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REPORT OF THE EXTERNAL EVALUATION TEAM

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Report of the External Evaluation Team

on

SOIL MANAGEMENT SUPPORT SERVICE

(AID Project No. 393-1229)

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Executive Summary

Executive Summary

[NOTE: Since Chapter VI is a summary of the major conclusions of the External Evaluation Team (EET) and their translation into actionable recommendations, this executive summary concentrates on the highlights concerning performance and special issues reviewed and is not intended as a substitute for the report itself].

The SMSS project was initiated in October 1979 through a PASA with the USDA and extended into Phase II through 1987 in September 1982 with a total estimated funding level of $7,377,000. It was part of an AID/S&T strategy in soil and water management which foresaw the use of the Soil Taxonomy (ST) classification system in agrotechnology transfer.

Performance

In assessing performance, particularly within the context of project effectiveness and impact, the team relied heavily upon application of these criteria:

- o use and application of ST by developing countries;
- o extent of world-wide recognition of importance of soil and site characterization in agronomic research;
- o amount of cost-sharing and support provided by international, regional and national organizations, plus USAID missions;
- o quality and type of technical assistance; and
- o impact of SMSS activities within the U.S.

SMSS activities are categorized as technical assistance and technology transfer. Based on replies to recent questionnaires, there is general USAID field support of technical assistance and support services provided and it has been more than adequate in responding to demand. The problems have been with the less than anticipated demand level and its ad hoc nature.

All other activity comes under technology transfer. Perhaps the most significant activity of the SMSS in Phases I and II has been its support of International Soil Classification Committees (ICOMs) in their work of revising and expanding the ST to cover adequately the soils of the tropics and sub-tropics.

The training forums have also been an important element in the SMSS program and are well-received, including a high proportion of cost sharing. Many useful by-products have also been produced, e.g., providing soil classification data for the World Benchmark Soil Project (WBSP). The

workshops have, until recently, been an integral part of the ICOM process. It is noted that changes in the focus and subject-matter of both workshops and training forums is under way as the project focus shifts to the utilization of ST in soil management.

The WBSP, a misnomer for a soil-crop yield data base, collects and analyzes soil samples (by the National Soil Survey Laboratory of SCS) which have been randomly supplied by SMSS as a result of training forums, soil classification workshops, and technical assistance. As a result, SMSS now has one of the most comprehensive collections of representative world soils. It is used extensively by IBSNAT in its crop model development. Notwithstanding its expansion and use to date, there are some general problems in the further development of the data base, (e.g., it contains very limited crop yield data and virtually no climatic data, it is not very user friendly, and it lacks spatial data) which need to be addressed. Nevertheless, the quality and quantity of the NSSL outputs to date are high.

Given the purpose of the SMSS project as helping LDCs to 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.

Selected Issues

The EET, in addition to assessing project performance, investigated a number of issues provided in its terms of reference designed to get at questions of continuing relevance, effectiveness and the actual and/or potential impact of the SMSS project. These considerations formed the basis for the major conclusions and recommendations for the future but a brief summary of the highlights follows:

Soil Taxonomy

o The work to internationalize the ST is inevitably time consuming and long-term but it is important, has many beneficial by-products and should be continued.

o There is gratifying evidence of increasing use of ST but very little to date in agrotechnology transfer and none in soil conservation. Nevertheless, the ST has become, de facto, the international soil classification system.

o Problems impeding the use of ST have been identified. Among them is scarcity of trained staff, poor laboratory support services and lack of know-how in interpreting taxa for practical applications.

o The absence of sufficient management information for the soils of the tropics constrains SMSS's ability to relate ST to management but linkages with IBSNAT in its Decision Support System for Agrotechnology Transfer (DSSAT) and others will help in developing such information and methodologies.

o Creating an awareness and understanding of the potential use of ST as a soil classification system based on objective criteria is the most important accomplishment of SMSS to date.

o While firmly supporting a change in focus in Phase III to the actual utilization of ST, i.e., in soil survey and soil survey interpretation, and on soil fertility and water management - soil classification relationships, it is necessary to recognize the progressive steps involved in a systematic and effective approach to soil management and that only where these steps have taken place can "soil management" or "technology transfer" occur in a routine manner.

Soil-Crop Yield Data Base

o Soil survey information generated in LDCs is in general meager and insufficient to make most kinds of predictions on, or control, crop performance.

o Data base management systems and artificial intelligence are very new tools with considerable potential and SMSS involvement in these developments should be continued, particularly its collaboration with IBSNAT.

o Efforts to design a comprehensive data base management system which is user-friendly and facilitates soil interpretation, i.e., predicting soil behavior and performance from soil data, should be a major priority for Phase III and SMSS's next major accomplishment.

Training Forums

o The time has come to consider more in-depth training needs with a changing focus on utilization in step-wise progression.

o Increased involvement of regional and national organizations in the design and conduct of training programs should be encouraged and facilitated to accelerate the foundations of national understanding and participation.

o In Phase III, a modular package of training programs should be developed based on a systems approach.

Technical Assistance

o The problem of coordination of SMSS activities with other field activities is at least a partial function of the ad hoc nature of the technical assistance demand.

o There is an obvious need for a programmed or planned approach to technical assistance which is less passive and more result-oriented.

o This may require some kind of a planning, coordination and brokering mechanism for headquarters and field activities which involve significant soil and water management components, e.g., the "umbrella" concept now being developed by S&T/AGR/RNR.

Strategy

o A shift in program areas and operational mode is desirable in Phase III. The current mode is too passive for ST utilization and desired products are not likely to be produced as a sole by-product of mission demand for SMSS support services.

o The understandable concern that the commodity focus of the IARCs will undermine attention to other critical aspects of the production process and on-farm application will be overcome with patience and persistence and work itself out as credibility gains momentum through the use of solid ST work by SMSS and the crop modeling of IBSNAT enters the validation and demonstration phase.

o A five-year strategy paper would be useful in conjunction with the review and approval of Phase III, encompassing the new elements suggested in this exercise and focused on a coordinated approach to catalyze and influence actions to remove or ameliorate the impediments in reaching the project purpose and program goal.

Management

o The SMSS was and still is a very cost-effective mechanism for tapping into and channeling the major U.S. soil resources to provide benefits both to the developing countries and the U.S.

o The Project Leader has done an outstanding job and the EET wishes to congratulate him (Dr. Hari Eswaran) on his motivation, enthusiasm and efficient implementation of the project.

o Backstopping and communication has been adversely affected at times by a lack of flexibility in OICD support and SCS staff ceiling limitations.

o The SMSS Advisory Panel has made a positive contribution to the management of the project.

o A systems approach to overcoming soil and water management problems impeding agriculture production is endorsed by the EET. As part of such an approach, and for other reasons, the "umbrella" approach discussed both for USDA (i.e., SCS, ARS and CSRS) and AID (i.e., centrally funded soil and water contractors, including PASAs) should be pursued.

Recommendations

As noted, Chapter VI was written to provide the reader with a summary and synthesis of the Team' major conclusions and the basis for its recommendations which are repeated here in truncated form:

1. SCS/SMSS and S&T/AGR, in collaboration with the Regional Bureaus, USAID field missions, and principal soil and water contractors, should initiate a series of actions designed to influence and restructure the demand for technical assistance to make it more complementary to the utilization of Soil Taxonomy and agrotechnology transfer and increase project effectiveness and impact (specific suggested actions are included).

2. Any change in strategy, program focus, priorities, etc., which are to take place in Phase III, must be based on the major system elements (progressive steps) which are the prerequisites to improved soil management and agrotechnology transfer.

3. SCS and SMSS, in collaboration with S&T/AGR and current and potential users, should review strategy, objectives and plans for establishing a soil-crop yield data base to, inter alia: (a) stimulate and support national involvement: and (b) think through the uses, content, design, interfaces, etc., of a user-oriented soil data base management system, including the role of the NSSL in Phase III.

4. Beginning as soon as possible, SMSS should initiate (through contract or otherwise) the comprehensive design and on-line operation of a user-friendly soil-crop data base which is machine retrievable for instant analysis and use and is compatible with the DBMS developed by IBSNAT for DSSAT. (Design points for resolution are also suggested).

5. SMSS and IBSNAT, in cooperation with TROPSOILS and others, should be encouraged and supported by AID to assign high priority over the next two or three years to development of an "expert system" for soil survey interpretation.

6. Training forums and workshops should remain an important category in Phase III but must shift in subject-matter, emphasis and perhaps format, as utilization of ST and coordination of soil and water management activities are stressed. (Specific suggestions to accomplish this are provided).

7. An end-user survey on the usefulness of current publications and reactions to planned or needed ones should be considered in preparation for Phase III.

8. As a crucial part of the preparation, approval and allocation process for the proposed extension, a revised and written five-year strategy should be developed which will set the parameters for subsequent project (re)design to be included in the AID Project Paper and OICD/USDA PASA and for work planning. (Elements in such a strategy are suggested).

9. The USDA, particularly OICD and SCS, should arrange for adequate support to SMSS headquarters professional staff, particularly for the Project Leader. In planning Phase III along the lines suggested, the staffing needs for backstopping will require review and, most probably, augmentation.

10. USDA management, in collaboration with AID, should consider the advantages of consolidating its AID-financed soil, water and related activities into a single, "umbrella-type" project or PASA, involving SCS (SMSS), ARS (TSMM) and CSRS, possibly among others.

11. AID/S&T/AGR management, in collaboration with the AID regional bureaus and, among others, USDA, should move forward with their plans to develop an "umbrella-type" project for all centrally-funded soil and water management projects.

12. In preparation for Phase III, the project design should be revised to: (a) more clearly distinguish between major design levels; (b) provide objectively-verifiable indicators; (c) incorporate any changes resulting from review of the above recommendations; and (d) make technology transfer more "output-oriented" - leading to increased SMSS effectiveness and eventual impact.

List of Frequently Used Acronyms*

AID	Agency for International Development
ARS	Agricultural Research Service
BSP	Benchmark Soils Project
CDSS	Country Development Strategy Statement
CSRS	Cooperative State Research Service
CRSP	Cooperative Research Service Program
DSSAT	Decision Support System for Agrotechnology Transfer
EET	External Evaluation Team
EOPS	End of Project Status
FAO	Food and Agriculture Organizations
IARCs	International Agricultural Research Centres
IBSCRAM	International Board for Soil Research Management
IBSNAT	International Benchmark Soils Network for Agrotechnology Transfer
ICOMs	International Soil Classification Committees
LDC	Lesser Developed Country
NSSL	National Soil Survey Laboratory
OICD	Office of International Cooperation and Development
PASA	Participating Agency Service Agreement
PID	Project Identification Paper
PP	Project Paper
SACCAR	Southern Africa Centre for Cooperation in Agricultural Research
SCS	Soil Conservation Service
SMSS	Soil Management Support Service
S&T/AGR/RNR	Renewable Natural Resources Division, Office of Agriculture, Bureau of Science and Technology
TSMS	Technology of Soil Moisture Management (PASA with ARS)
USDA	U.S. Department of Agriculture
WBSP	World Benchmark Soil Project

* Refer also to listing of SMSS collaborators on page 14

I. PURPOSE AND METHODOLOGY

Issues

The purpose of this effectiveness-oriented external evaluation is to review progress to date in achieving the established program objectives, assess how the several program activity components have or are contributing to achieving the overall goal and, in particular, reassess the activities related to the potential role of SOIL TAXONOMY (ST) in agrotechnology transfer.

During the preparatory phase of this evaluation, the Renewable Natural Resources Division, Office of Agriculture, Bureau of Science and Technology, of the Agency for International Development (AID/S&T/AGR/RNR), in close collaboration with the Soil Conservation Service (SCS) of the United States Department of Agriculture, developed a set of issues which were intended to focus the evaluation exercise on the actual/potential impact of project activities and the effectiveness of the approaches being made. At the same time they would help provide the framework for an assessment of the current relevance of the major program objectives. These issues and the evaluation team's scope of work are included as Appendix No. 1. On the basis of its review, the External Evaluation Team (EET) is to prepare a report which includes appropriate recommendations.

EXPECTATIONS

The evaluation is timely in that Phase II of the SMSS project will end on September 30, 1987, and a proposal for funding Phase III will shortly be finalized. The review exercise itself and the team report are expected to assist S&T/AGR in determining actions which can increase the developmental impact of the services provided and develop a stronger and more coordinated systems approach to agrotechnology transfer. More precisely, the evaluation exercise will provide the occasion for reviewing progress to date and providing analyses and technical inputs to assist AID in:

- o assessing the continuing validity of the project approach;
- o recommending any needed or desirable changes in program direction, emphasis and/or; style; and
- o determining future funding levels.

Methodology

The evaluation exercise began with the preparation of a scope of work for the EET, of which the most important component was refinement of the selected evaluation issues. Shortly thereafter, a questionnaire was prepared and sent to 16 USAID missions and a representative sample of

international and national institutions. Questions were designed to obtain end-user statements on SSMS services and products and a very good response was achieved. A summary and analysis of these replies, prepared by SSMS, is attached as Appendix No. 2. Comments from international agriculture research leaders are also attached as Appendix No. 5. Finally, to complete the preparatory phase, relevant documentation was assembled and, at the request of the Team Leader, SSMS prepared a written response to each issue as part of the documentation presented to the team. At this point, the methodology involved (1) defining the important issues and (2) collecting relevant data and documentation.

The next stage involved a (3) dialogue between the interested parties and (4) the development of a team synthesis and consensus. The program to accomplish this is attached as Appendix No. 3. The drafting and clearance of the report itself by the team members is an important part of the methodology which often results in further clarifications, definitions and more specific recommendations. Finally, the process is concluded by (5) an internal agency review of the report and, particularly, the recommendations included in a Project Evaluation Summary (PES).

II. PROJECT BACKGROUND

PASA

The SMSS project was initiated October 1, 1979 with a Participating Agency Service Agreement (PASA) with the Office of International Cooperation and Development (OICD) of USDA, utilizing the SCS as the implementor, to create a mechanism for providing support services to on-going AID country projects and to strengthen less developed countries (LDCs) institutions dealing with soil survey, soil classification, and use and management of soils. OICD handles the managerial aspects of the program while SCS handles its technical side. Since its inception, a wide range of services has been provided on a world-wide basis. Phase I - October 1979 to August 1982, was funded for $2,127,000. Phase II - September 1982 - September 1987, is provided with $5,250,000 in additional funding for a total of $7,377,000.

AID Strategy

SMSS did not just "happen"; it was carefully designed to respond to a felt need and the general technical assistance strategy of AID. In the early 1970's, the predecessor of S&T/AGR/RNR provided 211(d) institutional grants support to several land grant universities to develop their expertise in tropical agriculture. This culminated in the creation of a Consortium of the Soils of the Tropics (CST) who pooled their resources and talents to increase the productivity of tropical agriculture. In 1974/75, the Benchmark Soil Project (BSP) implemented by the Universities of Puerto Rico and Hawaii, became operational. This was occasioned by the publication by USDA of the Soil Taxomony (ST), the U.S. System of soil

classification, although it had been in wide unofficial circulation by 1970. The principal objective or purpose of BSP was to test the hypothesis that the soil family category of Soil Taxonomy contained sufficient information to serve as a basis for agrotechnology transfer.

Because of these efforts and on its own merits, soil taxonomy was being used increasingly in many countries. The FAO-UNESCO legend of the soil map of the world, which is based on Soil Taxomony, enhanced the use of this system. In addition, most countries were using the standards of the SCS in their normal soil survey work; the SCS Soil Survey Manual is the basic guideline for soils activities in many parts of the world.

Justification

The international use of Soil Taxonomy and SCS methods of soil survey and soil characterization was not without problems. Constraints of the less developed countries (LDCs) include lack of laboratory facilities, paucity of trained personnel and absence of a viable mechanism to receive on-site assistance. Initially, Soil Taxonomy was used as a cookbook. Also, soils were being misclassified because the correct analytical techniques were not available or not being used and 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 that Soil Taxonomy is a system to make and interpret soil surveys. Properly used, the system could serve as a quality control mechanism for soil survey programs and, more importantly, as a tool for agrotechnology transfer which would minimize trial and error experimentation and accelerate agricultural development in the tropical and sub-tropical areas of the developing world. The need for a program to strengthen institutions in the LDCs which were dealing with soil survey and classification and the need to provide support services to AID country projects became increasingly apparent and provided the justification for the SSMS project.

S&W Project Portfolio

The SMSS project is one of a group of S&T/AGR projects concerning soil and water management. They include:

- The International Benchmark Sites Network for Agrotechnology Transfer, (IBSNAT). This Project, implemented through a contact with the University of Hawaii, involves the development, testing and validation of crop models to predict yield and simulate the effect of alternate management practices to control outcomes. It involves transfer by simulation rather than by analogy as is the case of the Benchmark Soil Project;

o The TropSoils CRSP. This collaborative research support program is primarily directed towards the development of improved management practices to overcome key soil constraints in selected agro-ecological zones. It involves North Carolina State University as the management entity plus Cornell University, Texas A&M University and the University of Hawaii.

o The project on Technology of Soil Moisture Management (TSMM). This involves a PASA with the Agricultural Research Service (ARS) of USDA on soil and water research for dryland agriculture, particularly in Sub-Sahara Africa;

o Water Management Synthesis II. The WMS involves the Consortium of International Development (CID), Cornell University and the Universities of Colorado and Utah State in a systems approach to water management on the farm;

o The Plant Tissue Culture (PTC) project with Colorado State University concerns the use of biotechnology to breed stress-resistant plants which are adaptable to tropical and sub-tropical soils and their ecological conditions; and

o The Biological Nitrogen Fixation (BNF) Project, also implemented through a contract with the University of Hawaii, which is designed to increase the efficiency of nitrogen fixing microorganisms adapted to LDC conditions through biotechnology methods.

o The International Fertilizer Development Center, located in Mussel Shoals, Alabama, is concerned, among other things, with developing new fertilizer products within the soil-water-crop complex, the development of indigenous capabilities and the use of local resources (e.g., rock phosphate).

o The International Board for Soil Research and Management (IBSCRAM) is a new organization, located in Thailand, which is attempting to organize various LDCs to focus on selected soil management problems through a networking process. For example, a sub-network could concentrate on acid soils, land clearing, etc. AID/S&T provides partial support along with other donors.

III. ASSESSMENT OF PERFORMANCE

A. Major Program Objectives

The "objectives" of the SMSS project were spelled out during the process of extension to Phase II in 1982 as follows:

1. Technical assistance. Provide technical assistance personnel to AID and LDCs to assist national staffs in problem identification, evaluation of opportunities, and development of new programs in the subject area of soil survey, land use, land use planning, soil conservation, and soil fertility and management.

2. Technology transfer.

a) Improve the U.S. system of soil classification, Soil Taxonomy, to make it more applicable and acceptable to tropical and subtropical countries, especially in soil management and soil fertility, thus enhancing its value as a vehicle for effective agrotechnology transference.

b) Encourage and motivate the use of Soil Taxonomy in the LDCs and provide assistance for its greater use in national or regional soil survey programs.

c) Assist in the development of methodologies for the fertility evaluation of the soils of the tropics, integrate soil fertility evaluation and soil classification for better management, improve the interpretations of soil surveys, and inform LDC scientists on recent innovations in soil management techniques.

d) Increase the network and linkages already established by SMSS for a more efficient utilization of information for technology transfer. More specifically, provide the linkages for AID's cluster of soil based research projects.

