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**REPORT OF THE EXTERNAL EVALUATION
OF THE
SOIL MANAGEMENT SUPPORT SERVICE PROJECT (SMSS)**

Report Submitted under:

Contract PDC-1406-I-00-0034-00

Delivery Order No. 6

**Clarence C. Gray III
Daniel B. Taylor**

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ACKNOWLEDGMENTS

The External Evaluation Team thanks all who gave their time and who assisted in carrying out the evaluation during the months of February and March 1991.

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Clarence C. Gray III
Daniel P. Taylor

PREFACE

The Soil Management Support Project is one of a set of projects developed and carried out over the past several decades by the Division of Renewable Natural Resources Management in the Office of Agriculture of AID's Bureau for Science and Technology. As a group, the projects represent a mutually-supportive, balanced approach to clarifying, better understanding critical policy, management and environment issues as they relate to soils, a basic natural resource. The approach is now beginning to pay dividends, to the credit of the officers of the RNR Division.

The SMSS project has been in operation for about one decade. This is its second and final external evaluation.

This evaluation has been limited to a review of documents and discussions with U.S. project personnel and did not include contacts with recipient nations or with the project's cost-sharing, international assistance collaborators; thus, this evaluation must be appraised in that context.

This external evaluation has been conducted through a contract with the International Resources Group, Washington, D. C.

ACRONYMS USED

ACSAD	Arab Centre for Studies of Arid Zones and Dry Lands
ADAB	Australian Development Assistance Bureau
AGR	Office of Agriculture/Bureau for Science and Technology
AID/A.I.D.	Agency for International Development, US
ASEAN	Association for Southeastern Nations
AVRDC	Asian Vegetable Research and Development Center
BARC	Bangladesh Agricultural Research Council
BSP	Benchmark Soils Project (a completed AID project)
CAB	Commonwealth Agricultural Bureau
CATIE	Centro Agronomico Tropical de Investigacion y Ensenaza
CGIAR	Consultative Group on International Agricultural Research
CIAR	Centro de Investigacion Agricola Tropical
CIMMYT	Centro de Investigacion y Mejoramiento de Maiz y Trigo
CIP	Centro de Investigacion de la Papa
CNRA	Centre National Recherches Scientifique
CRSP	Collaborative Research Support Program
CSIRO	Commonwealth Scientific and Industrial Research Organization
DLD	Department of Land Development, Thailand
DOD	Department of Defense, US
EET	External Evaluation Team
EMBRAPA	Empresa Brasileira De Pesquisa Agropecuaria
EPA	Environment Protection Agency, US
FAO	Food and Agricultural Organization of the United Nations
FFTC/ASPC	Food and Fertilizer Technology Centre for the Asian and Pacific Region
ASPC	
GTZ	Gesellschaft fur Technische Zusammenarbeit
IARI	Indian Agricultural Research Institute
IBSNAT	International Benchmark Sites Project for Agrotechnology Transfer
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in Dry Areas
ICRAF	International Council for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFDC	International Fertilizer Development Center
IICA	Instituto Interamericano de Ciencias Agricolas
IITA	International Institute for Tropical Agriculture
ILCA	International Livestock Center for Africa
INRA	Institute National de la Recherche Agronomique
IRRI	International Rice Research Institute
ISCOM	International Soil Correlation Meetings
ISSS	International Society for Soil Science
NASA	National Aeronautics and space Administration

AGRONYMS USED (Continued)

NEBTA	Netherlands Bureau for Technical Assistance
NIFTAL	Nitrogen Fixation of Tropical Legumes (AID/Univ of Hawaii)
NORAD	Norwegian Agency for International Development
OAU	Organization for Africa Unity
ODA	Overseas Development Administration
OICD	Office of International Cooperation and Development, USDA
ORSTOM	Office de la Recherche Scientifique et Technique Outre-mer
PARC	Pakistan Agricultural Research Council
PCARRD	Philippine Council for Agricultural and Resources Research Development
ROCAP	Regional Office for Central American Program/USAID
RNR	Division of Renewable Natural Resources Management/S&T/AGR
SCS	Soil Conservation Service, USDA
SMSS	Soil Management Support Project, SCS/AID
SPC	South Pacific Council
S&T	Bureau for Science and Technology, AID
TSM	Technology for Soil Moisture Management Project
TROP SOILS	Soil Management CRSP or Tropical Soils CRSP
UH	University of Hawaii
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPR	University of Puerto Rico
US/U.S.	United States of America
USDA	United States Department of Agriculture
USAID	United States Agency for International Development
USGS	United States Geologic Survey

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I. EXECUTIVE SUMMARY

THE PROJECT

The SMSS project is an AID/S&T/AGR/RNR global agricultural research and development service project conducted by SCS/OICD/USDA through a PASA which provides technical assistance to developing nations to help them maintain and enhance their soil resources for sustained, productive, agricultural systems. The project is composed of two inter-related components: (1) technical assistance services to LDCs through USAID Missions in soil classification, survey, conservation and management on request and (2) strengthening LDC institutions in resource inventorying, monitoring and evaluation and soil analysis and research. Such technical assistance is provided directly to individual nations through USAID country programs and indirectly through a variety of SMSS-sponsored regional and global international activities. The over-arching thrust of the SMSS project is to improve and extend the use of Soil Taxonomy in the tropics and subtropics.

PURPOSE

The purpose of this external evaluation is to assess the overall performance of the project, evaluate the project's success in achieving its objectives, and indicate lessons learned and expected impact of its objectives/purpose on agriculture in LDCs.

FINDINGS

SMSS project personnel developed and followed a course of action -- an informal, opportunistic plan -- over the past decade which has resulted in the following accomplishments:

- Leading international soil scientists/authorities have helped SMSS adapt and extend the use of Soil Taxonomy, the U.S. system of soil classification, to tropical and sub-tropical areas of the world.
- The U.S./SCS Soil Taxonomy has become, de facto, the world system for classifying, inventorying and mapping national soil and land resources, largely through the activities and programs of SMSS.
- The World Bank and the Asian Development Bank require classification of soils according to Soil Taxonomy in their resource development programs.
- International assistance donors, IARCs, bilateral donors and host governments have assisted SMSS in conducting international soil training forums and workshops. Since 1982, approximately 30-50 percent of the annual, monetary costs of such activities been shared by SMSS's collaborators.

- **SMSS has arranged and conducted with collaborators:**
 - 21 Training Forums involving 1,297 participants and 176 nations**
 - 6 Soil Classification Workshops with 343 participants from 113 countries**
 - 7 Soil Correlation Meetings with 445 participants from 81 countries**
 - 6 Soil Management Workshops with 345 participants from 81 countries**
- **4,875 samples of 772 soils from 84 countries have been obtained and analyzed. These samples have provided information for the database of SMSS's World Benchmark Soils Project. The database is the world's largest of tropical soils.**
- **SMSS has published and distributed 50,000 copies of four editions of the paperback, pocket-book edition "Keys to Soil Taxonomy;" all or portions of which have been translated into Spanish, French, Italian, Indonesian, Arabic, Malay, Chinese, Greek, Japanese, Thai, Burmese, Polish and Russian.**
- **SMSS has provided 609 short-term technical assistance consultations involving 6,937 person/days.**

The SMSS project has been a very productive project in terms of both the volume and quality of work it has accomplished. In fact, the SMSS project has accomplished just about what it set out to do in the relatively short period of one decade in exemplary fashion.

The project's success can be attributed to:

- **Adequate, timely, quality inputs by AID, OICD, SCS and SMSS collaborators**
- **Dedicated, high-quality staff**
- **Flexible, opportunistic plans**
- **Soil Taxonomy -- a saleable, useful product**
- **International networking/effective linkages**
- **Cost-sharing and other support by international assistance donors, host countries and others**

The External Evaluation Team concludes that the SMSS project has had it all: world class personnel, a global operation, something of value to promote and plenty of help. It has been an exceptionally successful endeavor.

As for the future, the Panel concurs that this should be the final evaluation and that the SMSS project will be completed at the end of FY90. Beyond FY90, AID may wish to consider supporting a re-structured and re-directed SMSS-type project to provide clearly needed soil and site characterization services for relevant, AID-supported research and demonstration projects.

Soil and site characterizations and classifications are procedures through which AID can help increase the efficiency and usefulness of its investments. AID should consider requiring that all AID-supported, relevant programs have or arrange to have SMSS soil and site characterizations as a part of their investigative or demonstration procedures.

