.

[6]Science Research Specialist, PCA, Bago-Oshiro, Davao City.

APPENDIX VI. FORUM VII SUMMARY

Modesto R. Recel[7]

The VII International Forum on *Soil Taxonomy* and Agrotechnology Transfer is about to adjourn.

Eleven days ago, participants from different institutions entered this room bewildered but inquisitive about *Soil Taxonomy*. Some were heard saying why and what those funny looking long taxa names were all about. However, on our way back from the field trip, they were heard saying that, "one can almost tell all the properties of a soil if one can understand the meaning of such lengthy names."

Such a dramatic change in attitude, I believe, is a very convincing evidence of a fruitful end of this forum.

This forum was carefully planned through the leaderships of Amado Maglinao of PCARRD and Director Godofredo Alcasid, Jr., of the Bureau of Soils in coordination with Hari Eswaran of the SMSS in Washington D. C.

The first three and a half days was an indoctrination of the participants on the logic principles, and mechanism of *Soil Taxonomy*. After understanding how the system works, the participants were exposed to a five-and-a-half-day field practicum in the provinces of Laguna, Rizal, Nueva Ecija, Pangasinan, Benguet, and Pampanga. In that exercise, no one among us was spared from getting down into the profile pit, muddy or dry, to feel the soil, look for mottles and clay skins, and other visible properties of the soil. The experience, I believe, was rewarding. Here, participants were given the chance to apply the *Keys to Soil Taxonomy*. They were so hungry with anything about the system that despite the hectic days work under the hot sun, they still managed to stay late in the night preparing for the next day's activity.

They organized themselves so effectively that although some were chemists, crop specialists, researchers and university instructors, they were doing excellent jobs in classifying the profiles.

In the last three days of the forum, after being able to apply *Soil Taxonomy*, they were oriented on the important uses of the system with particular emphasis on agrotechnology transfer.

And finally, to evaluate the whole activity, they were required to submit a written report of the classification of their respective study sites.

Lately, there was a popular desire of the participants to continue this exercise in their respective area of assignments and requested another similar forum for dryland soils. This is no doubt, a healthy sign that *Soil Taxonomy* is here to stay.

This forum could not have been a success without some key individuals. We are indeed fortunate to have with us one of the best minds in the world in *Soil Taxonomy*, in the person of Hari Eswaran. We have also with us Ron Yeck, a well known soil scientist of the National Soil Survey Laboratory of the SCS in Nebraska and Bernardino Cagauan, Jr., of the University of Hawaii who shared with us some of the richest information on agrotechnology transfer.

The support of the USAID through SMSS should also be recognized; special appreciations are also due to our forum coordinators, Ester Vergara and Theody Metra and also Odi Ilao, all of PCARRD staff who were constantly with us, seeing to it that nutritious meals were served (although someone would complain if there were no vegetables in the menu); have restful nights (although almost everybody wallowed on their own sweat and got bitten with mosquitoes during the brown-outs); and travelled in air conditioned bus made comfortable with PG and X-rated TV shows.

I would like also to recognize the great efforts of Art Dayot, Cris Alcalde of the Bureau of Soils, and Martin Raymundo who prepared the best profile pits ever seen by Hari Eswaran (although someone almost frowned when he fell in a deep old profile pit nearby in Laguna and Hari was so unhappy because he was not able to shoot a souvenir picture).

The other lecturers of course have their part in making the forum more meaningful.

Above all, I would like to thank the participants for their unending enthusiasm, sincere interest, and fine discipline throughout the duration of the forum.

A few hours from now, 51 participants will go out of this room as "disciples" of *Soil Taxonomy*—"Go forth, therefore, and spread the good news."

Remember, however, that this is just the beginning. The great challenge awaits us to classify our Philippine soils. This forum attests that the technology is with us, but

[7]Soil Research Evaluator, Bureau of Soils, the Philippines.

perhaps this is not enough. The mechanism of implementing a nation-wide classification program has to be re-examined to insure that the task is placed in the right hands, knowing from our experience in this forum that *Soil Taxonomy* is a system that requires tremendous field activity and considerable time, effort, and logistics to generate the quantitative data in the laboratory.

Some institutions attempt to take the leadership on this activity, but I believe that the Bureau of Soils has the necessary manpower, it has the technical capability and the equipment needed to launch a nationwide "Taxonomization" of our soils. Given that leadership to the Bureau of Soils and with the sincere cooperation of other qualified institutions, I believe that *Soil Taxonomy* will become the primary system of classification in this country within a reasonable period of time.