B. Scope of Work

To achieve these objectives, the PASA requires that the following work will be performed by the SCS:

1. Technical assistance. This will be provided on request up to six weeks on a TDY basis for a total of 24 person months for the first and second project years and 36 person months for the remaining three years. The tasks to be undertaken under this project include the following:

- o Provide professional expertise to AID in formulating appropriate broad policies and programs relating to problems in land use, and land use planning for food production in the LDCs.

o Give professional technical assistance to countries on matters concerning soil surveys, soil conservation and soil management.

o Participate in reviews or evaluations of proposed or ongoing projects in soil survey, soil conservation, and soil management.

o Organize workshops, seminars, and training programs in LDCs to meet program needs.

o Prepare publications on selected aspects of soil management as they affect land use and land use planning in LDCs.

o Help create soil fertility awareness, soil testing laboratories, soil fertility interpretation and farmer oriented extension services.

o Help develop training packages by involving LDC personnel.

o Provide specific analytical and/or field testing services to the field.

o Prepare publications on selected aspects of soil management as they affect land use and land use planning in LDCs.

o 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 the technology transfer program.

2. Soil Taxonomy Improvement. The SCS will maintain an International Soil Classification and Correlation Staff at Washington, D.C. which will work closely with the U.S. Director, Soil Survey Classification and Correlation Division in coordinating revisions to the Soil Taxonomy to make it more applicable and acceptable to tropical and sub-tropical countries. Specific functions include:

o Review proposals for updating the Soil Taxonomy.

o Originate and develop changes in the Soil Taxonomy for use outside the United States.

o Establish and give guidance to international committees dealing with certain facets of the Soil Taxonomy.

o Provide limited on-site assistance in the LDCs for the use of the Soil Taxonomy. Provide technical support in soil classification to scientists who are involved in the soil survey projects.

o Organize and coordinate international workshops for improving the Soil Taxonomy. (three workshops to be organized during the five year life of project).

o Publish newsletters to inform committee members and others of any activity for improving the Soil Taxonomy.

o Maintain a comprehensive file of proposals for updating the Soil Taxonomy and supporting documentation.

o In addition, the SCS will keep a Research Soil Scientist at the National Soil Survey Laboratory (SCS), Lincoln, Nebraska. The soil scientist will work closely with the International Soil Correlation 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 characterization of soils in inter-tropical areas. Its functions will include:

o Verify analytical procedures and analytical results established by cooperating laboratories for use in soil classification.

o Develop methods needed for characterizing soils in intertropical areas.

o Perform analyses needed to define new taxa if sophisticated laboratory facilities are not available in the countries where these soils occur.

o Help standardize analytical laboratories in about six tropical nations (2 each in Africa, Asia and Latin America).

o Maintain a data bank of representative samples of taxa from intertropical areas.

C. Major Activity Components

The project design, as reflected in project documentation and reports, is more activity than output oriented, so in attempting to assess performance to date in achieving project objectives, it will be useful first to review progress under each major project activity category. Detailed information on each component is included in (i) the annual reports, (ii) progress reports and (iii) background documentation provided for this evaluation, some of which in included in the appendices. Only a highly summarized version pertinent to the assessment in included herein.

1. International Soil Classification Committees (ICOMs) and Workshops

As Soil Taxonomy was developed for the U.S. temperate zone, refining it for the intertropical areas was an early activity of SMSS. Through suggestions form the international scientific community, areas of weaknesses are identified and ICOMs are formed under the chairmanship of leading international soil scientists. When the ICOMs have reached a certain stage in their discussions, a workshop is organized by SMSS to allow the members to discuss the issues. Without these workshops, SCS scientists would not be able to participate effectively in the process and soil taxonomy would soon devolve into just another national system. Participation of LDC soil scientists is also made possible and their knowledge of the use and management of tropical soils is a valuable input in and lends credibility to the efforts to refine Soil Taxonomy.

Preparation for the workshops commence a year or two in advance. During the first visit to the host country, initial plans are discussed, the field sites to be visited during the workshops are determined, and arrangements are made to sample the sites. In brief, the purpose of the workshop is to provide a forum for the ICOM members to meet, and discuss and resolve the taxonomic issues which may be involved.

Over the past six years, eight international committees were created as follows:

Name	Chairman	Date Created
o Low Activity Clay (ICOMLAC)	F. Moormann, Netherlands	1976
o Oxisols (ICOMOX)	S. Buol, South Carolina	1978
o Andisols (ICOMAND)	M. Leamy, New Zealand	1978
o Moisture Regimes (ICOMMORT)	A. VanWambeke, New York	1978
o Aridisols (ICOMID)	A. Osman, Syria	1978
o Vertisols (ICOMERT)	J. Comerma, Venezuela	1979
o Spodosols (ICOMOD)	R. Rourke, Maine	1982
o Wet Soils (ICOMAQ)	J. Bouma, Netherlands	1982

The work of these committees is time consuming as much of it is done through correspondence and involves considerable collation of information and preliminary testing of ideas. In addition, each proposal must be tested to evaluate its repercussions in other parts of the Soil Taxonomy. When each ICOM submits its report, it is evaluated by the National Soil Taxonomy Policy Committee and then distributed nationally and worldwide for international testing after which it is officially accepted, revised or rejected by SCS. This whole process can take 4 - 10 years or even longer. The current status of these committees is:

ICOMLAC -completed its task and proposals have been accepted after field testing by SCS. Final amendment in process. Its 13 Circular Letters and other selected papers have been published as SMSS Technical Mongraph No. 8.

ICOMMORT -report submitted and accepted by SCS but not yet tested or adopted. The Chairman developed a data base of the soil moisture regimes of the intertropical countries (SMSS Technical Monographs Nos. 2,3 and 9) to supplement committee work.

ICOMERT -completed its task and report being prepared for testing.

ICOMOX -expected to submit proposals by end of 1986.

ICOMAND -expected to submit proposals by end of 1987.

ICOMID -proposals expected in 1988

ICOMAX -proposals expected in 1988

ICOMOD -proposals expected in 1988

The first international soil classification workshop was held in June 1977 in Brazil to provide ICOMLAC members with the opportunity for personal interaction and studying key examples of the soils under scrutiny in the field. It was carried out by the University of Puerto Rico (UPR), under a grant provided by AID, with SNLCS and EMBRAPA. An outstanding success, it stimulated the establishment of new ICOMs which in turn led to further workshops:

Brazil	-1977
Malaysia/Thailand	-1978
Syria/Lebanon	-1980
Rwanda	-1981
Sudan	-1982
Chile/Equador	-1984
Phillipines	-1984
Brazil	-1986

Workshops are planned for 1986 in Brazil (Oxisol) and for 1987 in Japan (Andisol-Aquic Moisture Regime). The first three workshops were largely financed through separate AID grants to UPR but beginning with the Rwanda workshop, the SMSS provided most the funds, in part through contracts to UPR which continued to be centrally involved in the planning and organization. It is certainly worth noting that the experience gained in the initial workshops and the realization of the scope and magnitude of the required effort played an instrumental role in the establishment of SMSS.

There is no doubt that the ICOMs have played a critical role in extending the usefulness and acceptability of the Soil Taxonomy as a worldwide classification system, in fact they are the sine qua non. Their objectives have been clear and they have provided, or are providing, information needed to revise and complete the Soil Taxonomy so it can be used to classify any soil in the world. It has been a very cost-effective mechanism, relying heavily on volunteered time and supplemented by the workshops which have improved in efficacy over time, i.e., they now minimize "pomp and circumstances" and are strictly working groups, i.e.,

specific in scope and output-oriented. This was a logical and timely change in focus as the need to demonstrate the intent and willingness of SCS to "internationalize" Soil Taxonomy decreased and the increasing involvement of international and Third World scientists became apparent. The linkages established through the ICOMs have increased the status of Soil Taxonomy and greatly assisted in its adoption by many other countries.

Criticism of ICOMs is mostly confined to the amount of time it has taken for them to complete their work as well as the time it has taken SCS to revise and amend "Soil Taxonomy" to include the results of their work. Indeed, there has been considerable slippage in the original target dates for completion so this criticism is understandable but, in the opinion of the team, it is generally unfair. Soil Taxonomy, to be effective , must have stability and any revision has to thoroughly tested internationally before it is adopted. Such evaluation is a time consuming and participative process. Also, it must be remembered that the members of ICOMs are volunteers who participate in the studies for "the good of the order" and are not paid for these efforts. Therefore, the amount of pressure which can be exerted by the Chairman and the SCS is limited.

2. Technical Assistance

Since its inception until the latest Annual Report, SMSS has served 50 countries with approximately 2539 person-days involving 199 advisors.* During fiscal year 1985, SMSS responded to requests from 16 countries which involved 406 person-days of temporary duty assignments (TDYs) and 41 advisors. The number of technical assistance requests, in the opinion of SMSS, is small because they originated from the developing countries themselves and were not generated by SMSS which has the capacity to handle more requests. The problem is exacerbated by the fact that many USAID Missions are still not aware of the service available and "creating this awareness" continues to be an important activity.

Nevertheless, soil scientists traveling for SMSS soil sampling purposes are becoming increasingly involved in technical assistance and also with on-site training. The general areas of technical assistance in FY 1985 have included:

- o reviewing on-going projects (Indonesia);
- o technical back-stopping of on-going projects (Jamaica, Peru);
- o providing technical information and assisting national institutions with program development (Thailand);
- o providing consultant services to national institutions (Taiwan); and

*Annual Report, SMSS, 1 October 1984-30 September 1985

o providing consultant services to AID/Washington (Fragile Lands Initiative).*

Thirteen of 16 U.S. Missions responded to the questionnaire dispatched during the preparatory stage of this evaluation exercise. General satisfaction was expressed to the TDY's requested by Missions and country institutions. SMSS received high ratings on the quality of TDY personnel and, with only one exception, outstanding in working with local counterparts. Some misgivings were expressed concerning response time which, according to SMSS, averages about five weeks.

The SMSS project leader, who has had the opportunity to consult with every mission, has come to the following conclusions regarding technical assistance demand:

a) Most USAID missions are ill-informed about SMSS, the activities it undertakes and services it can supply.

b) Administrative difficulties also are an impediment. Most country projects are subcontracted, and contractors are not eager to request assistance. Missions do not have the flexibility for "buy-ins" unless this is built into their projects; consequently, even if there is a desire, there are serious problems.

c) Missions are over-worked and understaffed and are generally not excited to see centrally-funded staff (i.e., the carpet-bagger syndrome).

d) Missions like to be informed about but are generally not involved in centrally-funded activities. They are also concerned that such activities be coordinated to reduce "project fatigue" of local staff. AID/W has not been successful in effectively accomplishing this to date but the concept of a soils and water umbrella project is being developed partially in response to this problem.

e) SMSS is a new concept to most Missions and, in the beginning, it was difficult for them to accept that services were available at no cost.

The performance of SMSS in technical assistance, including the support and backstopping provided by the SCS and AID/S&T/AGR, appears to be more than adequate in terms of responding to demand. In the past, the main problems affecting demand have been (i) in generating an "awareness," i.e., demand, on the part of missions and LDCs for the type of services which can be supplied, (ii) coordination with other soil and water activities and (iii) timely and effective involvement of SMSS at the planning and implementation stages of bilateral country projects. These problems are likely to continue in the near future and may be further complicated by the need to restructure demand in the light of new priorities, e.g., the utilization of Soil Taxonomy in soil survey interpretation, etc.

*Ibid, refer for detail.

3. Training and Problem-Oriented Workshops

Assessments of less developed countries have repeatedly drawn attention to the lack of personnel at all technical levels, not only for making and interpreting soil resource inventories but also for supporting production-oriented research. The training of key personnel from LDCs to provide competent technical support for research and development and production activities in their respective home countries is a priority function of Soil Management Support Services (SMSS). Their training programs are designed to create a multiplier effect, with personnel trained by SMSS in turn conducting their own training courses within their own countries. Another function of SMSS with respect to training is to produce training packages and assist whenever possible these secondary training activities.

The purpose of the International Training Forums 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.

Although the focus in forums is on Soil Taxonomy, attention is paid to other aspects of soil science and related sciences, and particular attention is given to management of crops important for the region or country. An example of the major emphases involved, in addition to the training on Soil Taxonomy, is the Training Forums held in the Pacific Region:

Country	Year	Major Emphasis
Fiji	1980	Soil Taxonomy
Papua New Guinea	1982	Soil Survey Interpretation
Guam	1984	Soil Survey
W. Samoa	1986	Soil Fertility

The major objectives pursued in the Training Forums thus far have been:

- To have land-use planners and other users of soil resource inventories become aware of how Soil Taxonomy can be used for agricultural development through agrotechnology transfer.

- To enable soil scientists to become proficient in the use of Soil Taxonomy for making and interpreting soil resource inventories.

- To inform persons in agricultural research about soil survey, soil classification, and the kinds of information that could be derived from soil resource inventories.

- To enhance the quality of teaching soil science in agricultural universities and to enable all workers in soils to exchange information and experience.

o To understand basic literature pertaining to soil properties in terms of an internationally known classification system.

o To be effectively involved in soil surveys and to be able to use soil survey information.

o To actively participate in the transfer of agrotechnology both internationally and within the country.

o To broaden the perspectives and development of an exchange of technologies transferred back to the United States and also providing a pool of resource persons knowledgeable to international conditions and agricultural practices and soil resources to assist developing countries.

SMSS organizes these Training Forums but their success is largely due to the efforts of the host institutions and other cooperating national, regional, and international organizations. Many of the collaborators have provided financial support to the Training Forums. In fact, the travel and per diem of all participants has come from non-SMSS funds.

In addition to the teaching and training aspects of the Training Forums, audiovisual materials are prepared for the training activities. A 16 mm movie entitled, "Soil Taxonomy: A Technical Language of Soil Science" was filmed in Puerto Rico and New York and a slide set and cassette tape has been prepared on the same subject. Another major benefit of the Training Forums is the published proceedings containing all the papers presented and the data and descriptions of the soils sampled. The soils data is the basis for the World Benchmark Soils Project (WBSP) of SMSS.

By the end of FY 1986 about 600 international participants will have attended the Training Forums representing about 80 countries. Some countries will have been represented more than one time. The Forums thus far organized or planned for the near future are:

No.	Year	Country
I	1980	Fiji; S. Pacific
II	1981	Morocco; N. Africa
III	1982	Cameroon; W. Africa
IV	1983	Thailand; S.E. Asia
V	1983	Papua New Guinea; S. Pacific
VI	1983	Costa Rica; C. America
VII	1984	Phillipines; S.E. Asia
VIII	1984	Jordan; Middle East
IX	1984	Guam; S. Pacific
X	1985	Rwanda/Burundi; C. Africa
XI	1985	Zambia; Southern Africa
XII	1985	Pakistan; Asia
XIII	1985	Tunisia; N. Africa
XIV	1986	Phillipines; Association of South-East Asian Nations (ASEAN)
XV	1986	Western Samoa; S. Pacific

Collaborators on these forums have been:

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, University of Hawaii and University of Puerto Rico USAID/Rabat
III.	Institute National Recherche Agronomique, Cameroon Benchmark Soils Project, University of Hawaii and University of Puerto Rico FAO, Cameroon ORSTOM, France USAID/Yaounde
IV.	Department of Land Development, Thailand IBSNAT, University of Hawaii and University of Puerto Rico FAO, Rome Rubber Research Institute of Malaysia Other Thai Organizations USAID/Bangkok
V.	Department of Primary Industries, PNG IBSNAT, University of Hawaii and University of 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, Columbia Kellogg Foundation, USA University of Costa Rica ROCAP/San Jose
VII.	PCARRD, Phillipines IRRI, Phillipines USAID/Manila

VIII.	Department of Agriculture, Jordan ASCAD, 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
X.	Carte Pedologic Rwanda Ministry of Agriculture, Rwanda Ministry of Agriculture, Burundi Universiti Burundi BADC, Belgium USAID/Kigali USAID/Bujumbura
XI.	Department of Agriculture, Zambia University of Zambia NORAD, Norway BADC, Belgium USAID/Lusaka Soil Survey of Pakistan National Agriculture Research Center, Pakistan FAO/Rome Fauji Fertilizer Company, Pakistan National Fertilizer Corporation, Pakistan USAID/Islamabad
XIII.	Department of Agriculture, Tunisia ACSAD, Syria University of Ghent, Belgium ORSTOM, France USAID/Tunis Near East Bureau, AID/W
XIV.	Ministry of Agriculture and Food, Phillipines Bureau of Soils, Phillipines PCARRD, Phillipines ACIAR, Australia USAID/Manila
XV.	University of South Pacific, Western Samoa University of South Pacific, Fiji Soil Bureau, New Zealand ACIAR, Australia South Pacific Agriculture Research and Development, Western Samoa USAID/Suva

Through the 14 forums already conducted, SMSS has reached about 600 soil scientists in about 35 countries. The forums usually consist of six days of indoor technical sessions and seven days of hands-on training in the field. According to SMSS, the observed transformation is sometimes unbelievable. In the beginning, many participants are fumbling trying to grasp the new concepts but, in the last few days when they classify soils on their own, the results are very rewarding and the import of the new knowledge acquired is self-evident. There are other indicators of success, however, particularly in terms of the time devoted and cost-sharing provided by other organizations. In Zambia, as an example, cost sharing involved:

DOA Zambia	$10,000	(estimated)
NORAD	75,000	
USAID	45,000	
Belgian TZ	25,000	
Canadian TA	5,000	
IBSNAT	4,000	
SMSS	10,000*	
University of Zambia	3,000	

Soil Correlation and Management Workshops

Workshops, which are not designed primarily for training, are problem or functionally-oriented. The International Soil Classification Workshops are conducted to support the work of the ICOMs as previously reviewed. However, for the most part they have served their purpose and are being phased out. They are being replaced by (i) International Soil Correlation Meetings (ISCOM), and (ii) International Soil Management Workshops (ISMW).

Both will be "open meetings" in the sense that SMSS financial support will be minimal with most of the funding coming from USAID Missions and other sponsors. ICOMs are designed to serve the purpose of international soil correlations and as a quality control mechanism for national soil survey institutions. They enable scientists to exchange experience and observe soil management practices in other countries, particularly in the U.S. ISMWs will be designed to address special soil constraints or problems soils with the emphasis on management although they will have a small characterization and classification component.

An example of the latter was the very successful Soil Management Workshop on the "Classification Characterization and Utilization of Peat Land," held 7-18 April 1986, in Thailand and Malaysia. Organized by the Land Development Department of Thailand and the Malaysian Society of Soil

*Plus two instructors and training materials. SMSS contributions in each Forum have not exceeded this amount.

Science, the principal purpose of the workshop was to evaluate the impact of deforestation of the peatland eco-system and to assess available technologies to utilize peat lands with minimal disturbance to the fragile resource base. The program involved field trips in both Malaysia and Thailand, presentation of original papers, and a series of technical sessions. A final report, which will be published and distributed by SMSS, is under preparation.

Performance

The responses to the questionnaire on training per se were very positive. Every mission found them relevant, appreciated by the host country, and effective. Similar support from the IARCs and international organizations specializing in soil is most encouraging.

The EET concludes that, for the proportion of the budget spent on training and workshops (approximately 3 and 15 percent respectively of the five year budget for 1982-87 which totals $5,250,000), these activity components have been highly cost-effective, both in terms of the number staged and the output and quality of the workshops and forums. It is noteworthy and gratifying that host countries and other organizations contribute substantially to the cost of running the training forums. These forums also have many significant results other than training, e.g., provide additional soil data for the WBSP data bank, site characterization for IBSNAT collaboration, etc. The forums act as a catalyst to help soil scientists and their institutions become more effective. This has been accomplished by appropriate instructions and the development of a peer concept in which soil and allied scientists from national, regional and international backgrounds developed a continuing , working rapport within a collegial atmosphere. They have obviously assisted scientists to understand and utilize soil taxonomy, and this comprenension will provide a good basis for agrotechnology transfer.