RECOMMENDATIONS

The External Evaluation Team recommends:

1. That A.I.D. should consider adopting a policy which would require on a phased-in basis over a reasonable period of time SMSS soil and site characterizations for all AID-supported agronomic, horticultural and forestry research and demonstration projects and activities. Such a policy should require that all new projects make provision for SMSS soil and site characterizations at project initiation as a requirement in the project approval process.

2. That AID/S&T/AGR should consider a PASA arrangement with the SCS/USDA to enable a re-structured, re-directed SMSS project to maintain a core staff and administrative and analytical laboratory facilities to (a) provide SCS soil and site characterizations as requested and paid for by requesting agencies in connection with Recommendation 1, above, (b) provide SCS soil classification and soil mapping services, including Geographic Information Systems, to USAID missions, national and international assistance agencies as requested and paid for by such agencies and (c) maintain and extend the SCS/SMSS Benchmark Soil Project's world soils database.

3. That AID should consider using its good offices and influence to encourage international assistance donors to consider requiring internationally acceptable soil and site characterizations when and where appropriate as integral components of agricultural, horticultural, forestry and other relevant projects.

LESSONS LEARNED

The success of the SMSS project reaffirms well-known lessons that the success of development assistance projects is related directly to a variety of factors, especially to:

- (1) project personnel: high level of knowledge, experience/reputation, cultural sensitivity, dedication and enthusiasm;
- (2) an adequate, appropriate mix of inputs: sufficient but not too much or too little money, and supportive materials and supplies;
- (3) an enabling perception: an attractive, highly-regarded, development-promoting product, and
- (4) committed, helpful allies: cooperating U.S. agencies, international assistance organizations and developed and developing nations.

Project-specific lessons learned by project personnel are given in the body of the report.

II. PROJECT DATA

Project Title: Soil Management Support Services (SMSS)

Project Number: 393-1229

Date of Obligation: October 1, 1979

Date of Completion: September 30, 1991

PASA Number: DAN-1229-X-AG-7051-00

Funding: Authorized: \$9,732,000
Obligated: \$9,682,000

Lead Scientists/Contacts: Dr. Hari Eswaran
Dr. Richard Arnold

A.I.D. Project Manager: Dr. Raymond Meyer

Type of Evaluation: Final Evaluation

External Review Team:

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III. PURPOSE OF THE EVALUATION AND STATEMENT OF WORK

Purpose

The purpose of the external evaluation is to review progress in achieving program objectives and assess how program activity components contributed to overall goals. The goal of the Soil Management Support Services project is to increase food production through improved land resource management in developing countries.

B. Statement of Work

The contractor shall assess the overall performance of the project, evaluate the project's success in achieving objectives, indicate lessons learned, and expected impact of the project's objectives/purposes on agriculture in LDCs. The Evaluation Team shall:

- a) Assess the use and application of Soil Taxonomy by developing countries and determine if the technologies, methodologies and products of the project are being used by developing countries and to what extent.
- b) Determine the extent of worldwide recognition of importance of soil and site characterization in agronomic research and whether the project objectives were appropriate and significant to developing country needs.
- c) Quantify the amount of cost sharing and support provided by the international, regional and national organizations, and USAID Missions.
- d) Evaluate the effectiveness and appropriateness of the project's technical assistance and training activities.
- e) Determine the impact of SMSS activities within the U.S.
- f) Determine the progress of the project since the last evaluation in 1986 and determine the degree to which its recommendations have been addressed.
- g) Assess the progress on the projects's major activities since 1986. Describe outstanding accomplishments and determine if all project outputs will be accomplished by the project's ending date.
- h) Review the networking with other S&T projects as means to help facilitate technology diffusion and to increase project efficiency.
- i) Make recommendations as to future directions with respect to anticipated requirements for assistance in soil resource information in LDCs.

IV. PLACE OF THE EVALUATION AND METHODS USED

The external evaluation took place in Washington, D. C. and Rosslyn, Virginia in the Offices and conference rooms of USDA, IRG and AID/S&T/AGR. Briefings, interviews, review of documents and discussion and analyses of findings were the methods used to evaluate the SMSS project.

V. PROJECT DESCRIPTION

The SMSS project is an AID/S&T/AGR/RNR global agricultural research and development service project conducted by SCS/OICD/USDA through a PASA which provides technical assistance to developing nations to help them maintain and enhance their soil resources for sustained, productive, agricultural and forestry systems. The project is composed of two inter-related components: (1) technical assistance services to LDCs through USAID Missions in soil classification, survey, conservation and management on request and (2) strengthening LDC institutions in resource inventorying, monitoring and evaluation and soil analysis and research, including the World Benchmark Soils Project. Such technical assistance is provided directly to individual nations through USAID country programs and indirectly through a variety of SMSS-sponsored regional and global international programs (e.g., soil classification workshops, international Soil Classification Committees, and international Soil Taxonomy Training Forums) and through programs of the IARCs and other international assistance agencies. The over-arching thrust of the SMSS project is to improve and extend the use Soil Taxonomy in the tropics and sub-topics.

Current SMSS' objectives as stated by the Project Director are to:

1. Provide technical assistance to AID country projects and Less Developed Countries (LDCs) in problem identification, evaluation of opportunities, and planning and utilization of land resources, especially in the areas of soil classification, soil survey, soil conservation, and soil fertility and management.
2. Assist countries in the development and utilization of soil resource databases and database management systems (including Geographic Information Systems) as tools for better evaluation and management of natural resources.
3. Improve the potential of soil survey and soil classification interpretation for resource conservation and agricultural development in LDCs.
4. Develop world-wide linkages for the more efficient utilization of agricultural information for crop production.

These four objectives arose out of the project's overall purpose which was changed after the 1986 external evaluation to "developing the prerequisites for sustainable agriculture and soil based agrotechnology transfers, and thereby assist USAID Missions and LDC institutions in policies and decisions affecting agricultural development."

The overall goal of the project, which gave rise to its purpose and objectives, is maintaining and enhancing the natural resource base of agriculture and to improve income generation through improved land resource management in developing nations.

The Review Team finds that the SMSS's objectives were especially appropriate for assisting LDCs and for securing international support for use of Soil Taxonomy, a system of classifying, inventorying and planning the use of national soil resources.

VI. FINDINGS AND CONCLUSIONS

A. Project Planning

Without the benefit of a clear program strategy and course of action when the project was initiated, SMSS project personnel developed and followed a plan that evolved and involved (1) securing the participation and support of internationally recognized soil scientists for Soil Taxonomy through their participation in SCS/SMSS-sponsored International Soil Classification Committees and Soil Classification Workshops, (2) assisting nations and groups of nations through a series of national and regional training forums calculated to reach scientists and leaders in LDCs and influence their understanding and adoption of Soil Taxonomy, (3) securing international support for Soil Taxonomy through involving international assistance agencies in planning and conducting SMSS training forums and related activities and (4) promoting the adoption and use of Soil Taxonomy through technical assistance to nations as requested by USAID Missions.

To a considerable degree, SMSS project personnel have had a great deal of flexibility and freedom to conduct the project. They seem to have been largely unfettered over the years by written, annual work plans, which were conspicuous by their absence among the large number of documents made available to the EET. The lack of clear guiding structures for operations in the SMSS project worked. It worked because of the unusual abilities, experience and dedication of project personnel; the attractive, useful nature of product (Soil Taxonomy) being promoted; and the opportunistic, evolving nature of contemplated activities. In fact, the lack of such structures may have been a contributing factor to SMSS's success.

z The Review Team finds that the SMSS's informal plans and flexible operations were especially appropriate for providing soil management support services to LDCs and for securing international support for use of Soil Taxonomy. The SCS's existing global relationships and experiences with international authorities and leaders in pedology and soil classification/mapping were probably key to SMSS's planning and executing a successful course of action.