APPENDIX VII. FORUM VII FOLLOW-UP ACTIVITIES

Some of the forum participants have requested follow-up activities. The following suggested activity is purely voluntary. No one is under any obligation to do it. However, if you undertake the following project, please adhere closely to the instructions.

A. Soil Characterization and Classification

The purpose of this exercise is twofold. First, it will enable you to make a profile description and classification *on your own*. Second, it will make a contribution to the national Benchmark Pedons File.

1. Dig a pit to 2 m or to rock or to a permanent water table and describe and sample it. The pit(s) should be located at an experimental station or in the region of your responsibility. If a soil map is available, use it for selection of the pit site. You may describe and sample more than one pit. If you do not have a color chart, the colors can be described later.
2. If a horizon is more than 25 cm thick, take more than one sample and subdivide the horizon accordingly. The laboratory will need about 500 g of each horizon. This is the bulk sample. In addition, take out large clods, about 5 cm diameter, wrap them in cotton, and pack them separately. Label all bags with labels both inside and outside the bag.
3. The *samples* and *profile description* should be sent to the Bureau of Soils, and addressed to Dr. Modesto Recel. The sampling should be done in early April, and samples should reach the bureau by *end of April*.
4. Attach to the profile description
   - — monthly rainfall (mm),
   - — monthly temperature (°C),
   - — any other climatic data available,
   - — a detailed account of the crops grown, varieties, farmers' yields, experimental yields, and target yields,
   - — an account of the management of these crops (consult your agronomist), and
   - — search published literature and summarize previous investigations on these soils.
5. The Bureau of Soils will analyze all the soils.
6. Sometime at the end of this year or beginning of next year, the staff of the bureau and I will visit each of you. We will review your description and make the final classification.
7. We will then compile all the information, and PCARRD will publish this as an official report. Professionally, this activity is of benefit to you since your names will be cited in this publication as the person responsible for making the soil classification.
8. The success of this depends on you. Everybody is encouraged to collaborate.

B. Monitoring soil moisture regimes

The Philippines must make a serious effort to monitor the soil moisture regimes, particularly in the areas with rainfed agriculture. The product of this exercise is an accurate soil moisture regime classification and, eventually, a soil moisture regime calendar. We will have two approaches.

1. Computer simulation

   Soil Management Support Services (SMSS) will assist you in developing this. PCARRD must compile the following information for as many stations as possible. Data needed are
   - — name of station,
   - — location: latitude and longitude,
   - — elevation (m),
   - — monthly temperature (°C), and
   - — monthly rainfall (mm).

   All participants are requested to compile this information and send it by the end of April to Dr. Amado R. Maglinao. We need 20-year averages but 5-year averages may suffice. PCARRD will compile other stations and send all the data to me by the end of May.
2. (You need to do this only if you have facilities. PCARRD will try to do this for some other stations).

   Equipment needed:
   - — An oven reading to 110°C.
   - — Moisture cans. These are about 1 cm high and about 5 cm in diameter.
   - — An accurate balance.

   Sampling is done every Monday morning. The sampling area is a circle about 200 m diameter around the pit which you have described.

   Use an auger and sample every 25 cm (composite) to a depth of 1.25 m (5 samples). Put the soil in the moisture cans. Weigh it, dry it at 105°C for 24 hours and weigh it again.

If, C = weight of can (dried at 105 °C),
W = weight of moist soil (and can),
D = weight of oven-dry soil (and can), then

$$\% \text{ moisture} = \frac{(W-C) - (D-C) \times 100.}{D - C}$$

If the area is irrigated, it is not necessary to sample during the period of irrigation. In order to get reliable results, this monitoring must be continued for at least 10 years. So start now.

When the soil analyses are complete (particularly 1/3 bar, 15 bar water content, and bulk density), we will show you how to determine the soil moisture regime and make a soil moisture calendar. If we accumulate sufficient data, we can make predictions on when to irrigate, length of growing period, and so on.