4. World Benchmark Soils Project (WBSP)

The WBSP and the soil data base of SMSS are outcomes of other SMSS activities, i.e., assistance and training. The data base is a result of the soil sampling activities of SMSS in conjunction with its Soil Classification Workshops and Training Forums. For each of these activities , one or two soil scientists of the USDA-SCS describe and sample selected sites in collaboration with local soil scientists and other agronomists. The soil samples are shipped to the U.S. and are prepared and analyzed by the National Soil Survey Laboratory (NSSL) of the SCS. In some cases the samples are split and duplicate samples are sent to laboratories in the cooperating countries for inter-laboratory checks. In selecting the pedons, preference is given to sites at experimental stations. The advantage of this procedure is that all the sites are characterized by the same methodology or procedures as established by the USDA-SCS. This differentiates the SMSS data base from other world data

bases where sampling and analysis is done by different organizations. The only exceptions are the data base being developed by the International Soil Reference and Information Center (ISRIC) and by ORSTOM of France.

Objectives

The objectives of WBSP have changed with time. Initially, between 1980 and 1985, the objective was to provide information for the International Soil Classification Workshops, ICOMs, and the International Training Forums. However, with time and as the data base grew, its usefulness became more apparent, and a new set of objectives have been developed:

a) to provide a data base to test the concepts in IBSNAT's Decision Support System for Agrotechnology Transfer (DSSAT) and also to provide data for its soil-weather-crop simulation models.

b) to provide a data base on international soils and a bank of soils from foreign countries for research purposes, to test soil property interrelationships or methods of analysis.

c) to assist countries in providing soils information for their benchmark soils or soils of agricultural experiment stations.

d) to serve as a quality control mechanism for interlaboratory cross-checks and thereby aiding countries to improve the quality of their data.

A major goal of SMSS is to develop a soil-crop yield data base that will improve the understanding of soil productivity and the effects of management on soils. The data base, when used in conjunction with a geographic information system, will help improve understanding of soil conservation and the effects of soil erosion on soil productivity.

Performance

To date, the activities under the caption of WBSP (really an outdated misnomer) involved the characterization data for reference on benchmark soils throughout the world [NOTE: It began in support of the original AID-sponsored Benchmark Soils Project carried out by the Universities of Hawaii and Puerto Rico]. Many of the soils are located at agricultural experimental stations in developing countries and, in many instances provide the only complete characterization of its soils.

Although the intent is to have as many reference sites as possible characterized and documented, no special effort is made on terms of TDYs for this activity. The samples collected to date constitute the samples collected for the Training Forums and the Soil Classification Workshops. In addition, SMSS has a collaborative linkage with IBSNAT and TropSoils

projects where their experimental sites are also characterized. On a few occasions, SMSS has characterized experimental sites of USAID Mission projects.

As a result, SMSS and the SCS now have one of the most comprehensive but random collections of representative world soils which have been described and analyzed in a systematic way. Sampling has taken place in 34 countries. As of 1986, an approximate total of 3129 samples for 545 pedons had been made. The general types of available data are soil characterization morphological, climatic and crop yield data. SMSS is developing a soil interpretation record for each of the soils sampled and will add these to the horizon data for each soil.

Table 1 shows the taxonomic breakdown of the pedons that have been sampled by and for SMSS and have been classified according to the Soil Taxonomy. They have been further sub-divided by the pedons sampled by Order and the distribution of pedons sampled by countries. The analytical work has not been completed on pedons sampled in Korea (20), Indonesia (10), Taiwan (4), Japan (21), Botswana (15), Tunisia (15), and Western Samoa (14). Data are stored in the SMSS data base and can be used for general comparisons.

Uses of the Data Set

The SMSS sampling projects have been used for inter-laboratory checks and standardization; for on-site training in locating suitable sites, sampling and collecting soil morphology data; and support for the International Committees on Soil Taxonomy. The data were also used to support the Training Forums and ICOM workshops conducted by the SMSS. The data have been invaluable for testing Soil Taxonomy in the tropics and in developing the proposed Andisol Order. Much of the development and testing of the newly accepted kandic horizon and the resultant changes in the Great Groups and subgroups of the Alfisol and Ultisol orders were done using the data in the WBSP data base. Many countries submitted data for developing and testing the proposals but the WBSP data base was the only standard data set that could cover a wide range of climatic and geographic conditions.

Table 1.--Summary of Pedons in SMSS Data Base by Classes in Soil Taxonomy.

Taxonomic Level	Number Represented
Orders	10
Suborders	34
Great Groups	86 (1)
Subgroups	179 (2)
Families	280 (3)
Particle Size Family	26 (4)
Mineralogy Family	12
Temperature Regimes	8 (5)

Present uses of the data include the continued testing of Soil Taxonomy; testing ICOM proposals such as the kandic horizon and proposed changes to the Oxisol order; and the development of simulation models by IBSNAT and ARS. SMSS is also using the data base to test the Fertility Capability Classification (FCC) (Sanchez, 1982) system developed at North Carolina State University. The newly formed International Board for Soil Research and Management (IBSRAM) proposes to use the data set of WBSP-SMSS to ease the transfer of data and/or technology from one area to another.

Using samples collected and stored by SMSS, the ARS has made additional phosphorus measurements for the development of lime-phosphorus models. Work on the interrelationships between fertility analyses and standard characterization data are being conducted with the University of Nebraska and SCS-NSSL scientists. Information in the data base has also been used by personnel on international assignments arranged by the International Activities Division of the SCS.

WBSP and DSSAT

In the documentation provided the EET, it is stated that the WBSP data base is now employed by IBSNAT for the application of the Minimum Data Set on soils for the DSSAT. These data are required for estimation of soil model inputs during validation and for prediction of crop responses at sites where soil and weather data are not available and also where experiments have not been performed. Less than 25 percent of the data in the WBSP data base is currently needed by IBSNAT for estimating soil model inputs; however, it was decided that the entire pedon data base be retained in DSSAT for two reasons: (i) crop models may change through time and may include other soil factors which currently are not considered; and (ii) since current crop models do not include all soil factors that influence productivity at a site, interpretation or simulated results must be made relative to known characteristics of the soil.

In the WBSP data base, not all soil properties required by IBSNAT, particularly the temporal properties, are included. However, attempts are being made to incorporate some of the temporal attributes. In addition, information at critical depths required by the models may not be present in the data base as the soils were sampled for pedological purposes. Future sampling will provide these data once the critical depths are established. A basic component of DSSAT is expert systems. This artificial intelligence technique could be used to develop 'synthetic profiles' for critical sites where data are not readily available or urgently needed to obtain a first approximation. The data base and DSSAT users will want to examine the soil characteristics and WBSP could provide a printout of the pedon and soil data.

Location of the Data Base

The main data base is located at the NSSL in Lincoln, Nebraska, at the Nebraska State Computer Center. The data have been loaded in a Statistical Analysis System (SAS) data base (Helwig, 1978). SAS, which is

a computer system for data analysis, allows for statistical summaries of the data. Upon request the NSSL can output the data to tape in the SAS format or as a flat file.

All of the foreign data have been provided to the University of Hawaii for their work in International Benchmark Soils Network for Agrotechnology (IBSNAT). A subset of the data base is used for the International Committee on Andisols (ICOMAND) activities by New Zealand and the development of productivity models by the ARS in Temple, Texas. Printed copies of parts of the data base have been provided to the different ICOM chairmen for their work. Each Training Forum had printed copies of the data for the Field Guide and for use as training and teaching aids in Soil Taxonomy. Some of the data have been published in the proceedings of the Soil Classification Workshops and of the SMSS Training Forums. Data in printed copy form is also always supplied to the country where samples were collected. Upon specific request, data has also been supplied to universities for the use in teaching.

General Problems

The WBSP data base has complete chemical, physical, mineralogical, and morphological data. However, the data base has very limited crop yield data and virtually no climatic data excepc for moisture and temperature regimes as defined by Soil Taxonomy (Soil Survey Staff, 1975). The data base also suffers from the lack of a world-wide distribution of points sampled.

Another problem is that the data must be loaded into a readily available data base management system to make it interactively (user friendly) available to all users. At present the data base is loaded in the SAS system or as a flat file on a main frame computer. The SAS data base requires a main frame computer to operate and is not considered a data base management system. One of the objectives of the study is to download data to microcomputers. Work continues on the development of a microcomputer data base such as dbase III which has been adopted by IBSNAT (IBSNAT, 1985).

Problems with the data include improper sampling such as critical horizons not sampled, lack of clods for bulk density, and sampling depths too shallow to classify the pedon in Soil Taxonomy; incomplete morphological and site descriptions; and lack of follow-up after analytical work has been completed. Analytical problems include standardization of methods to interface the data from various countries.

A problem with any soil pedon characterization data base is that pedon data represent the point at which they were sampled. In order to extend the data geographically, the point data must be related to spatial data that represent the extent of morphologically similar and/or taxonomically similar soils. Data of this sort include digitized soil maps stored in a geographic information system (GIS). The USDA-SCS is presently testing GIS systems on mini- and microcomputer systems. It is the desire of WBSP to monitor the GIS technology. The data set of the WBSP would be included in the soil information system part of a GIS system.

Performance

SMSS-WBSP has sampled over 500 pedons in 34 countries. In the past several months, all pedons have been classified and the classifications have been entered into computer storage. These pedons represent one of the largest data sets of its kind in the world and represent a good beginning toward the establishment of a worldwide data base. SMSS is now looking at distribution patterns of soils around the world and hopes to develop projects to fill data gaps. The data base provides a core of data that can be used by the ICOMs in the development of Soil Taxonomy.

The impact of the WBSP on USAID projects has been slow but as users become aware of the available information, the use of the data base is expected to expand as is the numbers of soils represented in the data base. Information in the data base can be used to help in agrotechnology transfer and to generally improve environmental quality in developing and developed countries. The expanded use of the data set will require that the system be dynamic. Recently, requests have come to SMSS to characterize all of the USAID experimental sites in East Africa. An effort is also being made to have sites of the International Centers characterized. The sites for this conference were characterized and have been added to the data base. In 1986, soils have been sampled in Tunisia, Botswana, and Taiwan. These three projects will add about 35 more pedons to the system. Sampling has been scheduled in Zimbabwe in June of 1986. SMSS hopes to continue its Training Forums in the future and plans to hold two to three per year. Work is still needed to develop a package of information for national decision makers and also for extension workers for use at all levels of planning. SMSS and IBSNAT are working to bring data base management systems and artificial intelligence or decision support systems to developing countries. The WBSP will be an integral part of this work.

It is obvious that the SMSS has been very active and has made a significant contribution to methodology transfer as well as to the direct execution of soils sampling in many countries. However, as discussed subsequently, it may be necessary to adjust project management strategies to , inter alia, (i) stimulate and support national involvement and (ii) think through the uses, content, design, interfaces, etc., of a user-oriented soil data base. This would also involve a new look regarding the capabilities and priorities which are to be assigned to these activities considering resources and other constraints.

5. Soil Analysis and Research

While identified separately in SMSS Progress Reports, the category encompassed all the soil analyses done by the National Soil Survey Laboratories of the SCS and is an integral part of the so-called WBSP. The objectives of this work include:

a) to test methods of soil analysis suitable for soils of the tropics;

b) to develop or modify methods which utilize few chemicals and minimal equipment so that LDCs can use them;

c) to standardize laboratory techniques and provide inter-laboratory cross-checks to assist LDCs to improve the quality of their work; and

d) to characterize soils of LDCs which are used in the SMSS workshops and training courses.

There is surprisingly little direct information in the documentation made available to the EET on objectives a-c and the open discussions focused on the impact of the scientific exchanges on the NSSL and the mutual advantages that accrue because (i) people look to the U.S. as world leaders in agrotechnology, (ii) the U.S. learns from these exchanges and, hence, is able to do a better job in its domestic operations, and (iii), as the SCS incorporates improvements learned from collaborators in other countries, it has more to offer future collaborators.

Currently, about 50% of NSSL activities involve analytical services. Other activities concern scientific exchanges and technology transfer, the accumulated data base, and the accumulated soil sample bank. While the NSSL has justified a sizable input into SMSS activities, it says it has reached its maximum effort. At full strength, the NSSL has 18 soil scientists. Seven lead the analytical operations and the remainder are Research Soil Scientists.

As in assessing the performance of the WBSP, there is no doubt that the quality and quantity of the NSSL's outputs are high. The question is whether, on the basis of experience to date, technological breakthroughs, new priorities and resource constraints, the above cited objectives and levels-of-effort are adequate within the total AID-SMSS program or require adjustment in Phase III. The team was not able to arrive at definitive findings on this category separate from the WBSP.

6. Publications

This category was one of the issues included in the EET's scope of work but was not discussed extensively in the open meetings and was inadvertently omitted, from SMSS's written reply to the issues. Therefore, the team's assessment of this activity is somewhat constrained although samples were available in its meeting room. There is no information in the latest Annual Report under this heading; the latest appearing in the 1982-84 Progress Report.

The need to provide up-to-date information to soil scientists in the developing countries is well known and the SMSS has established a program of publishing and distributing technical materials, often as an output of other activities. A resume of some of the publications that have been produced includes:

Agrotechnology Transfer- Until 1985, SMSS produced a semi-technical newsletter published quarterly. At the request of S&T/RNR, it was recently combined with the IBSNAT newsletter for reasons of cost-effectiveness.

Soil Resource Inventories and Development Planning- A monograph prepared for decision-makers and scientists.

Soil Taxonomy and Technology Transfer- A monograph on the international use of Soil Taxonomy and its potential for agrotechnology.

Soil Taxonomy Keys- Expanding from the keys up to the Great Group, this field book contains all the keys up to and including the Family category.

Soil Moisture Regimes in South America- Calculates soil moisture and temperature regimes and maps their distribution. A companion monograph for Asia and Africa has been published and one for the Middle East is under preparation.

Guideline for Soil Resource Inventory Evaluation

Soil Analysis for Soil Taxonomy - Deals with the kind of analyses needed for soil classification.

Excerpts from the Circular Letters of ICOMLAC-Tech.

In addition to these technical monographs, monographs are also published on the Benchmark Soils of the World, beginning with the Yemen Arab Republic and Thailand. The proceedings of each International Training Forum are also published, usually by the host country. The proceedings of the International Soil Classification Workshops are published although all but the latest are out of print or otherwise not available.

A Bibliography of the Soils of the Tropics and on Soils Taxonomy was compiled for USAID as Technical Series Bulletin No. 17 with succeeding volumes published by SMSS and brochures are produced from time to time.

Soil Taxonomy is now used all over the world. Under agreement between the SCS and Soil Survey of India, an Indian edition has been published. Copies of an Italian edition published in Rome have been circulated in Ethiopia and Somalia and it has also been published in Great Britain. The Arab Center for studies of Arid Zones and Dry Lands (ACSAD) has published a summarized version. A Spanish version of the diagnostic horizons and Keys of Soil Taxonomy has been completed and one in French is planned.

The quality, relevance and usefulness of the publications scanned by the EET is outstanding. The ability of the SMSS to get other participants to pick up the costs of some publications is again noteworthy. The project budget 5-year total for publications and visual aids is about $160,000 or an average of $32,000 per year which does not seem excessive. However, the team notes that there has been no systematic attempt as yet to assess the usefulness of its publications by targeted end-users and believes this might be a valuable exercise as part of the plans and

proposals for Phase III, particularly in view of the likely resource constraints and other priorities. Finally, unless evidence to the contrary is presented, the EET believes that the combining of the SMSS and IBSNAT technical newsletters is resulting in a better and more meaningful publication for both parties with an expanded audience. This would seem to be increasingly so as the SMSS project becomes more concerned with the utilization of the Soil Taxonomy and, particularly, with a soil data bank management system.

IV. SELECTED ISSUES and MAJOR CONCLUSIONS

In addition to an assessment of performance to date as described just above, the EET was requested to investigate a number of issues purposefully designed to get at questions of continuing relevance, effectiveness and the actual and/or potential impact of the SMSS project. These issues are specified in Appendix No. 1. In general, the Team found these statements a useful device for developing its own consensus on major conclusions and, subsequently, preparing appropriate recommendations. In arriving at these conclusions, the views of SMSS/SCS and concerned AID officials were given careful consideration as well as the findings of previous reviews, including those conducted by the SSMS Advisory Panel. The EET recognizes that its reactions to these issues are not necessarily new or startling but believes that their timeliness may be very important in view of current budgeting problems and the preparatory work already commencing for Phase III.

A. Soil Taxonomy

1. ICOMS

The work and current status of the ICOMs has been discussed under performance. The EET agrees with SMSS's assessment that the ICOMs have been very successful and that, given the voluntary and difficult nature of their charge, the work to internationalize the Soil Taxonomy is inevitably time-consuming and long-term. SMSS reminds us that it took USDA 25 years to develop the system for the U.S.

Through the ICOMs, SMSS has reached scientists in more than 60 countries. FAO is currently updating their legend of the 1.5 million Soil Map of the World and have incorporated most of the ICOM proposals in their draft. The International Soil Science Society is working on an International Reference Base for soil classification and they have adopted the same procedure as the ICOMs. In addition, their committees are relying on the work of the ICOMs for most of their inputs. An unexpected impact, perhaps, is that as part of this collaboration, institutions around the world have worked on methodologies and testing new techniques, a good example of low-cost networking.

2. Use of Soil Taxonomy

About 40 countries use Soil Taxonomy as its national soil classification system, based on a 1983 questionnaire, with another 25 countries using it in conjunction with another system. In the recent questionnaire sent to 250 collaborators with a 60% response, about 40% indicated they used Soil Taxonomy as the national system with an equal number using it in conjunction with another system with the remaining reporting that it is being adopted. The response also indicated that most countries are using it either for national land-use planning or soil survey evaluation. Very few used it for agrotechnology transfer and no one reported its use for soil conservation. It is interesting to note the major reasons reported which impede the use of Soil Taxonomy, viz.:

- o poor laboratory support services
- o lack of trained staff
- o absence of a systematic soil survey program
- o use of other system
- o FAO system is simpler to use
- o lack of know-how in interpreting taxa for practical applications
- o restricted opportunities for discussing problems

It is obvious that more and more countries are adopting Soil Taxonomy, using it as an adjunct system, or as a standard of comparison for their own system. The only reason they are doing this is because it is able to classify the soils of the world. Without the work of the ICOMs, Soil Taxonomy would have been viewed as a "point in time" taxonomic system. The ICOMs, as supplemented by the workshops, training forums, technical assistance and publications of SMSS, have provided the essential ingredients to make the system dynamic, to correct inadequacies and provide adequate criteria for classifying soils no matter where they occur. It has become, de facto, the international soil classification system. SMSS's continuing task is to encourage countries to use the system for making and interpreting soil surveys and not merely classifying holes in the ground, a concept difficult for many to appreciate as most other systems are designed to do just that.

3. Agrotechnology Transfer

SMSS has not yet been effective in this area because, as they state, "We still lack management information for the soils of the tropics and only when we have this can we relate Soil Taxonomy to management." However, SMSS notes that their linkages with IBSNAT, TROPSOILS, IARCs and other institutions are for the purpose of developing such information and methodologies. The original BSP provided the basis for transfer by analogy and now IBSNAT is developing the methodology through DSSAT for transfer by simulation. The EET report returns to this question below.