B. Project Inputs

1. AID/S&T/AGR/RNR

The SMSS project was carried out through a Participating Agency Service Agreement (PASA) with the Department of Agriculture with funds provided through the Office of Agriculture in the Bureau for Science and Technology of the U.S. Agency for International Development. The Project was developed and managed by the Division of Renewable Natural Resources Management (RNR). The S&T/AGR/RNR Project Manager monitors and supports the conduct of the SMSS project as outlined in the PASA. The Project Manager was an intermediary and facilitator between SCS/OICD/USDA, AID/Washington and AID's field missions (USAIDs) for those actions/activities requiring AID approval and/or coordination (e.g., matters involving release/use of funds, personnel, procurement of equipment/machines and evaluations). For AID, the Project manager was the operational project supervisor/AID official who monitored and reported on the administrative, financial and technical status and progress of the project.

2. USDA

a. OICD

OICD contributed to the project in two ways. One was logistical and the other involved financial management. Logistical support included securing country clearances and arranging travel, obtaining visas and so forth. SMSS personnel indicated that throughout the duration of the project, OICD's logistical support was outstanding.

The financial management activities of OICD consisted of holding funds transferred from AID to USDA/SCS, dispersing funds for approved activities, and periodic accounting of the project's financial status to USDA/SCS and S&T/AGR/RNR personnel. The financial reporting function of OICD did not operate adequately during the first few years of the project. AID ameliorated this problem by hiring and paying an OICD employee to carryout the tasks required to provide accurate, timely, financial reports. It is noted that this additional cost was in addition to OICD's overhead charges.

In order to support the services it provided to SMSS as well as to other activities, OICD charged overhead. At the start of the SMSS project OICD charged 18 percent overhead. At present, the overhead rate is 36 percent.

b. Soil Conservation Service (SCS)

The SCS carried out the technical and scientific aspects of the SMSS project in accordance with the provisions of the PASA. Specifically the SCS provided:

- (1) Project plans, guidance and supervision
- (2) Scientific and technical personnel
- (3) Scientific and technical information, including access to world soils database.
- (4) Specialized soils laboratory analytical services.

The Project Director and the project's core staff were all SCS personnel. With exception of Dr. Kimble, who is based at the SCS's National Soil Survey Laboratory (NSSL) in Lincoln, Nebraska, these individuals were based in Washington, D.C. In addition to this staff, numerous SCS personnel, both based in Washington and across the nation, participated in this project. In some cases, their inputs were obtained without any salary reimbursement. It should be noted that these contributions were not counted in the cost-sharing which is reported below.

The activities of SMSS received strong support from SCS administrators at all levels. Many SMSS activities, including some of the soil testing at NSSL, were accomplished as a part of the routine SCS activities at no charge to SMSS. This strong administrative support was vital to the success of the project.

Almost without exception, the SCS personnel who contributed to SMSS viewed their experiences as career enhancing. Almost no refusals to participate in the project were encountered when SMSS core staff elicited help from SCS personnel.

The quality and dedication of the Project Director and core staff were critical to the success of the SMSS project. It is hard to envision a better group to work on the project. They approached their work around the world by treating LDC scientists as colleagues. While the SMSS staff were instrumental in making the arrangements to make refinements to Soil Taxonomy for the tropics, their active involvement of scientists from around the world in this refinement has made Soil Taxonomy an international system, rather than just an SCS system.

The soil analysis services of the NSSL were an important aspect of this project. The analyses not only provided data for the workshops and laboratory calibration/standardization of procedures around the world, but they also led to the compilation of the most extensive computer data base on tropical soils in the world. Only a small portion of the soil samples have been used so far; thus, they are available for additional testing, calibration, and correlation work in the future.

3. Project Cooperators/Collaborators, including host countries

All of SMSS' major international programs and activities, with the exception of certain technical assistance services, have been conducted cooperatively with other agencies, whose inputs have been money, personnel, materials, equipment, facilities, field sites and information. The nature and magnitude of scientific/technical and training inputs by SMSS' collaborators are indicated in Table 1.

Table 1. Some Institutions that have Collaborated with the SMSS Project and the Nature of their Collaboration

Institution	Country	Input Contribution
ABOS	Belgium	<ol style="list-style-type: none"> 1. Training 2. Technical Assistance 3. Publications 4. Soil Characterization
ACIAR	Australia	<ol style="list-style-type: none"> 1. Training 2. Workshops 3. Technical Assistance
ACSAD	Syria	<ol style="list-style-type: none"> 1. Soil classification workshops in Syria, Lebanon and Sudan 2. Training courses in Jordan, Tunisia and Yemen Arab Republic 3. Technical Assistance 4. Joint monographs/publications
CATIE	Costa Rica	<ol style="list-style-type: none"> 1. Training 2. Technical Assistance 3. Characterization of Benchmark sites in Central America
CIAT	Colombia	<ol style="list-style-type: none"> 1. Characterization of experimental sites
CIP	Peru	<ol style="list-style-type: none"> 1. Characterization of outreach sites
FAO	Italy	<ol style="list-style-type: none"> 1. Workshops and correlation meetings 2. Technical assistance
FFTC	Taiwan	<ol style="list-style-type: none"> 1. Workshop in Thailand 2. Training courses
GTZ	Germany	<ol style="list-style-type: none"> 1. Technical assistance 2. Training
IBSRAM	Thailand	<ol style="list-style-type: none"> 1. Workshop on Vertisols in India

Table 1.(Continued)

ICARDA	Syria	1. Workshop on agricultural environments
ICRISAT	India	1. IBSRAM Workshop on Vertisols 2. Characterization of benchmark Vertisols of India 3. Publication on agro-ecological characterization of experimental sites
IITA	Nigeria	1. Training
IRRI	Philippines	1. Workshop on wetland soils 2. Characterization of network sites
ISRIC	Netherlands	1. Laboratory Exchange 2. Publications
LRD	England	1. Technical assistance
NORAD	Norway	1. Training 2. Technical assistance
ORSTOM	France	1. Soil Characterization 2. Publications
UNEP	Kenya	1. Technical assistance

A complete listing of institutional collaborators and their inputs into SMSS activities would have to include those governments that have hosted the 21 Training Forums, the six (6) international soil classification workshops, the seven (7) international soil management workshops and the eight (8) international correlation meetings. These are all detailed in the SMSS Final Report and record the remarkably, high level of inputs into SMSS activities by cooperating, international agencies and governments. This is an unusual, perhaps unique, record in agriculture assistance provided by a U.S. government agency (also see cost-sharing detailed in Section VI, Paragraph D1 of this report).

The EET finds that the inputs into the SMSS project by AID, OICD and SCS and their domestic and international collaborators were adequate, timely and of outstanding quality. They were the basis and means through which a successful endeavor was accomplished. The mobilization of international support for SMSS by SCS/SMSS project personnel, especially by the Project Director, has been a special accomplishment and deserves special citation by AID and USDA.

4. External Reviews

An external evaluation was conducted by a team of four persons in October of 1986. It was an impressive, useful evaluation that was published as a paperback, booklet by SCS. The team had this to say about the performance of SMSS: "Given the purpose of the SMSS project as helping LDCs establish the prerequisites for soil based agrotechnology development and transfer, the EET assesses project performance to date, using the criteria specified above, as highly cost effective, and the problems it addresses remain very important and significant."

The Team made 14 detailed recommendations for improvement of the SMSS project. The response of AID and SMSS to the recommendations was positive; however, actual implementation of the recommendations has been mixed: some have been implemented, other are still in process and others have not and probably will not be adopted and implemented. Given the size of the SMSS staff and the time and resources available the response is not surprising. The impression is that AID and SMSS have moved to implement recommendations that they could do something about and with which they agreed. The considerable adjustment in SMSS' plans and operations, and its rapid progress towards achievement of objectives after 1986 can be attributed, in part, to the recommendations of the 1986 External Evaluation Team.

5. External Audits

No external audits were performed during this project. In a project of this length and magnitude, the EET finds the lack of an external audit to be a serious omission. Fortunately, internal audits were routinely performed through OICD's established internal auditing procedures.

C. Project Outputs and Accomplishments

1. Impact of the SMSS Project on LDCs

The record of activities involving personnel from LDCs by the SMSS project during its years of operation (1980-90 incl) is summarily documented in statistical form in Appendix C. The data highlight an impressive record of an appropriate mix of actions to accomplish the project's objectives. There have been individual and group consultations to LDCs to provide specifically requested assistance; Soil Taxonomy "Training

Forums" for LDC land use planners and users of soil resource inventories; soil classification workshops for national and international scientists/specialists to review, refine and adapt Soil Taxonomy for worldwide use, with special regard to the tropics; international correlation workshops of scientists from developed and developing nations to discuss and adjust/modify the Soil Taxonomy classification system and standardize supporting analytical procedures; and the World Benchmark Soil project to sample and describe soils of the world and maintain a world soils database. Flowing from these diverse activities has been a steady stream of technical and non-technical publications that document and describe in detail activities undertaken, results/findings and recommendations. These publications have been distributed to LDCs and copies of many are still available for use.