APPENDIX VIII. SUMMARY DATA ON WORKSHOPS

1st International Soil Classification Workshop

Brazil, 20 June to 1 July 1977

THEME

Classification of Alfisols and Ultisols with low activity clays

SPONSOR

Institution	Responsibility/Input
Servico Nacional de Levantamento e Conservacao de Solos de Empresa Brasileira de Pesquisa Agropecuaria (SNLCS/EMBRAPA)	Logistic and technical organization, bus transportation, printing of proceedings
University of Puerto Rico	Planning and organization, editing of proceedings
U.S. Agency for International Development	Funds

CONTRIBUTORS

Institution	Contribution
USDA Soil Conservation Service	Soil characterization data
Cornell University	Soil moisture and temperature regimes
University of Hawaii	Soil mineralogy
University of Ghent	Soil micromorphology
ORSTOM	French classification

INTERNATIONAL PARTICIPANTS

1. AID/UPR Support
   Australia (1), Belgium (2), France (1), Italy (1), Kenya (1), Malaysia (1), Netherlands (2), New Zealand (2), Nigeria (1), United States (9), Venezuela (2)
2. Other Support
   United States (1)

Total: 24 international participants; 11 countries

PROCEEDINGS

Published by SNLCS/EMBRAPA in 1978.

2nd International Soil Classification Workshop

Malaysia and Thailand, 28 August to 9 September 1978

THEME

Classification of Oxisols, Alfisols, and Ultisols with low activity clays

SPONSORS

Institution	Responsibility/Input
National Soil Survey, Dept. of Agriculture, Malaysia	Technical and logistic organization in Malaysia, bus transportation
Land Development Department, Thailand	Technical and logistic organization in Malaysia, bus transportation, printing of proceedings
University of Puerto Rico	Overall planning and organization, editing of proceedings
Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA)	Support of some Southeast Asian participants, partial funding of printing of proceedings
U.S. Agency for International Development	Funds

CONTRIBUTORS

Institution	Contribution
USDA Soil Conservation Service	Soil characterization
University of Ghent	Soil micromorphological studies

INTERNATIONAL PARTICIPANTS

1. AID/UPR Support
   Australia (1), Belgium (3), France (2), Italy (2), Malaysia (5), Netherlands (3), New Zealand (1), Thailand (3), United States (8), Venezuela (1)
2. Other Support
   Belgium (3), Indonesia (1), Malaysia (1), Philippines (1), Sri Lanka (1), United States (1), Venezuela (1)

Total: 38 international participants; 13 countries

PROCEEDINGS

Published in two volumes by Land Development Department, Bangkok, Thailand in 1979.

4th International Soil Classification Workshop

Rwanda, 2 to 12 June 1981

THEME

Classification and management of Andisols and soils with sombric horizons

SPONSORS

Institution	Responsibility/Input
Institute des Sciences Agronomique du Rwanda (ISAR)	Technical and logistic organization in Rwanda
Algemeen Bestur voor Ontwikkelings Samenwerking (ABOS)	Technical and logistic organization in Rwanda, bus transportation, preparation of material for tour guide, printing of proceedings
Soil Management Support Services USDA/SCS	Funds, planning and organization, soil sampling and characterization, printing of tour guide
University of Puerto Rico	Overall planning and organization, editing of proceedings
Rijksuniversiteit Gent, Belgium	Micromorphological studies, funds for participants
U.S. Agency for International Development	Funds

INTERNATIONAL PARTICIPANTS

1. AID/SMSS/UPR Support
   Australia (1), Belgium (3), Cameroon (1), Colombia (1), Federal Republic of Germany (1), France (2), Italy (1), Kenya (1), Malaysia (1), Netherlands (3), New Zealand (1), Nigeria (1), Portugal (1), Sudan (1), Syria (1), Tanzania (1), Thailand (1), United States (8), Venezuela (2)
2. Other Support
   Belgium (2), Burundi (2), Federal Republic of Germany (1), Zaire (2), Zambia (2)

Total: 41 international participants; 22 countries

PROCEEDINGS

In press at ABOS; scheduled for publication in 1984.

5th International Soil Classification Workshop

Sudan, 2 to 11 November 1982

THEME

Taxonomy and management of Vertisols

SPONSORS

Institution	Responsibility/Input
Soil Survey Administration, Ministry of Agriculture and Irrigation, Sudan	Technical and logistic preparation of workshop, preparation of material for tour guide, meeting room facilities, bus transportation
Soil Management Support Services, USDA/SCS	Funds, planning and organization, soil sampling and characterization, printing of tour guide
Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)	Funding of participants
University of Puerto Rico	Overall planning and organization, editing of proceedings
U.S. Agency for International Development	Funds

CONTRIBUTORS

Institution	Contribution
USAID/Khartoum	Logistic organization, printing of proceedings

INTERNATIONAL PARTICIPANTS

1. AID/SMSS/UPR Support
   Australia (1), Belgium (1), Chile (1), Egypt (1), India (3), Netherlands (1), Rwanda (1), Saudi Arabia (1), Thailand (1), Trinidad (1), United States (10), Venezuela (1)
2. ACSAD Support
   Belgium (1), Federal Republic of Germany (1), Iraq (1), Italy (1), Jordan (1), Morocco (1), Syria (3), Tunisia (1), United States (1), Yemen (1)
3. Other Support
   Federal Republic of Germany (1), France (1), Hungary (1), Italy (1), United States (1)

Total: 40 international participants; 22 countries

PROCEEDINGS

In preparation.