4. Effectiveness

It is difficult to measure success and cost-effectiveness in an objective fashion but in the EET's view, this activity has been very successful. The objective, i.e., to provide a soil classification system with world-wide application, has been largely accomplished and will be substantially completed within the next few years. If as good as it is claimed, and the EET thinks it is, it will gain increasing acceptance as the "standard" method for classifying soils. Without SMSS support, Soil Taxonomy would have remained an incomplete soil classification system.

This has been accomplished at a comparative small cost and meager inputs with SMSS taking on the role of catalyst. A good success indicator is the enthusiastic support of the international community and the fact that many institutions invest time and funds to support SMSS activities. In FY 1985 alone, others contributed more than $350,000 to SMSS Training Forums. Creating an awareness and understanding of the potential use of Soil Taxonomy as a soil classification system based on objective criteria is, in the team's belief, the most important accomplishment of SMSS to date. It has played a major role in facilitating linkages between pedologists throughout the world to accomplish this which will serve it well as the project emphasis changes to utilization.

5. Synthesis

As this project approaches the end of Phase II, having been initiated in 1979, it is understandable that AID, as the funding agency, and other interested parties, are raising questions as to the specific application or use of Soil Taxonomy in increasing agricultural productivity in the tropical and sub-tropical areas of the developing world. This was a major issue in the SMSS review of November 1984, which recommended "...that the scope of work of the technology transfer component of SMSS should be broadened in a way to focus on the applications of Soil Taxonomy rather than on its inner structure." While recognizing the ST should remain the central area of interest and expertise of SMSS, the first applications to be developed, continues the review team, are the ones it has been initially created for, viz., soil survey and soil survey interpretation, and on soil fertility and water management-soil classification relationships. It has also been a basic assumption that the transfer of agrotechnology will be facilitated by such an unambiguous scheme for classifying soils.

To readers of this report, some explanation at this point may be in order. ST imposes a way of collecting data and observing soils in the field. It provides the rules by which soils are to examined and data obtained. It is the first step in the soil management process or system. Step 2 is the Soil Survey itself which is the process of representing what occurs in and on the soil landscape by means of a soils map. It is necessary for SMSS to provide training, technical assistance and information in a progressive manner. Once the Soil Survey of an area is made, the map represents the area in question. Different scale maps can be used for different purposes. Soil Survey Interpretation is Step 3 in

this progression. Use of Soil Survey Interpretations in Soil Management, in all its aspects, is Step 4 but it cannot really be accomplished until Steps 1-3 are in place and understood. The process is presented in a schematic form as Table No. 2. It is important to understand that, at present, only in those countries where steps 1-3 are accomplished facts can "soil management" or "agrotechnology transfer" occur in a routine manner. The impact of ST on increasing agricultural productivity, therefore, still lies mostly in the future. However, while the EET agrees that the results of R and D work being carried out in IBSNAT, TropSoils and similar projects will accelerate this process and permit some leap-frogging over on-site data collection and trial-and-error experimentation, for the near future, there are few if any shortcuts.

B. Soil-Crop Yield Data Base (WBSP)

One of the objectives of WBSP, a major program category or activity using an out-of-date acronym, is the support of the ICOMs and, in the process, to provide standardized descriptions and analyses of soils to enable a developing country to calibrate itself. Its ultimate objective, however, is to develop a soil-crop yield data base which will help improve the understanding of soil productivity, and the effects of soil management in the developing countries and the adverse effects of not using soil conservation practices. (See page 18 for statement of detailed objectives).

Table 2 -- The Soil Management Process

Step 1

Soil Classification-is the rule book for observing soils uniformly.

Step 2

Soil Survey-means making a map. Is often referred to as a soil resource inventory. Scale of map determines how useful it might be for various interpretations.

Step 3

Soil Survey Interpretations-means the interpretation of a soils map for a particular use, e.g. predicting soil behavior and performance. Generally a new map is expected.

Step 4

Soil Management- means use of soil survey-soil survey interpretation to improve growth and yield of crops.

Step 4a Land Use Planning-is a particular interpretation-say for growing corn, or potential for irrigation. Goal is to improve yield or reduce yield variation from year to year.

Step 4c Soil Conservation-could also be a part of 4a Can you sustain these yields or will erosion ruin land? What erosion level can you tolerate per year?

Step 4b Soil Fertility-is a part of information needed to improve crop growth. Generally a particular soil response to fertility differently than another soil. Soil Fertility is a part of crop growth where input cost is a big variable.

1. Adequacy of Traditional Soil Surveys

Soil survey information generated in LDCs is in general meager and insufficient to make most kinds of interpretations, particularly those concerning site-specific predictions of crop performance. Even in a very detailed soil survey, only a few pedons are sampled for each soil series and fewer are completely characterized. Conceptual changes are needed in the approach of LDCs to soil surveys. The problems involve a lack of facilities to generate information, absence of methodologies to translate information to user needs, and lack of trained specialists to undertake such a task. The latter two problems are addressed by current SMSS activities but methodologies are still needed to package the information for national decision makers and extension workers.

2. Use of Advanced Information Technology

Data base management systems and artificial intelligence, e.g. expert systems, are very new tools which have considerable potential. SCS and the ARS are in the forefront of using these technologies within the USDA and SMSS, in close collaboration with IBSNAT, is trying to bring them to the LDCs. For example, it has produced its first software package on classifying soils according to the ST. SMSS is currently assisting the Land Development Department of Thailand to develop a software package for land evaluation which will be used in providing technical assistance to other countries. SMSS believes that this approach is the basis for agrotechnology transfer and the direction it will be taking in the future, in addition to more conventional approaches.

3. IBSNAT-SMSS Collaboration

SMSS is committed to agrotechnology transfer and has an impressive record of activities in LDCs contributing to this end (refer to Part III for assessment of WBSP performance). The prototype network and activities of IBSNAT are most attractive to SMSS as they facilitate its own global approach. On the other hand, the data base of SCS/WBSP is essential for the model development and validation activities of IBSNAT - in other words, a symbiotic relationship exists.

Specific areas of SMSS collaboration with IBSNAT include:

o Inaugural workshop of IBSNAT, held at ICRISAT, Hyderbad, India in March 1983, was cosponsored by SSCM.

o The extensive travel of SMSS staff have provided it with the opportunity to create an awareness of IBSNAT. Formal lectures have also been given about SMSS-IBSNAT in Thailand, Pakistan, India, Rwanda, Belgium and the Phillipines.

o Assisting national and regional institutions to collaborate with IBSNAT, e.g., in Pakistan, Panama, Zambia, Burundi and Guam. In addition, SMSS has been assisting in the formation of regional networks such as OBSNAT, the Pacific region network; and ABSNAT, the ASEAN Network.

o Characterizing IBSNAT sites. SMSS does not have a systematic program for this. Sampling is done only when SMSS is in a country for other purposes. No special temporary duty assignments are made to sample specifically for non-SMSS purposes. IBSNAT sites have now been sampled from ten countries, i.e., Thailand, Zambia, Burundi, Costa Rica, Panama, Pakistan, India, Venezuela, Guam and USA (Maui). The sites at Venezuela and Thailand are analyzed with IBSNAT funds, whereas the sites at Guam and Maui are being analyzed by SCS-USDA.

o Soil moisture and temperature regimes at all identified sites have been computed, using the SCS model.

o Developing linkages with other organizations. SMSS has linkages with many regional and international organizations and many of them will be used by IBSNAT. The most recent organization is the International Board for Soil Research and Management (IBSRAM), which will be working on a network basis on specific soil-related constraints. It is expected that IBSRAM will rely very heavily on IBSNAT for the simulation models.

A crucial component of the Decision Support System for Agrotechnology Transfer (DSSAT) being developed by IBSNAT is the soil data base. A unique feature of the simulation models is that they employ minimum data sets (MDSs). WBSP monitors all relevant soil properties but not all these properties serve as parameters in the models. While WBSP provides the soil data base, IBSNAT makes a judicious selection of properties based on their relation to crop growth. Since DSSAT is still in the development stage, WBSP is currently being used to test it. The soil sampled in the WBSP collection are also used for developing or testing analytical techniques for IBSNATs crop-weather-soils simulation models.

4. WBSP Strategy

The WBSP, or soil data bank, has not been developed in accordance with a specific or comprehensive plan but has mostly grown as a by-product of sampling activities in connection with workshops and training forums. Such activities provide the host country with basic data on its benchmark soils and a special effort is made to sample sites at agricultural experimental stations. In many countries, this is the first time they have been characterized . Countries are encouraged to analyze the same soils and later a comparison is made of the data which serves as a quality control mechanism. LDC scientists are encouraged to present technical papers at international meetings on this data base.

Impact of WBSP on AID projects is developing slowly as they realize the value. Recently, REDSO East Africa requested SMSS to characterize all experimental sites of AID projects and those of the International Centers. USAID/Bujumbura utilized SMSS to map and characterize their Kajondi Farm. SMSS has in collaboration with International Rice Research Institute, characterized all their sites in the Phillipines and Pakistan. The Board of IRRI has approved the appointment of a full time soil

scientist at IRRI - perhaps a first for an International Center. ROCAP, Central America and CATIE requested SMSS to characterize all CATIE Benchmark sites and this was done over a three year period. In collaboration with TROPSOILS and IBSNAT, most of their sites have been characterized. Experimental stations in more than 30 LDCs have been sampled and agronomic data are now being reported by these countries, with identification of the soil where the experiment was conducted. The management information being obtained is very useful as it gives SMSS the information to develop the interpretations with respect to Soil Taxonomy. Finally, the biggest current users of WBSP are the ICOMs as SMSS has the basis for testing the proposals with the more than 550 pedons from all over the world plus the 15,000 from the U.S..

5. Synthesis

AID missions in developing countries frequently call for advice on crops to be grown in a given country. In the United States, the USDA does not yet have a national basis for making such assessments. It doesn't know, for example, how a particular crop will perform on a clayey, kaolinitic, isohyperthermic Tropepetic Haplorthox. While this situation will undoubtedly change in the not too distant future, and is a principal reason for the cooperation of SCS and ARS in AID-sponsored crop simulation research and development work, AID/S&T is not interested in simply a "better" soil classification system but in how it can be used to improve agricultural productivity in the Third World and solve or side-step the constraints which exist in the tropical and sub-tropical areas of the world.

As discussed in Issue A on Soil Taxonomy, there are a number of prerequisites to improving productivity through soil (and water and crop) management. The challenge is to reduce the effort, cost and time required to complete these steps, a prime objective of both the SMSS and IBSNAT, as well as all other soil and water projects in the S&T/AGR portfolio.

In the review of WBSP performance, a pattern can be easily discerned where the soil data bank was supplemental to other SMSS activities and interests and has grown until, almost unnoticed, it is becoming the "tail that wags the dog." In fact, as recent SMSS statements indicate, a major goal is now to develop a soil-crop yield data base per se but the comprehensive design of such a system is still in the study stage and a definitive strategy for its use is yet to be proposed. As the data bank grows, this becomes increasingly a gap which can cause future problems. For example, in order for the data in the SCS data base to be machine retrievable for instant analysis and use, the data must be recorded in a new format. This is particularly important for IBSNAT use. *

Such a design exercise should also take into account potential user requirements. For example, the SMSS data base would be expanded to estimate the numerical values of the parameters needed to run crop simulation models for locations for which a soil survey but no site-specific characterization data are available. Prediction models with

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* See also the problems listed on page 21

narrow margins or error that can be run with soil survey information and simulated (or observed) weather data would obviously be of great value to SMSS as they can be used to guide soil management and land use decisions.

In the design and definition of such a data base management system, other issues, some of them involving SMSS collaboration with other projects such as TropSoils and IBSNAT, can be considered. There is obviously a need to store soil surveys in geographical spatial management systems. Computer models - both simulation models and expert systems - require a minimum set of input data that include soil properties. However, many of the required set of soil properties are not determined in routine soil characterization. Some can be derived from existing data through equations developed by regression analysis. This procedure requires a large data base for a wide variety of soils. It now needs to be determined which parameters can be confidently and accurately estimated through default procedures and which have to be measured in situ. In addition, some correlations may not hold uniformly for all kinds of soil. It therefore needs to be determined how the correlations can be stratified by taxonomic classes.

Finally, it should be noted that a huge amount of potentially useful information is contained in the existing soil data base but it takes knowledge and experience to transform tabulated data into useful information. The exercise of predicting soil behavior and performance from soil data is called soil interpretation. SCS/SMSS/IBSNAT must begin to write the rules that relate soil behavior and performance to soil characterization data. The most efficient way to do this may be through "expert systems." The development of such a system for soil interpretation requires the joint efforts of soil experts who have knowledge and experience about soils and knowledge engineers who know how to condense knowledge into expert systems. This would seem to be a high priority for SMSS/IBSNAT/TropSoils collaboration.

Most LDCs now have microcomputers that will permit the use of several kinds of techniques already available on diskettes, including Soil Taxonomy, ACID-3 and Fertility Capability Classification (FCC). There is a definite need to improve methods of communication between countries in terms of analyzed soil characterization soil characteristics. Methods of analysis need to be standardized for effective agrotechnology transfer and the SMSS can and is playing a central role in this process. However, it must be realized that change takes place slowly. The transformation of the WBSP into a a user-oriented and user-friendly soil data management system, in the team's viewpoint, should be the "next" major accomplishment of SMSS.

C. Training and Workshops

The training program of SMSS, called "Forums", is designed to develop staff at LDC institutions who will, to varying degrees, initiate and provide assistance for appropriate research in the development and utilizations of agrotechnologies. Their purpose is to reach a large number of soil scientists to inform them of recent developments in soil

survey, soil classification and the use and management of soils. Workshops are, however, not designed for training but are problem or functionally oriented. International Soil Classification Workshops are conducted to support the work of ICOMs and are an integral part of the ST refining process. These two elements are an important part of the current SMSS program and will remain so in any extension to Phase III.

1. Forums

The SMSS training program has been summarized in the team assessment of performance above. It is worth repeating, however, that although the focus remains on Soil Taxonomy, increasing attention is being given to other aspects of soil and related sciences and particularly to the management of crops important for the region or country. This program has been very effective as a catalytic and supplemental effort to the achievement of SMSS objectives. However, it must be recognized that the training is mostly in the form of short-term sessions on the use of ST and is not a substitute for in-depth soil survey training. The EET suggests that the time may be ripe for AID to consider financing more practical training activities by SMSS. For example, SMSS personnel (or SMSS associated or trained personnel) could be assigned as project leaders of soil surveys of relatively small pilot areas for the purpose of training local soil surveyors in conducting a soil survey from start to finish.

The purpose of training should be a step wise progression (refer again to Table No. 2 on page 29) which starts with soil classification (Soil Taxonomy) and soil survey (resource inventory) and then progress as rapidly as possible to soil survey interpretation (predicting soil behavior and performance) at the appropriate scale, and then the preparation of single factor maps for soil management including (i) land use planning and evaluation, (ii) soil fertility and (iii) soil conservation. As previously noted, it is necessary that each stage be approached in the correct order as it is not possible to develop training courses in meaningful soil management without the requisite soil survey and soil survey interpretation.

Regional cooperation, as well as bilateral assistance to specific host countries, should be encouraged through such organizations, e.g., as the Southern African Centre for Co-operation in Agricultural Research (SACCAR) whose mandate is to promote cooperation in agricultural research among the national agricultural research systems of the nine member countries, to facilitate exchange of information among the national research systems and to appraise regional research projects. In this manner, training can reach more scientists and the peer concept is broadened to the regional level. Regional training may also be more cost-effective where individual member countries may have insufficient manpower for individual in-country forums.

Training forums are comprised of the trainee, the subject matter, the instructor and appropriate training materials and logistical support. It is apparent that cognizance have been taken of this in the past by SMSS in the preparation and implementation of forums and the amount of cost-sharing involved is particularly gratifying. However, the team believes more effort must be made to increase the coverage and participation of national and regional subject matter specialists and, eventually, to hand over a large proportion of the training component to local expertise. This is necessary to accelerate the foundation of national understanding and participation. While short-term "awareness" training certainly has its place, as demonstrated clearly in this project, no SMSS team can substitute for the national responsibility.

The trend, (e.g., peat-land workshop in Thailand and Malaysia (1986), the proposed acid soil forum to be held in the Pacific during this year, and a possible forum on vertisol soils - Southern Africa, 1987), in future forums to become more problem-oriented is strongly endorsed by the EET and should proceed with a similar orientation for the workshops.

Finally, the EET suggests that, building on the work already done, a modular package of training programs be developed based on the step wise progression outlined with flexibility for adjustments based on the normal training variables, e.g., the targeted audience, time-available, existing skill level, etc. These could be made available on a "buy-in" basis. As part of this process, a more systematic evaluation approach should be developed. This could include both (a) "reactive" evaluation by the participants during and/or at the close of a training session or forum and (b) "functional" evaluation after the fact regarding the achievement of the training objective(s) as a feedback to SMSS for improving training effectiveness.

In the team's view, the training forums have played a very significant role in alerting developing country officials and institutions, IARCs, and donors to the usefulness of Soil Taxonomy as a worldwide standard and soil classification system and as the basis for improved soil management and crop productivity. It should continue to be an important element in Phase III, with more forums on the techniques for characterizing soils and relating it to problems.

2. Workshops

The work of the ICOMs will soon be largely completed and the International Soil Classification Workshops, which were organized to provide a mechanism to discuss ICOM issues, are being phased out. For the most part, they have accomplished their purpose. Future workshops of this nature will be held if necessary, only when an ICOM is ready for a proposal or when and if a new ICOM is established. The team notes and endorses the plan to hold future workshops on soil correlation, soil survey interpretation, and soil management issues which address special soil constraints or problem soils.

D. Technical Assistance

Technical assistance to USAID country missions, Regional Bureaus, and to LDCs, is the core of SMSS activities. Currently, SMSS only responds to requests. Two important elements for attention include:

1. Adequacy of Approach

As described under "performance", the demand-orientation of this activity can result in a scattered and opportunistic approach which reduces project effectiveness and increases the problems of coordination with related field and centrally-funded projects. SMSS management describes the process like a shopkeeper waiting for customers. The demand is below SMSS's capacity and expectation, partially because AID missions (and LDC institutions): (i) resist cost-sharing (for lack of resources or flexibility); (ii) are unaware of services available; (iii) administrative problems; and /or, and most troublesome to the EET, (iv) bilateral contractors, who implement Mission-funded projects, are not aware and/or concerned about SMSS's existence and, as their contracts require them to provide their own consultants, hesitate to request assistance.

The problem of coordination of SMSS activities with other projects is related to the need for a better orchestration of its TA program. Obviously, this must be done in close collaboration with the Regional Bureaus with the goal being to focus on a fewer number of selected countries within a more comprehensive, systems approach and in support of ongoing USAID and centrally-funded projects. For example, it would seem most useful if, based on the Africa Regional Bureau Agricultural Research Plan, selected sub-Sahara countries are targeted for special consideration which, in time, is included in their CDSSs.

In a similar vein, the team wonders why SMSS, through S&T/AGR, cannot be involved more systematically as a planning resource to AID Missions, through the appropriate Regional Bureau and S&T/AGR, at an early stage so that appropriate inputs can be made at the Project Identification Document (PID) and Project Proposal (PP) steps. While SMSS must continue to be open for ad hoc and short-notice demands, it is highly desirable for technical assistance, as with SMSS's other activities, to be provided in a disciplined progression starting with soil survey and soil survey interpretation to soil management. The burden for improving the effectiveness of SMSS technical assistance must be partially assumed by the Regional Bureaus and their field missions. It is not and cannot be the sole function of SMSS or S&T/AGR.