Through its training forums, the SMSS project has reached and influenced many agriculturists/participants -- 1,297 -- directly and, perhaps, thousands more indirectly. The training forums of SMSS have had impact on national programs of many countries in all parts of the world -- Asia and the Pacific, Africa, the Middle East, and North, South and Central America, including the Caribbean. This a noteworthy accomplishment that will pay dividends for years to come.

Eleven year totals indicate the number and variety of activities involving LDCs that have been undertaken. They are summarized in Table 2. The extent of adoption and use of Soil Taxonomy in the last decade is quite impressive and testifies to its perceived and actual value to nations. From SMSS project reports, the Review Team found that 45 LDCs now either use Soil Taxonomy as a national system or that much of their soil mapping is done using Soil Taxonomy. Given SMSS' relatively short period of operation, this is an outstanding accomplishment.

The EET concludes that the SMSS project is largely responsible for accelerating the adoption and use of the Soil Taxonomy soil classification system in LDCs through its diverse, well-designed and well-executed activities over the past decade. Importantly, the SMSS project accomplished the things it set out to do, that is, provide technical assistance as requested by USAID Missions and the countries they serve and improve and extend the use of Soil Taxonomy in the tropics, with special regard to its adoption and use by developing countries. It is conjectural as to what, if any, impact Soil Taxonomy has had on better soil and land use and food production in LDCs. In some parts of the world crops yields are up, notably in Asia -- the world's most populous region, and in other parts of the world, notably in Africa, crop yields are stagnant or declining. Many factors contribute to these circumstances and frustrate attempts to isolate contributions of individual factors. While SMSS activities will likely enhance planning and technology transfer and eventually production, the "how much and how soon" of these impacts is not known. Then the question of how many impacts the adaptation of Soil Taxonomy to the tropics will have that we can not even predict must be asked. The work on Soil Taxonomy is analogous to the work of Linneaus' on scientific nomenclature. How much of an impact has Linneaus' work had on the world?

The rapidly spreading adoption of Soil Taxonomy by national programs, indicates increasing awareness by national scientists and specialists of the need to assess the extent and status of their soil resources in order to protect and better use them for national development. A case in point is Uganda, where SMSS prepared a map of major land resource areas of the country. It is likely there are other LDCs moving in a similar direction, but it is much too early to see a major impact of SMSS efforts on land use planning and policy in LDCs or its impact at the farm level. Through its activities over the past decade, the SMSS project has begun to lay the foundations of a system which can help lead to better land use planning and transfers of technology in LDCs. Much more needs to be done in developing reliable soil mapping, soil analysis and interpretation/extension capacities in LDCs. That process will be slow and expensive. Notwithstanding this outlook, there are two things that can be done immediately by AID that can have an impact at the planning and the technology generation levels in LDCs: (1) begin to translate existing soil maps to Soil Taxonomy nomenclature and begin to help nations prepare maps of their major land resource areas and (2) require SMSS soil and site characterizations for all AID-supported and sponsored projects on phased schedule.

TABLE 2
Summary of SMSS Project Activities 1980-1990

Type of Activity	Totals 1980-90(incl)
1. Technical Assistance Consultations	
Persons	490
Person/days	5,910
2. Training Forums	
Number	21
Number of participants	1,297
Number of countries	176*
3. Soil Classification Workshops	
Number	6
Number of participants	343
Number of countries	113*
4. International Soil Correlation Meetings	
Number	7
Number of participants	445
Number of countries	81*
5. International Soil Management Workshops	
Number	6
Number of participants	345
Number of countries	81*
6. World Benchmark Soils Project	
Number of Countries	84
Pedons	772
Samples	4,875
 *Some countries have been repeated	

2. Worldwide Impact of the SMSS Project

On a global basis, an important impact to date of the SMSS project is that Soil Taxonomy has made it possible for national soil scientists/agriculturists/planners to better communicate with one another and to exchange information regarding the nature, properties and use of soils. The 1986 external evaluation concluded that, de facto, Soil Taxonomy had become the world's system for classifying soils. This circumstance has been reinforced in the interim between 1986 and 1991. The SMSS project reports that more than

45 nations now use Soil Taxonomy as their national Soil Classification system and many others are moving in that direction. SMSS reports that international agencies, such as, the World Bank and the Asian Development Bank require classification of soils according to Soil Taxonomy in resource development programs. As a sign of its diffusion and use, China is using Soil Taxonomy as the basis for its national system; Belgium is translating key portions at their own expense for use in French- speaking countries; and Mexico is doing the same thing for Spanish- speaking nations in Latin America. Thus, the actions of international assistance agencies and nations testify to the spreading, worldwide impact of the SMSS project.

3. Impact of the SMSS Project on the U.S.

Through the National Cooperative Soil Survey, the SCS is linked to all U.S. land-grant universities and state departments of agriculture. The SMSS project has used this connection to involve U.S. university, state and federal scientists and specialists in many of its international activities. Through this mechanism, publications and professional fora, the SMSS has had a salutary impact on U.S. scientists and teachers by expanding their knowledge, understanding and appreciation of the nature and extent of world soil resources. SCS publications and color slides of soils, landscapes and agriculture are used extensively in U.S. textbooks and instructional materials and in magazines and publications of such organizations as the National Geographic Society and the Smithsonian Institution. Soil Resource information generated by SMSS is being used by such diverse U.S. governmental agencies as USDA, NASA, DOD, USGS and EPA.

The EET concludes that the SMSS project has had and will continue to have a profound, pervasive, enduring impact on the U.S. scientific and educational community and U.S. foreign and domestic interests and to some extent on the public at large.

4. SMSS networking with AID/S&T/AGR projects

The SMSS project has a record of cooperation/ collaboration with several of S&T/AGR's global projects, particularly with soils related projects: TropSoils, TSMM, IFDC and IBSNAT. SMSS' WBSP database is used by IBSNAT in its Decision Support System for Agrotechnology Transfer (DSSAT); thus, cooperative links are close with IBSNAT. Similarly, there is a productive working relationship with the Forestry/Fuelwood Research and Development (F/FRED) project. SMSS assists F/FRED with the development of the soil database so important to F/FRED's Multipurpose Tree Research System. SMSS' cooperation with TropSoils, NiFTAL, TSMM and IFDC has been largely with information exchange and in training. There has also been some limited cooperation with S&T/AGR's other Collaborative Research Support Programs (CRSPs). The EET was somewhat disappointed by general lack of strong SMSS interaction with the agronomic S&T/AGR/RNR projects. Stronger linkages should be encouraged.

The EET concludes that SMSS' cooperation/collaboration with S&T projects, with several notable exceptions, has been less than fully satisfactory; a great deal more can and should have been done in areas of mutual interest. The CRSs and other S&T/AGR and A.I.D. projects of the Regional Bureaus engaged in agronomic, horticultural and forestry research should draw on the services of the SMSS project for description and classification of soils at all experimental sites.

5. Progress towards accomplishment of SMSS' major activities

The Review Team has reviewed the tasks (major activities) outlined in the PASA (DAN-1229-X-AG-7051-04) FOR SMSS' two components: the Technical Service component and the Soil Taxonomy Correlation/Survey Improvement component. The activities as stated in the PASA by components are as follows:

a. Technical Service Component

- (1) Provide professional expertise in formulating appropriate broad policies and programs relating to problems in land use, land use planning for food production in the LDCs.
- (2) Give professional technical assistance to LDCs on matters concerning soil surveys, soil conservation and soil management.
- (3) Participate in reviews or evaluations of proposed or ongoing projects in soil survey, soil conservation and soil management.
- (4) Organize workshops, seminars and training programs in LDCs to meet program needs.
- (5) Help create soil fertility awareness, soil testing laboratories, soil fertility interpretation and farmer oriented extension services.
- (6) Help develop training packages by involving LDC personnel.
- (7) Provide specific analytical and/or field testing services to the field.
- (8) Prepare publications on selected aspects of soil management as they affect land use and land use planning in LDCs.