6th International Soil Classification Workshop

Chile and Ecuador, 9 to 20 January 1984

THEME

Taxonomy and management of Andisols

SPONSORS

Institution	Responsibility/Input
1. Overall Sponsors	
Soil Management Support Services USDA/SCS	Funds, planning and organization, soil sampling and characterization, printing of tour guide
University of Puerto Rico	Planning and organization, editing of proceedings
Agency for International Development	Funds
2. Chilean Sponsors	
Sociedad Chilena de la Ciencia del Suelo	Overall coordination of workshop activities in Chile, preparation of material for tour guide
Universidad Austral de Chile	Bus transportation, conference hall and other facilities, logistic and technical organization
Universidad de Concepción	Printing of proceedings (?)
Universidad de Chile	Organization
Pontifica Universidad Catolica de Chile	Soil micromorphologic studies, organization
Universidad de Santiago	Organization
3. Ecuadorian Sponsors	
Sociedad Ecuatoriana de la Ciencia del Suelo	Overall coordination of workshop activities in Ecuador, preparation of material for tour guide
Ministerio de Agricultura y Ganaderia	Bus transportation, logistic and technical organization

INTERNATIONAL PARTICIPANTS

1. AID/SMSS/UPR Support
   Argentina (1), Belgium (1), Chile (4), Colombia (1), Costa Rica (1), France (1), Japan (3), Kenya (1), Netherlands (1), New Zealand (4), Peru (1), Spain (1), Syria (1), Trinidad (1), United States (11)
2. Other Support
   Brazil (2), Federal Republic of Germany (2), France (1), Spain (1)

Total: 39 international participants; 17 countries

PROCEEDINGS

In preparation.

7th International Soil Classification Workshop

Philippines, 26 March to 5 April 1984

THEME

Characterization, classification, and utilization of wetland soils

SPONSORS

Institution	Responsibility/Input
International Rice Research Institute, Los Baños, Philippines	Organization
Soil Management Support Services, USDA/SCS	Planning, soil sampling and characterization, funds

PARTICIPANTS

1. International Participants
   Australia (1), Bangladesh (1), Belgium (1), Burma (2), Cameroon (1), Chile (1), Federal Republic of Germany (2), India (3), Indonesia (5), Japan (1), Malaysia (1), Nepal (1), Netherlands (3), Nigeria (1), Pakistan (1), People's Republic of China (3), Philippines (37), Singapore (1), Sri Lanka (2), Thailand (2), United States (9), Vietnam (2), Zambia (2)

Total: 83 international participants; 23 countries

Partial List of Acronyms Occurring in the SMSS Progress Report

ACSAD -	Arab Center for Studies of Arid Zones and Dry Lands
AGR -	Office of Agriculture
BSP -	Benchmark Soils Project
CATIE -	Centro Agronomico Tropical De Investigacion Y Ensenanza
CGIAR -	Consultative Group on International Agriculture Research
ICOMAND -	International Committee on Andisols
ICOMAQ -	International Committee on Classification of Soils with Aquic Soil Water Regimes
ICOMERT -	International Committee on Vertisols
ICOMID -	International Committee on Aridisols
ICOMLAC -	International Committee on Classification of Soils with Low Activity Clays
ICOMMORT -	International Committee on Soil Moisture Regimes
ICOMOD -	International Committee on Spodosols
IITA -	International Institute of Tropical Agriculture, Ibadan, Nigeria
INSFFER -	International Network on Soil Fertility and Fertilizer Evaluation for Rice
IRRI -	International Rice Research Institute
ISSS -	International Soil Science Society
LDC -	less developed country
NSSL -	National Soil Survey Laboratory
NORAD -	Norwegian Aid for Development
OICD -	Office of International Cooperation and Development USDA
PCARRD -	Philippine Council for Agriculture and Resources Research and Development
S&T -	Bureau for Science and Technology
S&T/AGR/RNR -	Bureau for Science and Technology, Office of Agriculture, Division of Renewable Natural Resources
TDY -	temporary duty assignments

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