Finally, the team wishes to note its recognition of a continuing problem in development assistance, i.e., the frequent isolation of projects, both within and among country missions, and the lack of an institutional memory caused and/or aggravated by staff turnover and shortages. This can result in a repetition of research or ineffectiveness, e.g., the ZAMARE project in Zambia has little contact with the ATIP project in Botswana though both are trying to find solutions

to similar soil and crop constraints. There is an obvious need for some kind of a planning, coordination and brokering mechanism for activities which involve significant soil and water components. The so-called "umbrella concept" for centrally funded soil and water management projects appears to be a significant step in the right direction and is supported by the EET.

2. Linkages

As noted, the project has an impressive record of linkages with international institutions. According to SMSS, such institutional linkages are vital to their worldwide program. The relationships developed have been mutually beneficial. The SMSS role has been primarily information dissemination and creating awareness. Measuring their impact on IARCs would be presumptuous as, in their own words, "...SMSS annual budget is petty cash for these centers." The only useful and objective indicator is the fact that IARCs have utilized the services of SMSS, collaborated in joint activities and assisted SMSS in carrying out its activities.

The EET concludes that the forging of linkages with IARCs with personal contact should be continued. By providing the soil input for the Agro-Ecological Zone studies in Africa, SMSS can play an essential role as the IARC's major inputs are through agro-climatologists and not soil specialists. The Team believes this approach to be of great value and SMSS can make an important contribution to the process.

SMSS should continue to cooperate with the CRSP program, viz, TROPSOILS, INTSORMIL, and BEAN/COWPEA, principally in facilitating regional and international networks.

Particularly in connection with the IARCs, SMSS should take a lead role in initiating soil data collection from their outreach programs in which germplasm is extensively tested so that information on crop/varietal performance can be matched with soil/site data. The concept of soil correlation, and IBSNAT's role, will develop as the IARCs and other organizations see the full application of DSSAT. At that point, the IARCs can be encouraged to breed germplasm for specific sites as defined in extent and importance by IBSNAT developments.

E. Strategy

The strategy, or project approach, in Phases I and II has concentrated on creating an awareness of the usefulness of Soil Taxonomy, its refinement for tropical and sub-tropical soils, and providing assistance to LDC institutions in soil classification and soil surveys. It has become increasingly evident to both the SCS and AID that Phase III will need to be based on an updated strategy with an emphasis on the utilization of ST.

1. Shift in Program Areas and Operational Mode

While recognizing the need for some changes, SMSS states, quite correctly, that in the final analysis, research by the IARCs and others must benefit the farmers and only through a knowledge of the kinds and distribution of soils can this be achieved. In many parts of the world, this is not taking place. In the view of SMSS management, their activities can only contribute to this dilemma by creating awareness and information dissemination and, consequently, the current approach and format (i.e., major activity components such as forums, workshops, publications and technical assistance) is must suitable and, in fact, the only means to achieve program activities. At the same time, SMSS recognized there are other needs which must be addressed, in collaboration with others. Accordingly, in Phase III the emphasis will be on land evaluation, soil conservation and soil fertility with current activities continued but with reduced emphasis.

The team believes that this approach, especially as related to technology transfer, is too passive. Undoubtedly, it reflect a conception of AID policy that limits the project to "non-operational" activities and a project design which is more reactive and service-oriented. To some extent, and this should be clarified soon, this condition may or may be a communication problem. Evidence to this effect is included in the draft project paper for Phase III wherein it states that the program will consider these new areas of work designed to improve the quality of soil resource inventories and their use. These are:

a) provide assistance in the development of soil resource inventories by initiation at least three prototypes which could be used as models by others;

b) developing methodologies for soil survey interpretations to assist in land use planning, evaluating soil constraints, countering soil degradation, and conserving soil resources; and

c) linking soil classification to fertility and management evaluations and thereby enhancing agrotechnology transfer.

The team applaudes this thrust but does not believe it will happen as the by-product of field mission demands for SMSS services.

2. Overcoming the Commodity Focus

The IARCs are, for the most part, interested only in commodity focused research and the recently approved long range agricultural research plan of the AID African Bureau contains a similar orientation. The fear of many is that this understandable focus sometimes undermines attention to

other critical aspects of the production process and that the use of the results of crop research becomes limited due to the lack of knowledge on soils and on the geography of the kinds of soil. Africa is a clear example where the billions of dollars poured in by donors over the last few decades has had little impact. Unlike Asia, where commodity-oriented research pays off (and hence the success and impact of IRRI, CIMMYT and ICRISAT), in Africa, where there is considerably less information on soils, the difference is obvious. A priority need in Africa is to strengthen soil survey institutions and soil and water research and, until this is done, commodity-oriented research and assistance will be less meaningful in terms of on-farm use. The EET believes that with patience and persistence, this problem will work itself out as credibility gains momentum with the use of solid ST work by SMSS and the crop modeling of IBSNAT enters the validation and demonstration phase.

3. New Elements

The External Evaluation Team is not in a position to suggest alternative priorities within any given level of resource/inputs but does wish to repeat here, in succinct form, some of the elements it believes should be included in a revised strategy for Phase III and which set the parameters for subsequent project design, work planning and resource allocation:

o SMSS should continue to facilitate the revision/amendment of the Soil Taxonomy for tropical and sub-tropical soils but, in view of the progress already made, this no longer should remain its principal focus.

o Increasing emphasis, throughout the entire SMSS program of technical assistance and technology transfer, should be given to the progressive steps in the soil management process, viz, soil classification, soil survey, soil interpretation and soil management including land use planning, soil fertility and soil conservation.

o Expedite agrotechnology transfer by facilitating an integrated systems approach.

o A comprehensive design and on-line operation, in cooperation with SCS and ARS, of a user-friendly soil-crop data base which is machine retrievable for instant analysis and use and compatible with the Data Base Management System developed by IBSNAT for DSSAT. It should also be designed, and a work plan developed, to overcome the problems already identified (see page 21) and other potential user problems, particularly those in sister soil and water management projects (i.e., S&T/AGR financial).

o The development of rules relating soil behavior and performance to soil characterization data, probably through "expert systems," i.e., develop methodologies for interpretation of soil surveys.

o expanding the training concept beyond forums to include longer-term on-the-job and demonstration training in soil surveying in pilot areas from start to finish.

o Increasing use of regional agricultural organizations and national subject matter specialists in training and related SMSS activities.

o Development of modified packages of soil training programs available on a "buy-in" basis.

o A shift to problem-oriented training forums and workshops, tied into the soil and water management network approach.

o A more active pursuit of technical assistance requests orchestrated and coordinated to accomplish project objectives, produce useful outputs and meet S&T/AGR and regional bureau program priorities, e.g., encouraging resource inventories.

o Through SMSS funded activities, regional bureau buy-ins, joint activities with other S&T projects, or other means, additional opportunities to achieve the project purpose should be sought, e.g., serving as a conduit for the soils input for the Agro-Ecological Zone studies in Africa, initiating soil data collections from the outreach programs of IARCs, preparation of an updated soil map for Africa, development of case studies on the utilization of ST in the management of a specific soil, support of regional laboratories, etc.

o In light of the above, but with due consideration to priorities, funding and similar constraints, the joint AID/SCS strategy should include a less restrictive interpretation of forbidden "operational" activities and more emphasis given to producing specific outputs which can be planned for and achieved in Phase III. Other S&T/AGR projects can serve as a model for coupling technical assistance with research and training activities,

Finally, the EET believes it would be very useful if SCS, in conjunction with the review and approval of the proposal for Phase III, prepared a five-year strategy paper, encompassing the above elements and focused on a coordinated approach of SMSS activities to catalyze and influence actions to remove or ameliorate the impediments in reaching the project's higher level goals.

F. Management

1. Cost-effectiveness

SMSS was established on the assumption that tapping into and channeling the major U.S. soil service resources would provide benefits to both the developing countries and the U.S.. Impressive data on project

activities and accomplishments are included in the SMSS progress and annual reports and in the earlier review of performance in this report. Success indicators are also prevalent such as the voluntary and unpaid contributions to the field activities and ICOMs, cost sharing and buy-ins for the workshops and forums, etc., which show that SMSS was indeed, and still is, a cost-effective mechanism to accomplish this interchange.

2. Backstopping

The AID contract (PASA) is executed with the office of International Cooperation and Development (OICD) of the USDA which is to supply logistical support and plays a coordination role in finance and administration. Set up basically to support the international activities of USDA programs, and subject to tightening U.S. procurement regulations, the OICD sometimes finds it difficult to deal with the almost routine problems inherent in an overseas technical assistance program, e.g., unexpected urgent requests, name-specific requests, lack of usual lead-time, etc. SCS and USDA personnel ceilings have prevented the employment of secretarial and other support staff which has severely constrained the activities of the Project Leader. In turn, the large amount of time he spends in travel status, necessitated among other reasons because of staffing limitations, reduce his ability to work closely with OICD on a timely basis and to establish better rapport and communication. This also has its effects on communication with AID. These problems have sometimes required S&T/AGR/RNR to create alternative or supplemental mechanisms to support SMSS and SMSS-related activities, e.g., grants to UPR for support of ICOM workshops.

Through individual contacts and two questionnaires over the past few years, USAID field missions have expressed continued general satisfaction with SMSS response to their requests (see pages 10-11 and Appendix No. 2). The problem, at least as viewed by SMSS and the AID Project Monitor, is that the demand level is lower than the supply readily available.

Given the severe limitations on the support provided to SMSS by the SCS and AID/S&T due to their own staffing and resource constraints, the EET is very impressed by the project leadership provided by Dr. Richard Arnold, the Director, Soils, of the SCS, and the Project Leader of SMSS, Dr. Hari Eswaren. The Team wishes to note specifically the accomplishments of the Project Leader and congratulate him for his motivation, enthusiasm and efficient implementation of this important project under what might be described as less than ideal conditions.

Last, but certainly not least, the contributions of the SMSS Advisory Panel must be recognized. Chaired by Dr. Armand Van Wambeke of Cornell University, it consists of eminent scientists throughout the world, Directors of three IARCs and includes AID and IBRD representation. Particularly noteworthy was a review of the SMSS project carried out by a review team headed by the Chairman in 1984. [Note: this report, and the SMSS response, is included in Appendix I of the SMSS Annual Report for 1 October 1984 to 30 September 1985]. The membership of the panel itself is an important linkage for planning and coordination of SMSS activities.

3. Systems Approach

In the explanation of Issue No. 6, it is suggested that the need for a systems or integrated approach to increased crop production is breaking down the traditional division between the SCS, ARA and CSRS, between USDA and land-grant universities, between colleges and departments within universities, and between AID contractors, (i.e., universities, non-profit organizations, private firms, and USDA agencies) and AID, and within AID itself. This is happening at the same time AID (and USDA) staff, both in the field and at headquarters, is being curtailed and resource levels reduced. The implications of this scenario are serious if no changes are made in the means and mode of management. There is no time to wait until the step progression to soil management is completed in most countries.

One approach to handling this problem, which was discussed briefly in the review, would be to develop a single project, i.e., PASA, with SCS, ARS and perhaps CSRS, on soil and water management R&D, technology transfer and technical assistance which would coordinate and consolidate the support now given to AID. Frankly, not much enthusiasm was demonstrated by the SCS officials present for this proposal, partly because of the administrative difficulties which would be encountered when several agencies are involved.

A more positive reaction was expressed on the proposal by S&T/AGR/RNR to create an "umbrella" project of all its soil and water management and related projects, about seven or eight in number. This is conceived as a mechanism, with each current project included as a sub-project, to: (i) jointly develop and implement a multi-year strategy and work plan for a coordinated and integrated approach in the field to solving or ameliorating soil and water problems which are constraining agriculture production; and (ii) as a device to reduce staffing time and costs in program management.

In the Team's view, both of the above proposals deserve further consideration by senior officials in AID and USDA. They may be justified on their own but account must also be taken that the effective coordination of field activities involves the close collaboration of field missions, including their bilateral contractors, their headquarter's backstoppers, (i.e. the regional bureaus) and S&T. Given staff shortages on the part of all participants, the urgent priorities existing in many geographic areas, and the different agendas involved, this is easier said than done.

As indicated earlier in this report, the most critical pressure point to press the coordinated and systems approach is in the planning stages of new projects or their extension/revision. The EET suggests that both AID and USDA should take this observation under careful consideration when considering this subject.

V. ASSESSMENT OF EFFECTIVENESS AND IMPACT

A. Adequacy of Project Design

1. Definition of Terms

In a technical sense, an evaluation of effectiveness involves a judgment on the successful achievement of the project objective or purpose (or progress in achieving the same) using pre-determined, end-of-project status (EOPS) indicators. A project is aimed at a higher level objective, usually called a development or program goal, and the expected, i.e., hypothesized, causal relationship between successful achievement of the project objective (effectiveness) and that goal(s) is both the justification for the project in the beginning and the basis for measuring or otherwise determining its impact at project termination or thereafter. The Team has used these definitions, as contained in the AID-developed concept of the "logical framework," to the extent feasible in making its assessments.

2. Development Goal

The higher level objective referred to above is called the development goal and is described in the current documentation in a succinct form as:

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

Since this is a centrally-funded and not a country project responding to a national plan or AID country strategy, almost any project can be justified under this very broad statement. It would also be very difficult to trace through the affect of SMSS project achievements on this macro "goal" because of the almost infinite number of other factors/variables that would be involved. Therefore, any assessment of SMSS "impact" to date, in the literal sense, must be considerably qualified, subjective and largely predictive. It is also probably not a critical issue for management concern. It would seem, particularly when preparing the proposal for Phase III, and in developing the strategy superstructure for an umbrella project of S&T/AGR soil and water management "sub-projects," more useful to substitute the land resource management program goal of S&T/AGR, or a portion thereof to which the SMSS is directly addressed. At the same time, those problems which must be solved or overcome to achieve this program goal need to be defined and the appropriate sub-components most relevant to soil management identified. These, then, would serve the basis for a fuller justification of Phase III and subsequent assessments of potential and/or actual impact.

3. Project Objective

This statement, which is meant to describe the purpose of a project and the desired change which will take place upon its successful completion, is not clear. In the log frame included in the project paper for Phase II, the purpose is described as:

To help develop the prerequisites for soil based agrotechnology transfers among tropical and sub-tropical countries. However, this reasonable statement of intent is followed by a statement of "objectives" which are not specific and are more descriptions of acceptable major activity components, followed by a scope of work which includes some illustrative tasks to be undertaken. Intended major outputs or results to be produced by project activity are missing or vague in many instances. Since the verification of outputs produced is one of the two principal criteria for assessing effectiveness (the other is EOPS indicators or the use of project outputs by the targeted beneficiaries in the intended manner), their absence makes such an assessment necessarily subjective. It also makes work planning, reporting and monitoring more difficult.

4. Need for Improvement

To some extent, these design deficiencies can be attributed to the nature of the project which, according to the Project Leader, "...was designed as a support service to soil management and not a project dealing with soil management *per se*." With the scarcity of AID personnel specializing in the methodology of project design, the confusion of levels (particularly between (i) project purpose/objective, (ii) major outputs, and (iii) the activities, tasks or work required to produce them) is becoming increasingly common in other AID projects which does have some unfortunate consequences for subsequent project management. The point which the EET wishes to stress here, however, as already discussed under "strategy" (see pages 37-40), is that Phase III, particularly as it concerns technology transfer, must become more output-oriented and the revised project design (and the PASA) should reflect this reinterpretation of "non-operational" support services, *if* project effectiveness and impact are to be increased.

B. Assessments

1. Criteria

Given the definitions of impact and effectiveness provided above, the ambiguities in the project design, the nature of "support services," and the absence of predetermined and objective indicators of impact and project success, the Team finds it difficult to distinguish between impact and effectiveness. Under these circumstances, and the limitations on the time and data available to it, the team is inclined to accept the analysis prepared by the Project Leader and included herein as Appendix No. 4. This analysis relies heavily on these factors:

o The very significant cost-sharing and, to a lesser extent, mission buy-ins which have taken place. It is estimated that over the last five years other organization have contributed more than $1,250,000 to SMSS activities which is about 25% of its total budget.

o The use and application of Soil Taxonomy is another objective indication that the SMSS project is an effective approach. Ample evidence of this increase has been provided, a significant portion of which can be reasonably assumed to have been the direct or indirect result of SMSS activities.

o The recognition of the importance of soil and site characterization in agronomic research is another criterion upon which to gauge SMSS success. Several IARCs are adding the soil dimension to their work. Pakistan and Fiji have developed the Soil Capability Assessment Network (SCAN) and the Soil Capability Evaluation Project (SCEP) respectively. The South Pacific Council, with the assistance of IBSNAT and SMSS, is developing a regional network and the Association of South East Nations is working on a similar network. Other examples are also provided. In all cases, the standard reference procedure for laboratory charaterization procedures is now that of the SCS.

o The quantity and type of technical assistance supplied and the results of its use is another factor to be considered in assessing impact and effectiveness. SMSS reports contain many examples. Perhaps one of the more dramatic concerns an SMSS program appraisal mission to Indonesia which resulted in a $40 million project with major funding from the World Bank and USAID with the soil survey and conservation work sub-contracted to SCS.

o Of major importance is the impact of SMSS activities within the U.S. and particularly the SCS. Its chief, Mr. Wilson Scaling, states

> We benefit too, because our people can learn from the experience and improve their technical knowledge and professional capabilities. They can apply that new understanding to problems here at home.

The implications of SMSS activities on the domestic scene are perhaps most evident in the SMSS-IBSNAT collaborations, particularly in the development of DSSAT and its supporting data base management system.

2. Overall

In the team's view, it is both premature and perhaps presumptuous to attempt to trace and measure the effect or impact of SMSS accomplishments on increasing food production in the developing world. A more defensible assessment of project effectiveness, while still somewhat subjective, can be made if the project objective or purpose is as stated just above, i.e., helping LDCs to establish the "prerequisites" for soil base agrotechnology development and transfer. In this context, the team assesses the SMSS project as very cost-effective and the problems it addresses remain highly important and significant. The development hypothesis, while requiring some refinement and definition, remains valid and the basis for continuation into Phase III. The project approach, however, requires some adjustment based on experience and progress to date and the need to facilitate a systems approach to soil interpretation and management for increasing food production in the least developed countries.

3. Program Objectives

The major program objectives included in the teams terms-of-reference are impossible to assess objectively as they are neither finite or time-oriented, i.e., they are open statements (e.g., provide, improve, develop) with the exception of refining the Soil Taxonomy for intertropical areas. As reviewed under "performance," this has largely been accomplished.

A somewhat different set of program objectives were included in AID's project documentation for Phase II and are shown on page 5 of this report. They are divided into two categories, i.e., technical assistance and technology transfer. While a bit more specific, they are still somewhat vague in what the SMSS project is actually expected to achieve or support and SMSS reporting is activity rather than objective or output-oriented. As discussed under "performance", progress has been very satisfactory in technical assistance and, under technology transfer, in refining soil taxonomy and creating an awareness of its potential use. Much remains to be accomplished, however, in the development of methodologies for soil management and SMSS's part in this.

VI. SUMMARY OF MAJOR CONCLUSIONS AND RECOMMENDATIONS

A. Technical Assistance

SMSS performance, including the support and backstopping provided by SCS and S&T/AGR, appears to be more than adequate both in terms of quality and response time and in meeting past and current demands for technical assistance. USAID field missions have expressed general satisfaction. The less than expected level of the demand and its ad hoc nature, however, are problems of some concern to the EET, along with those identified by SMSS, i.e., coordination with other soil and water activities and timely and effective involvement in the planning and implementation stages of related bilateral country projects. These problems are likely to continue and be further complicated by the need, in the team's view, to influence and restructure the demand for technical assistance in the light of new priorities as SMSS moves into the utilization of Soil Taxonomy in soil survey interpretation, etc., i.e., Phase III. The project has an impressive record of linkages with international institutions which should be continued. The EET recognizes the problems encountered by the commodity orientation of most IARCs but notes their increasing use of SMSS services.