- (9) Obtain experience and information which will improve the technical transfer portion of the project by obtaining a clearer definition of problems and help to sharpen the focus and set the priorities for technology transfer program.

From a comparison of the above stated tasks with trip and financial records and reported accomplishments, the EET concludes that the SMSS project has provided soil management services under the Technical Services Component as requested by USAID missions and cooperating nations in timely, satisfactory ways, and, in doing so, it has accomplished the tasks outlined under this component. The EET notes that providing technical assistance to developing nations in soil management will likely be a needed support service for many years to come, particularly in Africa.

b. Soil Taxonomy Correlation/Survey Improvement Component

- (1) Maintain an International Soil Classification and Correlation Staff at Washington, D.C. The staff will work closely with the U.S. Director, Soil Survey Division SCS. The function of this staff will be to coordinate revisions to Soil Taxonomy with the goal of making it more applicable to tropical and subtropical countries.

Its functions will include:

- (a) Review proposals for updating Soil Taxonomy.
- (b) Ordinate and develop changes in Soil Taxonomy for use outside of the United States.
- (c) Establish and give guidance to international committees dealing with certain facets of the Soil Taxonomy.
- (d) Provide limited on-site assistance in the LDCs for the use of Soil Taxonomy. Provide technical support in soil classification and correlation to scientists who are involved in the soil survey projects.
- (e) Organize and coordinate international workshops for improving Soil Taxonomy and correlation.

- (f) Publish newsletters to inform committee members and others of any activity for improving Soil Taxonomy and agrotechnology transfer.
 - (g) Maintain a comprehensive file of proposals for updating Soil Taxonomy and supporting documentation.
- (2) Keep a Research Soil Scientist at National Soil Survey Laboratory (SCS), Lincoln, Nebraska. The soil scientist will work closely with the International Soil Correlation staff and the staff of the National Soil Survey Laboratory (NSSL) to provide for coordination and quality control in the uniform application of soil classification standards. The staff of the NSSL will be available to develop methods and to assist in sampling and characterizing soil in the intertropical areas. Its functions will include:
- (a) Verify analytical procedures and analytical results established by cooperating laboratories for use in soil classification.
 - (b) Develop methods needed for characterizing soils in intertropical areas.
 - (c) Perform analyses needed to define new taxa if sophisticated laboratory facilities are not available in the countries where these soils occur.
 - (d) Help standardize analytical laboratories in tropical nations.
 - (e) Maintain a data bank of representative samples of soil pedons from intertropical areas.
 - (f) Assist in characterizing research sites of IARCs and bilateral projects.

With regard to progress towards accomplishment of the major tasks and functions of the Soil Taxonomy Correlation/Survey Improvement component, the EET finds that the SMSS project has largely accomplished what it set out to do in exemplary fashion, particularly with regard to extending Soil Taxonomy to better cover tropical and subtropical soils and with regard to promoting global adoption and use of Soil Taxonomy. It should be noted that refinements to Soil Taxonomy will need to continue, as will the necessity to assist

nations with soil classification and survey (and supporting laboratory analytical services) for many years to come. The database of SMSS' World Benchmark Soils Project will need to continue to expand, so as to increase its national and international usefulness.

The Review Team concludes that the SMSS project has been a most unusual project in that it accomplished practically all of its major activities in a relatively short period of time -- in 10 years/one decade.

D. SMSS and A.I.D. Cross-cutting Evaluation themes

1. Cost-sharing

The relevance and importance of Soil Taxonomy to inventorying and planning the use of soil resources for national development purposes has attracted international assistance donors and aid-recipient nations to support the programs/activities of the SMSS project. The level of cost-sharing which SMSS has obtained is truly exceptional. Unfortunately, records of cost-sharing were not kept until FY89. However, project staff indicate that prior to 1982, there was essentially no cost-sharing and that from 1982 on, cost-sharing was between 30 and 50 percent of the level of their budget. Cost-sharing data for FY89 given in Table 3 are illustrative of the nature, magnitude and importance of cost-sharing to SMSS' activities, and the perceived importance of Soil Taxonomy by nations and assistance donors. An important point to note about cost-sharing funds reported, as is reported in Table 3, is that they represent the actual monetary contributions to various activities. That they do not include estimates of in-kind types of contributions suggests that these cost-sharing figures understate the true magnitude of cost-sharing that this project received.

Cost-sharing became an important means by which the SMSS project could stretch its funds and extend its collaborative assistance activities with LDCs. The approach used by the SMSS Project Director was for the host institution to seek donors and SMSS would help in the process. Joint activities were not confirmed until funding commitments were in hand.

Table 3 shows that for the activities listed SMSS leveraged its funds more than threefold in FY89. The impressive cost-sharing record of the SMSS project reflects the entrepreneurial abilities of the Project Director and attests to the attractiveness of the product as well.

Table 3
SMSS Project Cost-sharing

Workshop Activity	Place	Cost Sharing		Dollars Total
		SMSS	\$1,000 U.S. Others	
Spodosols	U.S.	25	75	100
Vertisols	India	25	100	125
Rice Soils	Taiwan	50	150	200
Soil Survey	Kenya	30	120	150
Rice Production	Sri Lanka	6	40	46
Cold Aridisols & Vertisols	U.S. & Canada	21	150	171
SADACC Soil Resources	Zimbabwe	35	50	85
Soil Genesis and Classification	Malaysia	15	40	55
Totals		207	725	932

2. Buy-ins

The SMSS project had only one buy-in during its decade of operation. USAID/Kampala secured the services of the project to prepare detailed evaluations/characterizations of the soils of three agricultural experiment stations in Uganda. Interest in making a more comprehensive appraisal of soil resources of Uganda waned because of travel constraints in the country. However, SMSS did collate existing information and submitted a report/map of "Major Land Resource Areas (MRLA) of Uganda."

The experience of SMSS has been that contractors who conduct most of USAID Mission-sponsored-technical assistance projects are generally not favorably disposed to buy the services of the SMSS project after a project has been developed. And it appears that because of the availability of the administratively easy and programmatically desirable cost-sharing option, SMSS did not pursue buy-ins. Notwithstanding, the EET notes that buy-ins can be important means for USAID Missions and the nations they serve to acquire basic soil resource data for planning and executing their development assistance programs.

3. Sustainability

Two issues with regard to sustainability arise. One has to do with the future of the activities conducted by the SMSS project and the other with the relationship of SMSS activities to sustainable agriculture and the quality of the environment.

Should the SMSS project terminate, some SMSS activities will continue at a reduced level and in an unorganized manner and others will not continue. Soil Pedologists of the U.S. and other countries will continue to exchange information and generally continue to support the adoption and use of Soil Taxonomy. It is likely that from time to time they will get together and revise and refine the system. Further, it is probable that the services of SCS will be acquired by those nations able and willing to pay for help with soil surveys and mapping, if the necessary arrangements can be made. Current arrangements with SCS facilitate and expedite responses to such requests. It is conjectural as to what the situation will be if present arrangements are terminated.

With regard to sustainable agriculture, there is no conventional agriculture without soil. Soil resources, their extent and quality, are critical to permanently-productive national agricultural systems; thus, if their futures are to be made secure through appropriate policies and actions, it is imperative that nations be knowledgeable as to the status of their soil resources and how they can best be used for socio-economic purposes.

While the SMSS project is not the only U.S.-sponsored assistance effort concerned with soils and soil management, by virtue of its nature and its global operations, it is a key component of the overall assistance effort of the U.S. and other international assistance donors in agriculture and natural resource conservation and use. Because of the uniqueness of Soil Taxonomy and the SCS as well, SMSS' demise would create quite a void that can not be easily filled, if at all.

4. Women in Development

According to the Project Director, the SMSS project has consistently supported A.I.D. policy to emphasize and secure the active participation and contributions of women in project activities. The fact is that in many countries of the world where SMSS

has operated, women are increasingly becoming agricultural scientists/soil scientists and becoming more and more active and influential in agricultural affairs. A leading, internationally known, soil microbiologist from a developing country is a woman. SMSS personnel have made a special effort to select and encourage women to participate in workshops, training courses, and technical assistance missions. The Project Director reports that SMSS has had good success in this regard in Asian countries, but less so in African countries. The Review panel notes that soil pedology and soil survey/mapping, despite their importance to national development, are not among the most attractive fields of agricultural specialization for men or women in developed or developing nations.