Recommendation No. 1

SCS/SMSS and S&T/AGR, in collaboration with the Regional Bureaus, USAID field missions, and principal soil and water management contractors and other USDA organizations, should initiate a series of actions designed to influence and restructure the demand for technical assistance to make it more complementary to the utilization of soil taxonomy and agrotechnology transfer (Phase III) and increase project effectiveness and impact. These actions could include:

a) Develop a "buy-in" mechanism which facilitates longer range and multiple service involvement of SMSS with USAID missions, possibly on a cost-sharing basis.

b) Schedule annual regional field meetings with SMSS, S&T/AGR, the concerned regional bureau and USAID missions, to discuss, inter alia, soil and water planning, coordination and backstopping needs.

c) Simultaneously, and in preparation for such meetings, S&T/AGR should conduct an annual review of its soil and water management strategy (See Recommendations Nos. 10 and 11).

d) On the basis of the above actions, involve SMSS (through S&T/AGR) and the appropriate regional bureau) at the earliest possible stage so that it may make inputs in the preparation and review of PIDs and PPs.

e) While the SMSS must remain ready and able to reply to ad hoc and unexpected demands for technical assistance, it would be highly desirable if such activities could be provided in a disciplined progression, already initiated in soil classification and proceeding increasingly through soil survey and soil survey interpretation to soil management and in fewer but specifically targeted countries, regions and/or agro-ecological zones (e.g. preparing soil maps for those countries identified in the Africa Bureau Agricultural Research Plan).

f) Active participation of SMSS in any mechanisms established under the S&T/AGR "umbrella project" concept for the planning, coordination and implementation of an integrated systems approach to soil and water management.

g) Providing the soils input for the Agro-ecological Zone studies in Africa.

h) Initiating soil data collection from the IARC's outreach programs.

i) Continuing close collaboration with IBSNAT, TropSoils, TSMM, the IARCs, and similar organizations which remains a sine qua non.

B. Technology Transfer

Soil Taxonomy

The ICOMs have played a critical role in extending the usefulness and acceptability of the Soil Taxonomy as a world wide classification system. Largely voluntary, by necessity, its work requires time-consuming review and thorough testing. The workshops have been an integral and important part of the process and highly cost-effective.

Data was presented which clearly indicates that more and more countries are adopting ST, using it as an adjunct system or as a standard for comparison with their own systems. Without the work of the ICOMs, ST would have been viewed as a "point in time" taxonomic system rather than the de facto international and dynamic system it is rapidly becoming. Notwithstanding this success, there is a continuing need to encourage countries to use the system for making and interpreting soil surveys. SMSS has not yet been effective in facilitating the use of ST for agrotechnology transfer as they still lack the management information for the soils of the tropics needed to relate ST to management. The original objective, i.e., to provide a soil classification system with world-wide application, has been largely accomplished. Creating an awareness and understanding of the potential use of ST as a soil classification system based on objective criteria is the most outstanding accomplishment of SMSS to date.

There is a consensus that in Phase III, SMSS's scope of work must be expanded under technology transfer to focus on the applications of ST rather than its further refinement. The EET endorses this new program thrust, as already implied above concerning technical assistance, but recognizing that, in country application, such a strategy must be based on the progressive steps involved in the soil management process or system, viz: (i) soil classification; (ii) soil survey; (iii) soil survey interpretations; and (iv) soil management which includes (a) land use planning, (b) soil fertility and (c) soil conservation. For the foreseeable future, only in those countries where steps i-iii are accomplished facts can "soil management" or "agrotechnology transfer" occur in a routine manner. Therefore, the impact of ST on increasing agricultural productivity still lies mostly in the future.

Recommendation No. 2

Any change in strategy, program focus, priorities, etc., which takes place in Phase III must be based on the system elements (progressive steps) required as a prerequisite to the use of Soil Taxonomy in soil management and agrotechnology transfer.

Soil-Crop Yield Data Base

The soil data base of SMSS, sometimes called the WBSP, is an outcome of the sampling and site characterizations done through other activities and, as such, while preference is given to experimental stations, is largely the result of random opportunities. Even so, SMSS/SCS now has probably the most comprehensive collection of representative world soils which have been described and analyzed in a systematic way.

The original objective was to provide information for the ICOMs, workshops and training forums, but over time a new set of objectives have been developed which, among others, include:

- to provide a data base to test the concepts in IBSNAT's Decision Support System for Agrotechnology Transfer (DSSAT) and also to provide data for its soil-weather-crop simulation models; and

- to provide a data base on international soils and a bank of soils from foreign countries for research purposes, to test soil property interrelationships or methods of analysis.

There have been good uses made of the available data sets for: inter-laboratory checks and standardization; on-site training in locating suitable sites, sampling and collecting soil morphology data; and support for the ICOMs. The data is used to support Training Forums and for testing ST in the tropics. Currently, the data is also being used in the development of simulation models by IBSNAT and in testing the Fertility Capability Classification (FCC). A number of general problems have surfaced (see page 22) in the use of the data base; e.g., it contains limited crop yield data, virtually no climatic data and lacks a world-wide distribution of sample points; it is not user-friendly and requires a main frame computer to operate; inadequate sampling data in terms of special characteristics; and poor relation to spatial data.

SMSS has been very active and has made a significant contribution to methodology transfer as well as to the direct execution of soil sampling in many countries. The EET suggests, however, that it may be necessary and timely for SCS/SMSS to adjust its management strategy.

Recommendation No. 3

> SCS and SMSS, in collaboration with S&T/AGR and current and potential users, should review its strategy, objectives and plans for establishing a soil-crop yield data base to, among other things: (i) stimulate and support national involvement; and (ii) think through the uses, content, design, interfaces, etc., of a user-oriented soil data base management system. Within such a context, the role, resources and capacities of the NSSL in Phase III should also be reconsidered.

AID missions frequently ask for advice on crops to be grown but in the U.S., the USDA does not yet have a national basis for making such assessments. This is a principal reason for their interest in USDA-AID collaboration. There are a number of prerequisites for improving productivity through soil management but the real challenge is to reduce the time, cost and effort required to complete these steps which is, and should remain, a prime objective of both the SMSS and IBSNAT as well as other S&T/AGR soil and water projects. An improved soil data base system is critical to this process.

Recommendation No. 4

> Beginning as soon as possible, SMSS should initiate (through contract or otherwise) the comprehensive design and on-line operation of a user-friendly soil-crop data base which is machine retrievable for instant analysis and use and compatible with the Data Base Management System developed by IBSNAT for DSSAT. In the design, the following points should be resolved:

a) a new format developed to facilitate use and compatibility with other DBM systems, including use of microcomputers;

b) inclusion of on-site or derived weather data;

c) the use of default procedures to determine soil properties not determined in routine soil characterizations; and,

d) determining how soil correlations can be stratified by taxonomic classes.

In addition to addressing the problems already discussed, as part of this process a very important task must be initiated, namely, to write the rules that relate soil behavior and performance to soil characterization data. The most efficient way to do this may be through "expert systems." The development of such a system for soil interpretation requires the joint efforts of soil experts who have knowledge and experience about soils and technology information engineers who know how to condense expert knowledge into systems.

Recommendation No. 5

SMSS and IBSNAT in cooperation with TROPSOILS and others, should be encouraged and supported by AID to assign high priority over the next two or three years to developing an "expert system" to guide soil survey interpretation.

The transformation of WBSP into a user-oriented and user-friendly soil data management system should be the next major accomplishment of SMSS.

Training Forums and Workshops

For the comparative low-cost involved, both training forums and soil classification workshops have been highly cost-effective, both in terms of the number staged, their quality and impact. The high rate of cost-sharing in training forums is quite noteworthy. The forums in particular provide support and stimulation to assist soil scientists and their institutions in becoming more effective. Its by-products, e.g., soil data, have been most useful in other endeavors. They have already assisted LDC scientists to understand and utilize soil taxonomy and this comprehension will provide a good basis for future agrotechnology transfer. The team endorses SMSS plans to (i) phase out soil classification workshops, (ii) plan future workshops on soil correlation

and soil survey interpretation including problem soils and soil constraints, and (iii) continue the recent trend of conducting forums on steps in the soil management system beyond soil classification per se.

Not withstanding SMSS's outstanding performance record under this activity category in creating "awareness" and "understanding" of ST, short-term training of this nature is not a substitute for in-depth and more complete soil survey training and it still remains for other steps in the soil management system to be effectively handled. The time appears right to consider more practical and skill-oriented training related to other AID projects.

Recommendation No. 6

Training and workshops will remain an important element in Phase III but must shift in strategy, subject-matter, emphasis and perhaps format, as utilization of Soil Taxonomy and coordination of soil and water management activities are stressed. In planning such activities, the following suggestions should be considered:

a) SMSS staff, or SMSS associated or trained staff, be assigned as project leaders for soil surveys of pilot areas in developing countries to train surveyors in conducting a soil survey from start to finish.

b) Regional as well as in-country training should be encouraged, particularly in Africa.

c) More effort should be made to increase the coverage and participation of national and regional subject-matter specialists and preparing them to assume responsibility for a longer proportion of the required training.

d) Training should be related to the step-wise progression of the soil management system and adaptable to the institutional progress in different and targeted countries. A modular package of training programs, perhaps based on major models of soil interpretation, could be developed, flexible to meet the normal training variables and special requirements.

e) As part of the training planning process, SMSS should continue its "reactive" evaluations by forum participants but initiate selected "functional" or post-training evaluations to provide feedback on training effectiveness.

f) The use of advanced programmed learning materials, including games and high tech A/V materials, should be considered.

Publications

The quality, relevance, technical content and usefulness of the publications perused by the EET is outstanding. However, it notes that there has yet been no systematic attempt to assess the usefulness of its publications by the intended beneficiaries.

Recommendation No. 7

An end-user survey on the usefulness of current publications and reactions to planned or needed publications should be conducted in preparation for Phase III.

C. Strategy

It is becoming increasingly clear that Phase III will not, or should not, entail just a "minor change in scope" and a continuation of established activities, but needs to be based on an updated strategy which recognizes both the shift in focus to utilization of soil taxonomy and resource constraints.

Change in Focus and Mode

SMSS management believes that the current approach and format remains suitable and, in fact, is the only means to achieve program activities. It recognizes that other needs must be addressed and intends to emphasize land evaluation, soil conservation and soil fertility in Phase III at the same time current activities are continued but with reduced emphasis. The EET believes this approach, especially as related to technology transfer, is too passive and reflects an interpretation of AID policy that is unnecessarily restrictive. In any event, it is difficult to contemplate how the new areas of proposed work (see page 38) can be achieved as a "by-product" of aggregate mission demand for technical assistance.

Commodity Research Focus

The fear that the commodity focus of most IARCs, the AID Africa Bureau, and others will undermine attention to other crucial aspects of the production process and that the use of crop research becomes more limited due to lack of knowledge on soils is understandable and well-founded. A priority need exists in Africa to strengthen soil survey institutions and soil and water research and, until this is done,

commodity-oriented research and assistance will be less meaningful, especially in terms of on-farm use. Nevertheless, the EET believes that with patience and persistence, this problem will work itself out as credibility gains momentum on the use of solid ST work by SMSS and its collaborators and the crop modeling of IBSNAT enters the validation and demonstration phase. (See Appendix No. 5)

New Elements

The EET is not in a position to suggest alternative programs and priorities within any given level of resources/inputs, but in the following recommendation, it displays some of the important elements it believes deserve attention.

Recommendation No. 8

As a crucial part of the preparation, approval, and allocation process for the Phase III extension of the SMSS project, the following elements should be included in a revised and written five-year strategy statement (reviewed annually) which will set the parameters for subsequent project design (as included in the AID project paper and OICD/USDA PASA) and work planning;

a) increasing emphasis should be given to the essential elements of the soil management process, i.e., soil classification, soil survey, soil interpretation and the management components of land use planning, soil fertility and management, and soil conservation;

b) this will expedite agrotechnology transfer by facilitating an integrated systems approach;

c) a new conceptualization for the design, development, and management of a comprehensive, user-oriented soil-crop data base;

d) an expanded concept of systems-oriented training including on-the-job and demonstrations in-depth;

e) a more active pursuit of technical assistance requests orchestrated and coordinated to accomplish the project purpose and produce planned results;

f) provide additional means to achieve project purpose, e.g. serving as a conduit for the soil input for the Agro-Ecological Zone studies in Africa, initiating soil data collections from IARC outreach programs, preparation of an updated soil map for Africa, development of case studies on the utilization of ST in the management of a specific soil, etc.

g) include a less restrictive interpretation of "operational" activities and introduce more work planning to produce pre-determined selected and coordinated outputs; and

h) identify the targeted organizations and desired parameters of linkages, with particular emphasis on coordination with S&T/AGR funded projects.

D. Management

Backstopping

The EET believes there is ample evidence to show that the SMSS project was and remains a very cost-effective mechanism to link U.S. scientists, particularly in the SCS, in a mutually beneficial relationship for application of the Soil Taxonomy to soil management and agrotechnology transfer.

While project leadership has been superb, there have been backstopping difficulties caused, among other things, by the unique demands placed upon OICD, the very small size of project staff and the lack of support staff help. This has also caused some communication difficulties for S&T/AGR and constrained both parties ability to plan and coordinate SMSS activities more effectively.

The team was particularly impressed with the high caliber of advice and assistance provided SMSS by its Advisory Panel and notes that the Panel membership itself is an important linkage for planning and coordination of SMSS activities.

Recommendation No. 9

The USDA, specifically OICD and SCS, should arrange for adequate support to the SMSS headquarters professional staff, particularly the Project Leader. In planning Phase III along the lines suggested above, the staffing needs for backstopping will require review and, most probably, augmentation.

Systems Approach

The systems or integrated approach to agriculture production in general and soil management in particular is a sine qua non. At the same time, reductions in staff and resources in both organizations, in the field and at headquarters, and the increasing requirements for coordination, make the need for management improvements and efficiencies more important than ever. There are two approaches to this problem which deserve serious consideration. One involves a consolidation of existing USDA "projects" in soils and water and related areas into an integrated "umbrella" PASA or its equivalent. The other involves a similar consolidation of all AID/S&T soil and water management projects as sub-projects in a S&W "umbrella" project. In both cases, the development of the umbrella project superstructure would: (i) provide the opportunity jointly to develop and implement a multi-year strategy and work plan for a coordinated systems approach in the field; (ii) afford a better justification for USDA/AID/S&T participation in the planning and backstopping of USAID field projects; and (iii) serve as a device to reduce or minimize staffing time and costs in program management.

Recommendation No. 10

> USDA management, in collaboration with AID, should consider the advantages of consolidating its AID-financed soil and water activities into a single, umbrella-type project or PASA, involving SCS (SMSS), ARS (TSMM), CSRS and possibly others.

Recommendation No. 11

> AID/S&T management, in collaboration with AID regional bureaus and USDA, should move forward with their plans to develop an "umbrella-type" project for all centrally-financed soil and water management and related projects.

Project Design

The purpose of a good project design is to clarify and justify the objective/purpose of a project, including its intended developmental or program impact, and serve as the framework for project management, including review and evaluation, based on specified and pre-determined results. It also includes objectively verifiable indicators of progress, performance and success appropriate to each major design level. The application of such a "project" tool to a purely "service" activity is difficult and can devolve into an exercise of little meaning or importance.

Some suggestions for improving project design in Phase III are included in Chapter V, particularly in distinguishing between the various levels, i.e., goal, objective, outputs, activities and inputs. Based on management's reaction to the recommendations included herein, additional changes will be required. The principal point to emphasize in this summary, however, is the need, under "Technology Transfer," for the design and subsequent project documentation to be made more output-oriented in conjunction with a reinterpretation of "non-operational support services" to improve intended project effectiveness and impact.

Recommendation No. 12

> In preparation for Phase III, the project design should be revised to (i) distinguish more clearly between major levels or elements (ii) provide objectively-verifiable indicators (iii) incorporate any changes resulting from review of the above recommendations, and (iv) make "Technology Transfer" more output-oriented - leading to increased project effectiveness and eventual impact.

Appendices

Appendix No. 1

EXTERNAL EVALUATION TEAM

SCOPE OF WORK

A. Project Title: SOIL MANAGEMENT SUPPORT SERVICES (SMSS)
Project number: 931-1229

B. Name of Contractor: Office of International Cooperation and Development, (OICD) U.S. Department of Agriculture (USDA)

Name of Implementer: Soil Conservation Service, (SCS) USDA
Contract Number: BST-1229-P-AG-2178

C. Purpose and Rationale of Evaluation

This PASA was initiated October 1, 1979, with OICD, using the SCS as the implementer to create a mechanism for providing support services to on-going AID country projects and to strengthen Less Developed Countries (LDCs) institutions dealing with soil survey, soil classification, use and management of soils. OICD handles the managerial aspects of the program while SCS handles the technical aspects. Since its inception, a wide range of services has been provided on a worldwide basis. Phase I -- October 1, 1979 to September 30, 1982 -- required $2,127,000 in funding. Phase II -- October 1, 1982 to September 30, 1987 -- is provided with $5,250,000 in additional funding for a total of $7,377,000. In November 1984, a SMSS Review Team made a number of recommendations regarding the future of SMSS. Progress Reports and Annual Reports up to September 1985 are now in hand for the six year life of the Project. The time is therefore propitious for an external evaluation to review the progress-to-date in reaching program objectives and providing analyses and technical inputs which will assist S&T/AGR of AID in:

i. assessing the continuing validity of the project approach;

ii. recommending any needed desirable changes in program direction, emphasis and/or style; and

iii. determining future funding levels.

D. Team Composition

Given the several internal and advisory panel reviews which have taken place, the focus of this external comprehensive (peer) evaluation will be on effectiveness and impact. The issues have been formulated with this purpose in mind and the following team members were selected:

1. Mr. Raymond E. Kitchell -- Development Management Specialist

   Mr. Kitchell, a retired AID career foreign service officer, is proposed as the Chairperson of the team. He was formerly the evaluation officer of the AID Technical Assistance Bureau, a predecessor of the S&T Bureau, and chief of evaluation at the United Nations Industrial Development Organization. He also served as chairman of the midterm evaluation of the IBSNAT Project last year.

2. Dr. Gilberto Paez, Director and Representative of Inter-American Institute for Cooperation on Agriculture (IICA), Organization of American States (OAS).

   Dr. Paez is former Director of CATIE in Costa Rica and has wide international experience.

3. Dr. D. E. Gollifer -- Director of Agricultural Research, at Southern African Coordination Council for Agricultural Research (SADCC)

4. Dr. Edward Runge -- Professor at Texas A & M University and Past President of the Soil Science Society of America.

   Dr. Runge has also wide international experience and assists the Soil Management Collaborative Research Program (TROPSOILS).

E. <u>Principal Participants</u>

1. AID/S&T/AGR

   Dr. Tejpal P. Gill, Chief RNR Division
   Dr. Raymond Meyer, Project Monitor, SMSS

2. SMSS

   Dr. Richard Arnold, Director, SCS - USDA
   Dr. Hari Eswaran, Program Leader, SMSS
   Mr. Greg Garbinsky, OICD
   Mr. Pat Miles, OICD

3. Observers

   Dr. Goro Uehara, PI, IBSNAT
   Dr. Fred Beinroth, Co-PI, IBSNAT
   Dr. Armand Van Wambeke, Chairman, SMSS Advisory Panel

F. Project Background

SMSS did not happen; its creation was by design and in response to a felt need and the general technical assistance strategy of AID. In the early days, prior to about 1979, A&T/AGR/RNR provided grants to several land grant Universities to develop their expertise in the field of tropical agriculture. This resulted in the Consortium of the Soils of the Tropics (CST) formed by these Universities who pooled their resources and talents to increase the productivity of tropical agriculture.

In 1974/1975, the Benchmark Soil Projects, implemented by the Universities of Puerto Rico and Hawaii, became operational. At the same time, Soil Taxonomy -- the U.S. system of soil classification -- was published by USDA, though it was already in wide circulation by 1970. The principal objective of BSP was to test the hypothesis that the soil family category of Soil Taxonomy contained sufficient information to serve as a basis for agrotechnology transfer.

Because of these efforts and on its own merits, Soil Taxonomy was being used increasingly in many countries. The FAO-UNESCO legend of the soil map of the world enhanced the use of Soil Taxonomy as it is based on Soil Taxonomy. In addition, most countries were using the standards of the SCS in their normal soil survey work -- The SCS Soil Survey Manual is the basic guideline for soils activities in many parts of the world.

The international use of Soil Taxonomy and SCS methods of soil survey and soil characterization was not without problems. Constraints of LDCs include, lack of laboratory facilities, lack of trained personnel and absence of a viable mechanism to receive on-site assistance. In some instances, there was also a misuse of incorrect use of Soil Taxonomy arising largely from a lack of appreciation of the fact that Soil Taxonomy is a system to make and interpret soil surveys and that it could serve as a quality control mechanism and more importantly as a tool for agrotechnology transfer.

The need for a program to strengthen institutions in the developing countries dealing with soil surveys and use and management of soils and a need to provide support services to on-going AID country projects were the motives for the creation of the Soil Management Support Services (SMSS).

G. Project Logic

The project logic has been refined since its inception beginning with a program or developmental goal which is in harmony with other S&T/AGR soil and water projects. While the program objectives are interrelated, and conceptually concern the strengthening of LDC agricultural institutions, operationally they are designed to enhance communication among soil

scientists and provide the basis for agrotechnology transfer, among or within countries.

THE TEAM WILL BE REQUESTED TO REVIEW THE PROJECT LOGIC, INCLUDING ITS DEVELOPMENT HYPOTHESIS IN THE LIGHT OF RECENT ADVANCES IN AGRICULTURAL AND INFORMATION TECHNOLOGY AND THE CURRENT RELEVANCE OF THE MAJOR PROGRAM OBJECTIVES.

Development goal:

Increase food production through improved land resource management in the developing countries.

Major Program Objectives

1. To provide technical assistance to AID and LDCs in problem identification, evaluation of opportunities, planning and utilization of land resources, especially in the subject area of soil survey, soil conservation and soil fertility and management.

2. To develop worldwide linkages for a more efficient utilization of agricultural information for crop production.

3. To improve the interpretation potential of soil surveys for agricultural development in LDCs, and

4. To refine Soil Taxonomy for intertropical areas and assist LDC scientists in its use and in its application for transferring agrotechnology from one tropical region to another similar region.

H. Issues to be Addressed by the Review Team

Team composition has been selected to include primarily end-user representatives from AID, the developing countries and other donors, since the focus of the evaluation will be on the actual/potential impact of project activities and the effectiveness of the approaches being made. As such, a set of specific issues has been developed to guide the exercise towards questions of importance on the use of Soil Taxonomy in agrotechnology transfer and the proper emphasis on resource inventory and evaluation, soil conservation, land-use planning and similar problem areas. They will be included in the terms of reference for the External Evaluation Team. Additional issues may be raised by the USDA, by AID Missions and by host country institutions through a questionnaire which will be prepared, or by the team itself.

ISSUE 1. SOIL TAXONOMY

Soil Taxonomy, the U.S. system of soil classification, is the most comprehensive internationally applicable system designed for making and interpreting soil surveys and to serve as a vehicle for agrotechnology transfer. SMSS has been involved in activities to create an awareness of the system, refining it for better use in the intertropical countries, assisting countries to use the system and helping them to make soil interpretations.

In assessing the effectiveness of the approaches being used and their impact in the developing countries, evaluate the following elements:

a. How successful have the eight International Soil Classification Committees (ICOMs) been in refining the soil survey for tropical and sub-tropical soils? Is their pace of work satisfactory and, if not, how can their work be speeded up?

b. How many developing countries have adopted Soil Taxonomy as

i. national soil classification systems
ii. as an adjunct system
iii. what have been the principal reasons for increased acceptance?

c. In what countries and under what circumstances has the Soil Taxonomy been used (or is in the process of being used) as a basis for agrotechnology transfer and how?

d. How successful and cost-effective have the SMSS supporting activities been in reaching this program objective?

ISSUE 2. WORLD BENCHMARK SOILS PROJECT (WBSP)

One of the objectives of WBSP is the support of the ICOMs and in the process, provide standardized descriptions and analyses of soils to enable a developing country to calibrate itself. Its ultimate objective is to develop a soil-crop yield data base which will help improve the understanding of soil productivity and the effects of soil management in the developing countries. It is also hoped that such a data base will improve understanding of the benefits of soil conservation and the adverse effects of not using soil conservation practices.

In reviewing progress to date and plans, evaluate the following issues:

a. Is the information contained in traditional soil surveys adequate to make accurate and specific predictions of soil behavior and crop performance?

b. Given recent advances in information technology and the varying and changing needs of developing countries, what approaches are being taken by SMSS to assist countries in the use of data base management systems, expert systems, etc.?

c. Transfer by analogy and by simulation models are the approaches taken respectively by the Benchmark Soils Project and its successor, the International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT). Accepting this as the approach to agrotechnology, what are, if any, the collaborative activities of IBSNAT and SMSS and what is the role of WBSP in this strategy?

d. What is the basis for sampling soils in developing countries? What has been the impact of WBSP on other AID projects, on the International Agricultural Research Centers and on developing country research? Who are the users of the WBSP data base?

ISSUE 3. TRAINING AND WORKSHOPS

The training program of SMSS (termed Forums) is designed to develop staff at LDC institutions who will, to varying degrees, initiate and provide assistance for appropriate research in the development and utilization of agrotechnologies. Its purpose is to reach a large number of soil scientists and inform them of recent developments in soil survey, soil classification and the use and management of soils.

Workshops are, however, not designed for training, but are problem or functionally oriented. International Soil Classification Workshops are conducted to support the work of the ICOMs and are an integral part of the Soil Taxonomy refining process.

These two elements are an important part of the current SMSS program and a review of their effectiveness and need is crucial and, consequently, please evaluate:

a. SMSS has conducted 14 Forums worldwide and an additional four are planned by the end of the project.

i. What has been the impact of the Forums?
ii. Each forum adopts a set procedure; are country and regional needs satisfied by this approach?

iii. What kind of cost-sharing or buy-ins have been in the Forums:

iv. If the project is extended, what will be the strategy of SMSS with respect to training activities, in terms of subject matter, frequency and approaches?

b. SMSS has organized eight International Soil Classification Workshops, two organized by the University of Puerto Rico.

i. What has been the impact of the workshops?

ii. As the workshops are organized for a specific objective, when is this activity expected to reach its objective?

iii. SMSS has initiated other related activities; what is the general strategy of these activities?

iv. The Soil Conservation Service of USDA is the author of Soil Taxonomy. What has been their role and support of these activities?

ISSUE 4. TECHNICAL ASSISTANCE

Technical assistance to USAID country Missions and Bureaus and to LDCs is the core of SMSS activities. Currently, SMSS only responds to requests.

Evaluate with respect to:

a. Is this an adequate approach and if not, should the project be redesigned to focus on fewer number of selected countries for better coordinated, targeted and comprehensive, system-wide assistance, in collaboration with USAID Missions and in support of ongoing centrally funded or Mission projects?

b. The Project has an impressive list of linkages with international institutions. What has been the impact of SMSS on these institutions, and what role has SMSS played in networking activities?

ISSUE 5. STRATEGY

In view of the considerable accomplishments to date and the experience gained by SMSS, considering the changes in technology and perceptions of LDC priority needs, and the ever increasing requirement for cost-effective and coordinated approaches, what kind of strategies, if any, are likely to increase program effectiveness and impact?

a. Should there be a shift in program areas of soil survey and interpretation with emphasis on the application of Soil Taxonomy for making soil surveys and their subsequent use for land use evaluation and soil conservation? If so, should it be based on existing activities -- forums, workshops, publications and technical assistance -- or are there other mechanisms?

b. Given the emphasis on commodity-focused research and development of AID's Bureaus and Missions, the International Agricultural Research Centers and other regional or national institutions, and noting the negative experience of some of these organizations, how can SMSS contribute to a more balanced and timely consideration of soil and water management by some of these institutions?

c. Given the general strategy of increased assistance to Africa by AID, what is the role SMSS can play to improve the agricultural development of Africa.

ISSUE 6. BACKSTOPPING

SMSS was established on the assumption that it was an effective mechanism for tapping into and channeling the major U.S. soil science resources, providing benefits to both the developing countries and the U.S.. Impressive data on project activities, accomplishments and success indicators are included in the SMSS Progress Reports and Annual Reports, notably the unpaid contributions of scientists at the field activities, cost-sharing and buy-ins in the workshops and forums, which indicate that this assumption was and indeed is still valid.

The systems approach to increased crop production is breaking down the traditional divisions both by bureaucracies and disciplines, e.g., between SCS, ARS and CSRS, between USDA and the universities, between the university colleges and departments and between AID contractors (universities, non-profit organizations, private firms and USDA agencies) and AID. This is happening at the same time AID staff both in the field and at headquarters is being curtailed and resources levels reduced. Given this scenario, is there any way SMSS and other USDA PASAs can be redesigned to give more effective backstopping for the leadership, coordination and monitoring role assigned to S&T/AGR.

I. <u>List of documents to be provided to the team</u>

1. Project papers and supporting documentation
2. All Progress Reports and FY 1985 Annual Report
3. Copies of previous reviews
4. Summary and analysis of USAID and collaborators replies to evaluation questionnaire
5. Evaluation Team, Terms of Reference
6. SMSS reply to issues

J. Agenda for Review

1.	June 2 to 6, 1986	-- Evaluation Exercise
2.	August 15, 1986	-- Final Evaluation Report
3.	October 31, 1986	-- PES Approved

Appendix No. 2

HOW OTHERS VIEW SMSS*
Results of Field Questionnaires.

USAID Missions

In preparation for this Review a questionnaire was sent to 16 USAID Missions and 13 have responded. They were asked to rate several of SMSS activities on a five-point favor-to-disfavor scale. SMSS obtained a grade point average of 4.5. The questions were:

A. (a) TDYs to Mission requests (b) to country institution requests.
There was general satisfaction.

B. (a) timeliness and adequacy of TDYs.
Missions indicated that our response time was not fast enough. Our average turnover is about 5 weeks and in some instances, we have sent a person in three days. Recently, we did delay (three months) with a request from Botswana (we got 3 points) and this was largely because we were not clear as to the nature of the assignment.

C. Quality of TDY personnel.
There was good appreciation for our personnel. Only one Mission indicated that our TDY personnel were not attuned to local conditions. With respect to ability of working with counterparts, practically every Mission gave us a 5.

D. Training program.
Every Mission found it relevant, appreciated by country and that it has had impact.

E. Workshops
They were less affirmative with the Workshops and could not decide on their usefulness.

F. SMSS publications.
Surprisingly, this was rated very low. It is possible that Missions are not well informed of this activity, as the survey of country nationals placed the publications program as one of its most important activities.

G. Extension of SMSS.
There appeared to be an unanimous opinion that SMSS be extended.

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*See also Appendix No. 5

H. Special comments.
A few of these are attached. Some specific ones are:
1. SMSS publications be translated into Spanish or French.
2. Period of SMSS TDYs be extended.

The Program Leader of SMSS has had the opportunity to visit with practically every Mission and discuss with the staff: some general reactions include:

1. Missions, with the exception of a few, are not well informed of SMSS and its activities. This is partly related to staff turnover at Mission.
2. Missions hesitate to request assistance for fear of administrative difficulties. Also most of Mission country projects are subcontracted, and contractors are not eager to request assistance. Missions do not have flexibility to buy-ins unless this is built into their projects; consequently even if there is a desire, there are serious problems.
3. Missions are overworked and understaffed and are generally not excited to see centrally funded staff. SMSS attempts to use as little as possible, Missions facilities and in the long run, Mission staff appreciates this.
4. Missions like to be informed but not involved in centrally funded activities and SMSS takes care to ensure this. Missions have repeatedly requested coordination of centrally funded activities to reduce project fatigue of local staff. We have not been successful though SMSS has taken the initiative to coordinate wherever possible. There has been a call for umbrella projects.
5. SMSS is a new concept to Missions and in the beginning it was hard for them to accept that such services were available at no cost. One ADO asked me, "where is the catch." However, after one or two TDYs, they begin to appreciate the program.

International Institutions

Some of the responses of international institutions are attached. They generally value the services of SMSS and are appreciative of the collaborative activities. The greatest honor for SMSS was when it was charged to organized the inaugural workshops of the newly formed International Board for Soil Research and Management.

National Institutions

Another questionnaire was sent to 250 collaborators randomly selected, worldwide and about 60% responded. Their views are as follows:

SECTION A

This section dealt with Soil Taxonomy.

1. The first two questions dealt with the work of the International Committees. Most of the respondents were unaware of the ICOMs. Those who were aware, found it a useful mechanism to improve Soil Taxonomy (these were only a handful of the respondents).

2. The third question asked if Soil Taxonomy was being used. About 40% indicated that it is used as the national system, another 40% indicated that it is used in conjunction with another system and the remaining indicated that it is being adopted.

3. Question 4 asked the primary purpose for which it was being used. Most indicated for national land-use planning and an equal number for soil survey evaluation. Very few used it for agrotechnology transfer and practically no one indicated for soil conservation practices.

4. With respect to the major constraints to use of Soil Taxonomy, the reasons were:

   a. poor lab support services
   b. lack of trained staff
   c. absence of a systematic soil survey program
   d. use of other procedures of soil survey (French) and so application of Soil Taxonomy is not relevant and does not fit into the pattern of activities
   e. FAO system is simpler to use
   f. do not know how to interpret taxa for practical applications
   g. until recently, had no opportunity to discuss problems

SECTION B

This section dealt with the World Benchmark Project. Only countries where WBSP has operated responded to the questions.

1. Practically every respondent indicated that prior to SMSS sampling and characterizing their sites, no such detailed characterization had been undertaken previously. Apart from a few studies of Ph.D. students, in general there were no detailed evaluations. Consequently, all countries where WBSP has operated, indicated that this was a positive contribution to the knowledge of the soils of the country.

2. The fourth question dealt with the ways in which the WBSP data had been utilized by the country.

   a. mainly for comparison with locally generated data
   b. defining the soil series
   c. used in reporting agronomic experiments
   d. used as minimum data sets in IBSNAT experiments
   e. used in the national soils capability networks
   f. used as benchmark profiles for teaching students
   g. about 20% of the respondents indicated that the data have yet to be used

3. The fifth question dealt with constraints in developing their own data base.

   a. almost unanimously, lack of equipment, personnel and funds
   b. no soil survey organization
   c. no funds for computer based system
   d. do not know how to use such a data base

4. The last question asked if a regional laboratory would relieve some of the constraints.

   a. an unanimous yes
   b. many wanted such a lab only for analyses which required special equipment or skilled technicians
   c. most felt that routine analyses to support soil survey is best performed by the country itself and this must be strengthened; the regional lab plays a role of quality control, performing special analyses and training of technicians
   d. a significant number of respondents indicated that their major constraint was obtaining spare parts, chemicals and equipment and the regional lab must have persons trained to repair equipment and funds to provide the essentials to national labs.

SECTION C

This section dealt with training.

1. The first question asked the number of forums they had attended. Most had attended one, a few had attended two. One veteran had attended four.

2. Most rated the forms as excellent or very good. (Our own rating of each forum indicate that, depending on the country or region, only between 40 to 60% of the participants benefited from the forum)

3. Most indicated that the knowledge gained has been useful for classifying soils, using soils literature, using soil survey reports and a few on conducting soils research. None of the respondents found the forums useful for making crop recommendations. A few indicated that more lectures could be given on soil survey interpretations and on soil management.

4. Most found the two week period adequate; they consider regional meetings more beneficial than national meetings.

SECTION D

This section dealt with the soil classification workshops. Only those who had participated in these responded.

1. Most had participated in only one workshop. None were aware of SMSS recently introducing soil correlation meetings and soil management workshops.

2. Most found the workshops useful, constructive and effective; a few complained that they tend to be dominated by a few and a few found it to be too specialized.

3. For future workshops, the request in order of preference was:

i. soil management
ii. soil fertility
iii. land use and land evaluation
iv. soil survey methodology
v. soil conservation
vi. soil classification

Conclusion

In the seven year life of the Project, SMSS has come a long way. We have achieved much, have had many disappointments, many frustrations but I believe, we have made a mark. When I joined the staff of SMSS in April of 1980, there was one folder in my filing cabinet; today, we have eight cabinets overflowing with correspondence. My challenge in 1980 was to transform a concept of Tej Gill, Bill Johnson and a few others who designed SMSS into an operational entity. Having been born and brought up in a developing country, my approach and rationale was not always well received but usually prevailed. The greatest obstacle to achieving project objectives was and still is the bureaucracy. I must add that the same bureaucrats have assisted me considerably in finding alternative means and ways.

More than 50% of project outputs has been due to our cooperating institutions, specifically, University of Puerto Rico, Cornell University, University of Hawaii and North Carolina State University. We are extremely appreciative of their continued support and assistance.

Finally, I would like to take this opportunity to thank my two colleagues, Dr. John Kimble and Terry Cook, who have stuck with me and our boss. Dr. Richard Arnold who has given us a free hand to manage the project and only chides us when things go wrong. The project has received continued guidance from Dr. Tej Gill and Ray Meyer. Early in the game, I adopted a policy that this was an AID project and if they do not lik an activity, we do not want it. I believe this has paid off in the long run. The staff of SCS and OICD have been ever cooperative even though I am not one of them and I would like a special word of thanks to go to Dr. Richard Guthrie, the first Director of SMSS who showed me the ropes and how not to lose my sleep over the administration. The Advisory Panel of SMSS has guided us along the way and I am glad that Dr. Van Wambeke has been the Chairman all these years; he helped mould SMSS as much as anyone else. As I said earlier, I would like to pay a special tribute to the collaborating institutions and particularly the University of Hawaii -- AID is very fortunate that it can call upon the resources of such institutions.

Finally, the project is meant for people outside the U.S. and their support and enthusiasm has been the motivating force for the continuation of project activities. We thank them.