5. Peer Review

The SMSS project has conducted its operations/programs largely through a series of global workshops and committees which have included in practically every instance the participation of world leaders in soil pedology, soil survey/mapping and other specialized areas of soil science. Thus, peer participation in SMSS-sponsored activities has, in fact, been peer review and peer approval. The published proceedings of international workshops and international committees attest to this fact. Furthermore, during the first six years of its operation, SMSS had a technical advisory committee of soil scientists from around the world. One of the members of the 1986 External Evaluation Team was a Past President of the Soil Science Society of America and Head of the Department of Soil and Crop Science of Texas A&M University.

6. Information Collection and Dissemination

The SMSS project prepared a list of SMSS project generated publications over the life of the project as of January 15, 1991. The list cites 243 publications of various kinds ranging from newsletters to refereed publications in recognized journals. By far most of the list is comprised of papers presented at conferences and workshops; however, the list includes several books (5), handbooks and manuals, technical monographs, and annual reports. Many of the publications, particularly the newsletters and proceedings of workshops and meetings, have had global distribution to institutional and individual collaborators. In this regard, 50,000 copies of four editions of the paperback, pocket edition of "Keys to Soil Taxonomy" have been distributed. All or portions of this useful compendium of soil classification information have been translated into Spanish, French, Italian, Indonesian, Arabic, Malay, Chinese, Greek, Japanese, Thai, Burmese, Polish and Russian.

The performance of the SMSS project in collecting and disseminating project results and useful information has been outstanding.

E. Lessons Learned

At the beginning of the external review, that is, during the familiarization period -- reading background documents in preparation for the formal review, it was clear that the SMSS project had been quite successful, probably beyond expectations; therefore, the EET devoted considerable time to the question: Why success? During the two days of joint discussions, SMSS/SCS/USDA/, OICD/USDA, and AID/S&T/AGR/RNR personnel were continually pressed on project planning, management/operations, inputs and outputs -- their magnitude, quality and timeliness. What things went right, what things went wrong and with a great deal of emphasis on the who, when, why, how, how much and so what of their operations. A lengthy, written set of questions based on project tasks as stated in the PASA was sent to the Project Director prior to the formal review. He responded in exemplary fashion with a detailed, written memorandum. The length of his memorandum is too long to be included in this report, but it is available in the AID project Manager's office and hopefully will be filed as an external annex to this report.

Back to the question of project success, contributing reasons cited by project personnel and recorded during discussions are given in the list that follows (in no order of significance and with some repetition):

Project personnel

The approach/the plan

Adequate, effective mix of inputs

SCS a premier institution/best in the world

Soil Taxonomy - a saleable, useful product

Dedicated staff

Cultural sensitivity

Vested interest of SCS in Soil Taxonomy

Experienced, savvy people

Linkages/networking

Staying power/sufficient time

Cost sharing

Commitment and support by sponsors (AID and USDA)

From the list it is clear that the SMSS project was blessed by an array of project enhancing features and factors. To the list, the Review Team would only add the significant intellectual contributions of soil scientists/specialists and others from collaborating host countries and international assistance agencies.

The success of the SMSS project reaffirms well-known lessons that the success of development assistance projects is related directly to a variety of factors, particularly to (1) project personnel: high level of knowledge, experience/reputation, cultural sensitivity, dedication and enthusiasm; (2) an adequate, appropriate mix of inputs: sufficient but not too much or too little money and supportive materials and supplies; (3) an enabling perception: an attractive, highly-regarded, development-promoting product and (4) committed, helpful allies: cooperating U.S. agencies, international assistance organizations and developed and developing nations.

The EET finds that the SMSS project has had it all: world class personnel, a global operation, something of value to sell and lots of help.

In terms of specific aspects of the project, some lessons learned have been identified by the SMSS project staff as follows:

1. **Use and application of Soil Taxonomy**
 - Success of any activity depends on personal contacts, giving importance and visibility to host country institutions and personnel, and financial support.
 - Enabling LDC scientists to visit the U.S. and other developed countries to observe soil survey and interpretation and land management operations can have as much impact as conducting meetings in-country.
 - Creating awareness in decision-makers is necessary for success and long-term follow-up. Development of personal relationships helps in building confidence.

- **Backstopping through letters, reviews of country reports, providing a liberal supply of publications, responding to requests, and recognition of LDC scientists in newsletter articles all aid in cementing relationships which are critical for a service project.**

2. Soil and Site characterization

- **In general, the quality of data from LDC laboratories is not good. Most LDCs, particularly in Africa, lack facilities even to perform the most elementary of analyses.**
- **Due to absence of data, scientists had difficulties in utilizing data developed by SMSS and others. Interpretation of data became an important part of the training. Misconceptions also prevail in many countries due to lack of understanding. These misconceptions are evidenced by observations of phosphate trials on high phosphate soils or liming trials on neutral soils.**
- **Soil as a factor in crop production appears to receive minimal attention in much agronomic research, and particularly in varietal trials where lack of attention to soil conditions can lead to erroneous conclusions. There is a need for more interaction between soil scientists and plant breeders and other users of soil information.**

3. Cost-sharing

- **Cost-sharing is an indication of the value others attach to an activity and should be the first option in organizing the activity. The process can be frustrating and time-consuming, but can be accomplished if sufficient lead time is provided.**
- **The seed money provided by SMSS is usually inadequate and should be significantly increased to ensure more success.**
- **A few activities require full funding, such as, those that benefit from regional participation.**
- **The ability of the project to carry over funds year-to-year has been used as a reason by AID for reducing the annual budget.**

- **Personal contacts, confidence in project activities and personnel, and the ability of the project to deliver are all ingredients to successful cost-sharing.**

4. Technical assistance

- **SMSS is designed as a service project and there must be commitment by S&T/AGR/RNR to provide reasonable services at no cost to USAID Missions.**
- **Lack of awareness by the Mission staff of services available has hindered their better use of the project. Creating this awareness is a duty of both the project and S&T/AGR/RNR.**
- **Periodic visits to Missions and familiarization of the project to Mission personnel is an important function of the Project Director.**

5. Successful Workshops

- **Planning is essential for the success of a workshop. Often two or more years of planning are required to put together a workshop.**
- **Uncertainty relating to annual funding made it risky to plan workshops far in advance. The SMSS project took some risks along these lines but was able to put together successful workshops.**
- **The ability to allocate funds in one year to an activity in a subsequent year, without having that subsequent year's funding reduced because of these carryover funds would greatly facilitate workshop organization.**

F. Status of the SMSS Project and Possible Future Operations

The SMSS project is one of five S&T/AGR/RNR soils-related global projects designed to help developing nations improve and maintain the productivity of their national soil resources for socio-economic development, with special regard to agricultural and forestry systems. The chart in Appendix D depicts the complementary and supplementary relationships between and among the five projects.

The SMSS project's special role in the scheme of development assistance is to help largely agrarian, developing nations characterize, inventory and plan the use of their soil resources. When SMSS was initiated, there was a need to extend the use of Soil Taxonomy to tropical and sub-tropical areas, because results of AID's Benchmark Soils project indicated that the Soil Taxonomy system of soil classification offered, among other things, the prospect of helping to accelerate the transfer and adaptation of crop production technologies between and among nations and in the process save substantial money and time. The SMSS project was initiated in 1979 and by 1990 Soil Taxonomy had been improved to better classify tropical and sub-tropical soils and it had become the world's leading soil classification system. Thus, in the short period of one decade, SMSS has largely accomplished what it set out to do with respect to Soil Taxonomy. As with any classification of natural systems, refinements, modifications and revisions will take place over time. Further, it will be many years before nations of the world will be able to complete the slow task of classifying and mapping their soil and land resources. Clearly, the overall task of putting Soil Taxonomy into use throughout the world is far from complete, but SMSS has shown the way and has helped to get the process started.

As to the future, there does not appear to be strong reasons for AID to continue to support the SMSS project as it is presently structured and operated after its termination in FY90. It has largely achieved what it set out to do. Soil Taxonomy has been adapted to the tropics and it has become the world's system of soil classification; thus, there appears little justification for AID to continue to make a special effort to promote the spread and use of Soil Taxonomy. Under AID sponsorship and support, this element of SMSS has clearly run its course.

A major concern at this time is how to secure greater use of Soil Taxonomy/soil classification in nations by national planners and researchers, and how to help nations move forward with soil classification and mapping in order to receive the technology transfer and other benefits which can accrue through the use of Soil Taxonomy. One approach would be to try to influence the thinking and planning of international assistance donors in much the same ways that the Rockefeller and Ford Foundations influenced the major donors to adopt the IARCs (IRRI, CYMMYT, IITA and CIAT) and establish the CGIAR. Soil Taxonomy is not in the category of the IARCs, but it is of sufficient development importance to be brought to their attention and to be put into use by the IARCs and other international assistance donors. At this time, it may be more appropriate for AID to get its own house in order before it tries to influence others.

Within AID, SMSS can and should provide soil and site characterization and database information for all agronomic, horticultural and forestry research and development programs sponsored by the S&T Bureau and the Regional Bureaus and those funded/conducted directly by USAID Missions or through contractors. The CRSPs are cases in point in the S&T Bureau. In the Africa Bureau, the SAARFA project (Support for African Agricultural Research and Faculties of Agriculture) is a good example. SAARFA is a \$40+ million, regional, largely agronomic research effort being conducted through

grants to the IARCs in which SMSS type services should be in direct support to help extend the usefulness of their research. Other Bureaus and projects could be cited, but the point is made: AID should consider taking steps to increase the value and usefulness of its investments in agronomic, horticultural and forestry research and demonstration programs by mandating the use of SMSS soil and site characterizations.

Should AID make SMSS soil and site characterization a requirement for all other agronomic, horticultural and forestry research demonstration projects that it funds (on a phased-in basis), the task might be too large for SCS handle alone. A SCS-led consortium effort with U.S. universities and others might be needed. The benefits which will accrue over time from such an effort will likely far exceed the additional costs required.

A less ambitious scenario would be for S&T/AGR to require soil site characterizations for all of its agronomic, horticultural and forestry research projects. Some of the projects have secured the services of the SMSS project and others are probably headed in that direction. If all of the CRSPs and S&T/AGR projects, for example, characterized their research sites abroad, this would be an important step in the process of influencing nations and enhancing the value of CRSP and S&T/AGR research.

What to do is fairly clear, that is, make SMSS soil and site characterization an integral part of all research involving soils. Less clear is how? Should SMSS remain a separate project much as it is? Or should it become a component of an enhanced soil management project, such as the TropSoils CRSP? The answer depends upon what kind of future role is envisioned for the SMSS project or SMSS-type activities.

If it is decided that a major campaign should be launched to require that all AID and/or S&T/AGR financed agronomic, horticultural and forestry research sites have SMSS soil and site characterizations, then a re-structured, re-directed SMSS project should remain as it is under a PASA arrangement with SCS. The nature and magnitude of services to be provided would preclude merger with other activities.

On the other hand, if a more modest level of activity is contemplated for program reasons or as may be required by AID funding and management constraints, then merger with other S&T/AGR/RNR soil management activities under an umbrella arrangement might be a reasonable course of action. However, given possible program and operational incongruities, a feasibility study seems in order before such a decision is made.

The EET believes that S&T/AGR should not be reticent to make the case for SMSS soil and site characterizations of AID supported research sites. To do so is simply to be consistent with accepted research practice. The Soil Science Society of the American, the Crop Science Society of America and the American Society of Agronomy require the USDA Soil Taxonomic descriptions of soils in experiments in reporting research results in their journals to help make such results more understandable and useful around the world. For AID, there is no justification to continue practices that can not be justified -- practices

that have been overtaken by advances in knowledge and capabilities (it is surprising that poor soil characterization, with or without Soil Taxonomy, has been tolerated so long by AID). Just as the officers in the S&T Bureau have had the vision and the will to put and keep in place a set of projects to help address global soils problems over the past several decades, they should now push hard to see that results obtained from these projects move to the payoff stage. In this case, if it is true that advances have been made that have the potential for decreasing costs and increasing efficiency of agricultural projects, then the Agency should know about them and either adopt them or justify why not.

Whatever the future, the SMSS project has been very productive in terms of volume and quality of work it has accomplished. The impact of the project goes beyond its revision and improvement of Soil Taxonomy, its database development, and its training/technical assistance. The international networking of soil scientists that the project has fostered will undoubtedly lead to continued professional growth of these individuals as well as to the enhancement of Soil Taxonomy over time. The soil classification capabilities of LDC Scientists have surely been improved through SMSS's efforts. The ultimate result of SMSS will be a better system of land-use planning and technology transfer leading to sustainable development in LDCs.

VII. RECOMMENDATIONS

The External Evaluation Team recommends:

1. That A.I.D. should consider adopting a policy which would require on a phased-in basis over a reasonable period of time SMSS soil and site characterizations for all AID-supported agronomic, horticultural and forestry research and demonstration projects and activities. Such a policy should require that all new projects make provision for SMSS soil and site characterizations at project initiation as a requirement in the project approval process.

2. That AID/S&T/AGR should consider a PASA arrangement with the SCS/USDA to enable a re-structured, re-directed SMSS project to maintain a core staff and administrative and analytical laboratory facilities to (a) provide SCS soil and site characterizations as requested and paid for by requesting agencies in connection with Recommendation 1, above, (b) provide SCS soil classification and soil mapping services to USAID missions, nations and international assistance agencies as requested and paid for by such agencies and (c) maintain and extend the SCS/SMSS Benchmark Soil Project's world soils database.

3. That AID should consider using its good offices and influence to encourage international assistance donors to consider requiring internationally acceptable soil and site characterizations when and where appropriate as integral components of agricultural, horticultural, forestry and other relevant projects.

VIII. APPENDIXES

APPENDIX A

PERSONS CONTACTED

Affleck, Richard	Chief, Natural Resources and Environment	OICD/USDA
Arnold, Richard	Director Soil Survey Division	SCS/USDA
Bathrick, David	Director Office of Agriculture	S&T/AGR
Gill, Tejpal	Chief, Division of Renewable Natural Resources Management	S&T/AGR/RNR
Cady, Foster	Director, Forestry/ Fuelwood R&D Program	Winrock International
Eswaran, Hari	SMSS Project Director	SCS/USDA
Juo, Anthony S. R.	Professor of Agronomy	Texas A&M University
Kimble, John	SMSS Soil Chemist	SCS/USDA
Malcolm, John	Project Manager Soil Management CRSP	S&T/AGR/RNR
Meyer, Raymond	SMSS Project Manager	S&T/AGR/RNR
Witty, John	Soil Scientist	SCS/USDA

APPENDIX B

DOCUMENTS REVIEWED

- AID/S&T. Peer Review Policy for the Bureau for Science and Technology. Memorandum, Richard E. Bissell, AA/S&T, September 9, 1990.**
- AID/S&T. Administrative Procedures for Conducting Evaluations, January 10, 1991.**
- AID/S&T/AGR. Program Guide to Office of Agriculture, Bureau for Science and Technology, AID, February, 1989.**
- AID/USDA. Soil Management Support Services, Working Towards a Better Evaluation and Utilization of Soil Resources in Developing Countries. A report for International Assistance. (nd)**
- Eswaran, Hari. Sustainable Agriculture in Developing Countries. A discussion paper. (nd)**
- Parker, J. Kathy. The roles of women in Agriculture and Natural Resource Management in Developing Countries. A presentation during the American Society of Agronomy Meetings, October 16, 1989.**
- PASA Dan-1229-X-AG-7051-04, FY 1988-89. Appendix A, Scope of Work.**
- SCS/USDA. Soil Taxonomy. Agriculture Handbook 436. U.S. Government Printing Office, Washington, D.C., December 1975, 754 pp.**
- SCS/USDA. Progress Report, Soil Management Support Services, 10 October 1979 - 30 September 1987.**
- SCS/USDA. Soil Management Support Services Final Report, FY 1980 to FY 1990, January, 1991.**
- SMSS. Annual Plan of Operation, FY 1988, September 29, 1987.**
- SMSS. Major Land Resource Areas of Uganda, A Report submitted to USAID/Kampala, July, 1990.**
- SMSS. Final Report of Obligations for FY90.**
- SMSS. Activities Summary, FY1990.**
- SMSS. Monthly Statement of Obligations, Final FY90, 1 January 1990.**

APPENDIX B (Continued)
DOCUMENTS REVIEWED

SMSS. Calendar 1991, 8 January 1991.

SMSS. Publications List, Soil Management Support Services, January 15, 1991.

SMSS and Benchmark Soils Project. Reprints from Advances in Agronomy, Vol. 33, 1980.

SMSS. Research and Soil Analysis at Lincoln, Nebraska. Lessons Learned, and Future Needs, February, 1991.

Soil Survey Staff. Keys to Soil Taxonomy. SMSS Technical Monograph No. 19. Virginia Polytechnic Institute and State University, Blacksburg, Virginia, Fourth Edition 1990, 422 pp.

Witty, John. Soil Taxonomy. A discussion paper, February 12, 1991.

USAID/S&T/AGR/RNR. Soil Management Support Services, Report of the External Evaluation Panel, October, 1986.

APPENDIX C
SUMMARY OF SMSS PROJECT OUTPUTS

Activity	1980*	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1. Tech. Assistance/ Transfer/ Consultations											
Persons	23	43	49	47	56	50	61	57	32	31	41
Person/days	303	583	742	507	646	523	927	563	370	352	385
2. Training Forums											
Number of Forums	1	1	1	3	3	4	2	2	2	1	1
No. Participants	40	56	55	170	152	271	114	144	160	85	50
No. Countries	11	11	8	36	40	35	22	5	4	3	1
3. Soil Classification Workshops											
Number Workshops		1	1	2			1	1			
No. Participants		41	40	122			65	75			
No. Countries		22	22	40			11	18			
4. Int'l. Correlator Meetings											
Number Meetings						1		3	1	1	1
No. Participants						45		150	65	90	95
No. Countries						4		46	14	20	21
5. Int'l. Management Workshops											
Number Workshops							3		1	2	
No. Participants							165		40	140	
No. Countries							49		8	24	
6. Publications											
Tech. Monographs		1	4	1	2	2	4	2	2		2
Benchmark Soils Newsletter		1	3	3	3	3	3	3	3	2	3
Brochure	1			1	1	1					
Bibliography				1				1			
Forum Proceedings		1		1	1	3	1	1	1		
Class. Workshop Proceedings	1			1	1	2	1	1			
ISCOM Proceedings								1	1		3
CLAMATROPS Proc.								1	1		
Annual Reports		1	1	1	1	1		1	1		
7. World Benchmark Soils Project								1	1		
No. Countries	3	6	17	15	7	4	8	7	9	1	7
No. Pedons	30	42	136	123	120	59	101	23	51	1	86
No. Samples	135	221	822	656	731	429	657	167	390	7	660
8. Audio Visual Products	2										
9. Computer Software						1					
10. Countries Visited	12	16	22	24	28	21	20	18	9	11	21

1980 includes activities in both FY79 and FY80

APPENDIX D

SUSTAINING NATURAL RESOURCES (SOIL AND WATER)

Recognizing the fragile nature of the balance for sustainable agriculture and the use of natural resources in many LDCs, S&T/AGR work through a well coordinated soil and water program to address the critical issues of policies and management. Environmental concerns are integrated in each project of the program. Computer systems approach is being developed under IBSNAT⁶ to do the risk analysis.

PROGRAM

AREA	LAND USE MANAGEMENT				MOISTURE MANAGEMENT		OPTION DETERMINATION
FOCUS	PLANT	NUTRIENT	PRACTICES		ASSESSMENTS	RAIN HARVEST	RISK ANALYSIS (SOIL/CROP/ENV./ECON.)
KEY OUTPUT	PRODUCT CHEM.	PRODUCT BIOL.	DATA BASE	TECHNL.	METHODOLOGY	TECHNL	METHODOLOGY
PROJECT	FERTILIZ.	BNF ¹	SMSS ²	CRSP ³	AWRH ⁴	TSMH ⁵	IBSNAT ⁶
INST.	IFDC ⁷	UH ⁸	SCS ⁹	NCSU ¹⁰	(NEW) ¹¹	ARS ¹²	UH ⁸

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- | | |
|--|---|
| <ol style="list-style-type: none"> 1. - Biological Nitrogen Fixation 2. - Soil Mgmt. Supp. Serv. 3. - Coll. Res. Sup. Prog. - Soils 4. - Agr. Water Resources Management 5. - Techn. Soil Moist. Mgt. 6. - Int'l Benchmark Sites Network for Agrotechnology Transfer | <ol style="list-style-type: none"> 7. - Int'l. Fert. Dev. Cntr. 8. - Univ. of Hawaii 9. - USDA - Soil Cons. Serv. 10. - N. Carolina State U. 11. - In implementation process 12. - USDA - Agr. Res. Serv. |
|--|---|

Drafter: S&T/AGR/RNR:TC111
875-4307, 3/1/90
(ID:8108g-Disk:0001g)

Clearances:

S&T/AGR:DBathrick _____ Date _____
S&T/PO:DSheldon _____ Date _____

APPENDIX E

PROJECT DESIGN SUMMARY LOGICAL FRAMEWORK

Life of Project: _____
 From FY 80 _____ to FY 92 _____
 Total U. S. Funding \$ 14,277,000
 Date Prepared: 1/86

Project Title: Soil Management Support Services (BST-1229-P.AC-2178)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <p>Goal: To increase the LDC's capability to expand production, utilization, and distribution of food supplies to alleviate hunger and malnutrition.</p> <p>Purpose: To help develop the prerequisites for soil based agrotechnology transfers among tropical and subtropical countries.</p>	<p>Measures of Goal Achievement:</p> <ol style="list-style-type: none"> LDC's use <u>Soil Taxonomy</u> as basis for their soil resource inventories. USAID country missions and institutions in LDC's request and use services of SHSS. 	<ol style="list-style-type: none"> International surveys USAID Missions 	<p>Assumptions for achieving goal targets:</p> <ol style="list-style-type: none"> Adequacy of <u>Soil Taxonomy</u> as a basic document for agrotechnology transfer. A ready pool of soil scientists available to serve the technical assistance component of program.
<p>Project Objectives:</p> <ol style="list-style-type: none"> To provide soil related technical assistance to AID and LDC to assist national staff. Assist in the development of methodologies for fertility evaluation and its integration with soil classification. Assist in development of soil resource inventories and soil survey interpretations. Develop linkages with national and international institutions to facilitate agrotechnology transfer. 	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <ol style="list-style-type: none"> Appropriate technical personnel provided promptly on request. Contacts established with LDC scientists and decision makers. International workshops and training courses organized. Soil resource inventories developed for selected countries and methodologies adopted for use by others. 	<ol style="list-style-type: none"> Annual reports, progress reports Files of SHSS Reviews of participants and/or AID Missions Circular letters Country adoption of recommendations <u>Soil Taxonomy</u> amended 	<p>Assumptions for achieving purpose:</p> <ol style="list-style-type: none"> Contingent on requests from USAID or countries. Continuing SCS and University support. Cooperation of participating countries and institutions.
<p>Outputs:</p> <ol style="list-style-type: none"> SCS and other experts sent on TDY to LDC's. International committees International workshops Regional training courses Newaletter Monographs Help strengthen national soil labs in LDC's. 	<p>Magnitude of Outputs:</p> <ol style="list-style-type: none"> 30-50 person-months per year 4 soil management committees one per year operational 1-2 per year 2-4 per year 3-6 per year 5-10 man-months per year 	<ol style="list-style-type: none"> TDY reports of experts; USAID reports; country reports Committee circulars Proceedings, tour guide Training manual Newaletter Monographs National labs use U.S. standards 	<p>Assumptions for providing outputs:</p> <ol style="list-style-type: none"> Requests from USAID Missions and countries , 3., 4. Contingent upon establishment of justified need and support from cooperators and countries. Support staff available Established need and willingness of potential authors. Requests from countries.
<p>Inputs:</p> <ol style="list-style-type: none"> Professional staff of SHSS. Technical and administrative staff. Professional and technical consultants. Laboratory, computer and library facilities. Financial support 	<p>Implementation Target (Type and Quantity)</p> <ol style="list-style-type: none"> 180 work-months 120 work-months 150 work-months Adequate for project \$6,200,000 in 5 years Adequate 	<ol style="list-style-type: none"> Annual report, onsite reviews, project documents AID records and reports 	<p>Assumptions for providing inputs:</p> <ol style="list-style-type: none"> , 2., 4. SCS facilities accessible to project personnel. Qualified technical and professional personnel easily available.

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