Prepared by : H. Eswaren
SMSS Project Leader
May 1986

Appendix No. 3

SMSS EXTERNAL EVALUATION MEETINGS

June 2 to 6, 1986

Program

Monday 2	Arrival of Review Panel Members and participants	
Tuesday 3	09.00	Welcome by Drs. N. Brady and T. Gill, AID/S&T
	09.15	Introduction by Chairman Review Panel R. Kitchell, Development Management Consultant
	09.30	SMSS: an overview R. Arnold, Principal Investigator, SMSS
	10.00	Break
	10.30	SMSS: operational H. Eswaren, Program Leader, SMSS
	11.30	SMSS: International Committees J. Witty, Soil Scientist, SCS
	12.15	Lunch
	13.30	SMSS: International Workshops F. Beinroth, Professor/UPR
	14.00	SMSS: International Training T. Cook, Soil Scientist, SMSS/SCS
	14.45	Break
	15.00	SMSS: World Benchmark Soils Project J. Kimble, Soil Chemist, SMSS
	15.30	Discussion
	16.00	Adjourn
Wednesday 4	09.00	SMSS: Publication and software activities T. Cook, Soil Scientist, SMSS

09.30 SMSS-SCS collaborative activities
W. Reybold, Soil Scientist, SCS

10.00 SMSS-NSSL collaborative activities
S. Holzhey, Director NSSL/SCS

10.30 Break

10.45 SMSS-IBSNAT collaborative activities
G. Uehara, Principal Investigator, IBSNAT

11.15 SMSS: impact and utilization
H. Eswaren, Program Leader, SMSS

11.45 SMSS: future
R. Duesterhaus, Deputy Chief, SCS

12.00 Lunch

13.00 SMSS and OICD
P. Miles and G. Garbinsky

13.45 Chairman, SMSS Advisory Panel
A. Van Wambeke, Professor, Cornell University

14.15 SMSS management
R. Arnold and H. Eswaren

15.00 AID Monitors
T. S. Gill and R. Meyer

15.30 Discussion of issues

17.30 Cocktail Reception

Thursday 5 CLOSED DOOR TEAM MEETING

Friday 6 REPORT PREPARATION

Appendix No. 4

IMPACT AND UTILIZATION*

Introduction

The Soil Management Support Services (SMSS) became operational on October 1979. Phase I of the project was from FY1979 to FY1982 and Phase II commenced on FY1983 and ends on September 31, 1987. During this period, SMSS has gone through several metamorphoses; the changes have been essentially with respect to activities within the general scope of work. In the beginning, the name of the project was slightly misunderstood and it took time to inform the collaborators that the project was designed as a support service to soil management and not a project dealing with soil management per se.

SMSS prime objective was to assist in the development of quality soil resource inventories and the utilization of such information for developing and transferring agrotechnologies appropriate to physical and economic conditions in the developing world. A second aim was to provide USAID Missions and national institutions with scientific and technological backstop for their programs and thirdly to mobilize the U.S. research community and to utilize this expertise to address problems of the Less Developed Countries (LDCs).

SMSS strategy to achieve these objectives has been one of personal contacts with LDC scientists and decision makers, creating awareness through a range of activities, disseminating information, and developing linkages among national scientists, U.S. scientists and other international scientists. SMSS has played the role of broker, catalyst and initiator. The approach has been to transcend national boundaries and where possible, to affect more than one region, but at the same time ensuring that we assist to strengthen the technical capacity of the institution and the technical competence of the scientist by stimulating them to participate in regional or international networking activities.

Evaluating the impact is difficult due to several reasons:

a. SMSS differs from other projects which are country specific; being a worldwide program, our activities are spread out and even though in the final analysis, we feel we have achieved our objectives, our efforts with respect to any one country is not obvious,

b. It is only through repeated contact with any one country over a long time period that any particular effect can be seen; the modus operandi of SMSS is to initiate an activity in a country, bring it to a successful conclusion and then move along to another country. The

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*Prepared by SMSS Project Leader.

contacts established are maintained but follow-up frequently is only through correspondence unless another activity is organized in the country,

c. the technical assistance component is limited to six weeks at any one time and consequently the project cannot be involved in any operational kinds of activities.

SMSS has now been operational for about 7 years; we have had contacts with institutions and scientists in more than 50 countries and have established linkages with many organizations. Through our small publication program, we have reached many people; through our site visits, we have helped solve technical problems and established contacts for LDC scientists so that they have a mechanism for problem solving. One of the ways we can evaluate the impact of the program and the utilization of its products is to cite some specific examples.

Cost sharing and Mission buy-ins

This is perhaps the best testimony to the value of the activities of a program. In FY1984, other organizations contributed more than $350,000 to SMSS activities. This ranged from co-sponsorship of Workshops and Training Forums to cost-sharing in SMSS publications and technical assistance TDYs. USAID Missions have also cost-shared and a good example is our training course in Rwanda and Burundi. USAID/Kigali covered the costs of the Rwandese participants in Burundi while USAID/Bujumbura covered the costs of the Burundi participants in Rwanda. Missions frequently sponsor nationals to SMSS workshops and Forums. The Near East Bureau, now the Asia and Near East Bureau, contributes annually $50,000 to support Forums in the Near East. The last Forum was in Tunisia and the next one will be in the Yemen Arab Republic.

Cost-sharing with International Centers and with other AID projects has proven to be very beneficial. SMSS has working arrangements with IBSNAT to cost-share when objectives are common. Even the implementer of the SMSS project -- the Soil Conservation Service -- is increasingly using SCS to strengthen the capabilities of its soil scientists. SCS has on several occasions sent its staff to participate in SMSS activities at its own cost or has paid salaries. U.S. Universities are providing their staff at no cost for the training courses because they value the international experience their staff obtain. Staff of many European and other Universities have also contributed to SMSS activities.

The greatest reward is when, staff of LDC institutions are assigned to SMSS activities at no cost to SMSS. At our most recent Workshop of soil classification in Brazil, the total number of participants was 100, out of which about 75 were Brazilians. The travel and per diem costs of the Brazilians was met by Brazilian institutions or by the participants themselves.

In total, our estimates indicate that over the last five years, other organizations have contributed more than $1,250,000 to SMSS activities which is about 25% of our budget. This does not include salaries of foreign nationals.

Use and application of Soil Taxonomy

As shown in the Progress report and the Annual Reports, there is a definite increase in the use of Soil Taxonomy worldwide. The reasons for this include:

* the merit and quality of the system,
* an increased appreciation of the usefulness of the system,
* the only system designed for making and interpreting soil surveys,
* the availability of a mechanism for problem solving and discussions,
* the availability of a mechanism for maintaining the system dynamic with the capability of responding to feedback from the field.

SMSS has played an important role in the last two items through its technical assistance activities, training courses and workshops.

Some specific examples:

* Thailand, Malaysia, Mali, India, Columbia, Yemen Arab Republic, Saudi Arabia, Syria, Lebanon, Tunisia, and a few of the Pacific Island countries have published national soil maps using Soil Taxonomy.

* Rwanda, Burundi, Zambia, Zimbabwe, Botswana, the Arab countries and a few others are in the process of making such maps.

* Rwanda and Zambia are two countries which introduced the concept of Soil Series in their soil survey program after TDYs of SMSS.

In each country there are one or two soil scientists who are already familiar with Soil Taxonomy. SMSS has been able to tap this resource to assist us in the process of refining the system. This has enhanced their desire to use the system as they are using a system which they are helping to improve.

Soil and site characterization

Following up from the experience of the Benchmark Soils Project, the importance of soil and site characterization in agronomic research has been continually stressed by SMSS. With the advent of IBSNAT, the need for this has been further emphasized. The message is slowly getting across to the LDC institutions but many of the international centers have already taken action. The Director General of IRRI recently informed SMSS that they will be hiring two soil scientists and have even created a department of Soil Science. Recently, ICARDA took the initiative to organize a meeting in Rome to examine this question.

Many soils organizations are awakening to the fact that their role is more than making a soil map. Relating soils information to crop production is a difficult task but efforts are being made to meet the challenge. Based on the BSP experience and using the assistance of SMSS, Pakistan and Fiji have developed the Soil Capability Assessment Network (SCAN) and Soil Capability Evaluation Network in the region and similarly, the Association of South East Nations is also working on such a network.

One important constraint in soil characterization is the availability of laboratory facilities. A great step forward is being taken by SACCAR to develop a regional laboratory for the Southern African Region and the DG of SACCAR has inquired if SMSS will assist in this venture. SMSS is already collaborating with ISRIC in the LABEX program to assist countries to improve the quality of their soil analyses. Finally, USAID/Bujumbura requested a detailed evaluation of the soils of their Kajondi experimental station. This is now complete and in collaboration with IBSNAT, a detailed report is in the press and this includes a detailed soil map of the station.

The standard reference procedure for all laboratory characterization procedures is now that of the SCS. The Soil Survey Investigation Report No. 1 is the basic reference document used by all countries.

Technical Assistance

Our TDYs are for short term and provided on request. Impact is difficult to assess but as shown by USAID Mission responses (provided in Appendix No. 2) they have been well received. There are a few instances where SMSS was directly or indirectly responsible for the development of a national program and a few examples are:

a. Phillipines.
Primarily as a result of an SMSS TDY, a national commitment was made by the President of the Phillipines to increase the utilization of Soil Taxonomy by the country. A special project

was created within PCARRD and the result was two training courses and one workshop. All the national experimental stations soils have now been characterized and several Universities use SMSS training packages in their normal curricula, supplemented by a local edition of SMSS Technical Monograph No. 6 -- Keys to Soil Taxonomy.

b. Indonesia.
In 1981, our present Deputy Chief and a colleague went to Indonesia to evaluate their soil conservation program. In 1984, three SCS soil scientists were sent by SMSS to discuss and develop a proposal. Today, this is a $40 million dollar project with major funding from the World Bank and USAID with the soil survey and conservation work subcontracted to SCS.

c. Jordan.
Between 1981 and 1983 SMSS provided ad hoc TDYs to Jordan. In 1983, the Program Leader was requested by Mission to examine the soil survey needs of the country. This was followed up by a consultant who developed a proposal. With slight modifications, the proposal was accepted by the GOJ and Mission is requesting SCS to field a soil survey party.

d. Djibouti.
SMSS provided many TDYs between 1981 and 1984 to develop the national soil survey laboratory to support Mission's soil survey project. The laboratory is probably the best equipped in the Near East but today, it is probably non-functional due to lack of personnel. We are considering the possibility of converting it into a regional lab.

Impact within the U.S.

To quote SCS Chief -- Mr. Wilson Scaling -- "We benefit too, because our people can learn from the experience and improve their technical knowledge and professional capabilities. They can apply that new understanding to problems here at home". Soil scientists of SCS and U.S. Universities have been exposed to conditions all over the world and this has broadened their horizons. Letters and reports of SMSS TDY personnel testify to the fact that the impact on their work has been tremendous. Everyone values the TDYs as an unique experience and now there is competition to be selected and SMSS staff has also been accused of favoritism.

All our soil analyses is done by the National Soil Survey Laboratories of SCS. By assisting us in the WBSP, they have been able to test their procedures on a range of samples; a few problems have arisen and they have initiated research projects to work on these problems.

The World Soil Geography unit of SCS is now collaborating with SMSS and using its data base to update the soil maps of the world. We are currently fighting a losing battle with AID Bureaus to support this activity of ours.

Appendix No. 5

Comments from International Agricultural Research Leaders

- John A. Foti
  Director
  Office of Agriculture
  USAID, Thailand

- A. J. Smyth
  Director
  Land Resources Development Centre
  Overseas Development Administration
  United Kingdom

- M. S. Swaminathan
  Director General
  International Rice Research Institute (IRRI)
  Philippines

- L. D. Swindale
  Director General
  International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
  India

- R. Tavernier
  Geology Institute
  Belgium

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
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April 11, 1986

Dr. Tejpal S. Gill
S&T/AGR/RNR
Agency for International Development
Washington, D.C. 20523

Dear Dr. Gill:

Subject: External Review of the Soil Management Support Services (SMSS) Project

The following are some comments to go along with your questionnaire:

The Department of Land Development (DLD) has collaborated with the SMSS Project for the last six years. For Thailand, the SMSS Project has been an important link with U.S. Scientists and particularly the Soil Conservation Service of USDA. Moreover, Thailand uses USDA procedures and quality control mechanisms in its soil survey program and it has been through this linkage with the SMSS Project that this has been achieved. Thailand also uses the USAID pioneered Soil Taxonomy System and was one of the first countries to make a map of the country using this system.

A. Technical Assistance

TA activities under the SMSS Project have been very useful in providing short-term technical assistance and back-stopping for Thai related activities. Much of the TA has been followed-up by correspondence which has resulted in an excellent rapport between U.S. and Thai Soil Scientists.

B. Training Courses

In 1983, the SMSS Project organized the IV International Training Forum in Thailand. This was an unique opportunity for young Thai scientists to meet and learn from world class scientists and to share information.

Thailand has also received and used SMSS Project training materials in their in-service training program. Moreover, SMSS Project audio-visual packages are currently being used by Thai universities for teaching purposes.

C. Workshops

The Soil Classification Workshop and the recent Workshop on "Management of Peat Soils" have exposed Thai scientists to international research workers wherein the Thai scientists have benefited from the discussions and technical papers. Generally speaking, Thai officials have limited opportunity to travel abroad, these workshops have been one of the few means for them to meet other scientists and research workers.

--Continued

Dr. Tejpal S. Gill
April 11, 1986

Thai soil scientists have participated in SMSS workshop and training courses in Brazil, Rwanda, Sudan, Philippines, Malaysia, U.S. and Senegal. The impact on Thai scientists can be seen in their improved quality of work and the recognition some of them have received in the world scientific community.

D. Publications

The SMSS publication program has been very well utilized by staff from DLD and the universities community. The technical monographs produced under SMSS on specific subjects, are written in easily understand English and address problems that Thailand faces. Moreover, with collaboration from the SMSS Project, Thailand translated Soil Taxonomy into Thai.

Based on Thailand's six years of collaboration with the SMSS Project, Thailand is going to publish a joint publication on the "Benchmark Soils of Thailand". This monograph will contain the 1986 soil map of Thailand.

E. Other Activities

- SMSS has contributed to other activities to Thailand, for example the "Problem Soils" Workshop of Kasetsart University.

- DLD has submitted an informal proposal for an activity in the area of data management which utilizes soil survey information. The proposal will have to be reduced in scope but could be financed under Agricultural Technology Transfer Project if it meets project funding criteria.

In closing, I want to thank you and the S&T Bureau for its continued support on behalf of our bilateral program.

Sincerely,

John A. Foti
Director
Office of Agriculture

Enclosure: a/s

OVERSEAS DEVELOPMENT ADMINISTRATION
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Telephone 01-399 5281 ext

Dr Tejpal S Gill
Chief, S&I/AGR/RNR
Agency for International Development
Washington D.C. 20523
USA

Your reference

Our reference
L/7/6

Date
16 May 1986

Dear Dr Gill

EXTERNAL REVIEW OF SOIL MANAGEMENT SUPPORT SERVICES (SMSS)

Please accept my sincere apologies for my failure, occasioned largely by my own absence on overseas travel, to respond to your request for comments in the above context before your 1 May deadline. Regrettably, since I am about to depart once more for India, I am still not in a position to give the questions the attention they deserve

In fact, I do not feel very competent to respond in detail to your questions on the performance of SMSS for my contact with its work has been limited to seeing its publications and attending two of its Advisory Panel meetings. The publications themselves are admirable in presentation, quality of content and in the frequency with which they appear. I have been impressed that the relatively small secretariat has been able to achieve so much, in addition to organising the meny meetings around the World. They are to be congratulated.

I am also impressed that SMSS has been able to sponsor several useful initiatives by staff not directly on its payroll of which the publication of a key to "Soil Taxonomy" on computer disc is an excellent example.

I have had reservations about the emphasis in SMSS on promoting soil classification through Soil Taxonomy, understandable though this is. My reservations relate, not to any doubts about the value of Soil Taxonomy or the usefulness of promoting correlation of analagous environments around the World, but to fears that the relatively few expert soil scientists in the Third World might have their attention unduly diverted into rather sterile discussion of details of classification. Such argument has long provided an excuse for pedologists to avoid facing up to the more difficult problems of integrating soils knowledge with other aspects of reality to provide interpretative information of immeidate practical value.

Consequently, in relation to your questions on strategy I have no hesitation in supporting the view that a shift in emphasis towards land evaluation, soil management and conservation is desirable. The present activities of workshops, forums and resulting publications still seems to be the way to go. The preparation of video tapes for training purposes could be an additional approach if funds were available.

As you emphasize, the focus of your enquiry is on the impact, present and potential of SMSS activities. I feel sure that all those who have taken part in the workshops and forums will have enjoyed a most important professional stimulus

Continued

and that this will have extended well beyond those members of the 'international circuit' who make regular appearances at such functions. In my own travels I have not been aware of any direct feedback reflecting SMSS activities but this, I feel is merely an indication of the vast numbers of people who remain to be contacted with this kind of assistance.

I am conscious that you were hoping to receive more timely and more detailed comments than these and apologize that I have not found time to deal with your questions in the detail they deserve. Let me sum up, however, with the hope that support for the SMSS project will continue and be enhanced for I am sure it is valuable.

With best wishes,

Yours sincerely

A J Smyth
Director

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April 28, 1986

Dear Dr. Gill,

Re: External review of Soil Management Support Services (SMSS)

I am very pleased to provide the following comments on Soil Management Support Services project requested in your letter of March 25.

The project is proving of very considerable value to many research agencies in the rice growing countries. Although we have had rather limited direct contact with SMSS we collaborate closely with many national soil research and soil survey organizations in the rice growing countries. SMSS undoubtedly provides valuable assistance to these agencies. Our staff have participated in some of the regional workshops organized by SMSS where the important contribution that is being made in training and in of understanding relationships between soils and crop performance has been very clear.

We have also ourselves benefited directly from SMSS activities. We organized jointly with them in 1984 a workshop on "Characterization, classification and utilization of wetland soils." The rice lands are of course the most important of the wetlands in terms of crop production. This meeting laid the foundations for developing a better guide to the use of soils for rice crop production and the future potential for increasing productivity on a sustainable basis. The inputs of Soil Management Support Services were an essential component to this activity. We have also collaborated with staff made available by Soil Management Support Services and the Philippine Bureau of Soils to establish a detailed characterization of the major wetland soils used for rice production in the Philippines and were able to draft, as a joint effort between SMSS, the Bureau of Soils and IRRI, a guide to wetlands soils of the Philippines which we hope will be published shortly.

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In the International Network on Soil Fertility and Fertilizer Evaluation for Rice (INSFFER) we work with 18 different national programs. We conduct jointly with the national programs various agronomic trials on rice. Results of these experiments can be extrapolated to similar soils within each country, provided that there is a satisfactory basis for wetland soil classification in terms of crop performance. The work of SMSS in improving the use and value of Soil Taxonomy in this respect is an extremely important contribution to the value of the work of INSFFER.

Overall we are pleased to say that we find the work of SMSS and the Invigorating leadership that Dr. Eswaran gives to it an extremely important activity that is making a considerable contribution to work on the improvement and management of soils for rice production. We hope that the project will be continued and that we will be able to collaborate even more closely in the future.

I trust these remarks will be valuable to those conducting the review of SMSS.

Yours sincerely,

M.S. Swaminathan
Director General

Dr. Tejpal S. Gill
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:fha

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30 April 1986

Dr. Tejpal S. Gill
Chief, S&T/AGR/RNR
Agency for International Development
Washington, D.C. 20523
U.S.A.

Dear Tej:

Subject: External Review of Soil Management Support Services (SMSS)

In my view SMSS has been and continues to be a very successful project providing valuable information on Soil Taxonomy and support services for Soil Survey to the developing nations. I hope it will continue.

My personal comments are well expressed already in the reports of the International Advisory Panel to which I have had the privilege of contributing since its formation. So I hope the External Review Panel will give the minutes of the Advisory Panel careful consideration and study. Your letter does, however, stimulate me to a few extra comments about SMSS.

1. Soil Taxonomy

The International Soil Classification Committees have undoubtedly been valuable ways for USDA to learn of the views of experienced soil scientists around the world about the international application of Soil Taxonomy. There is no question that it is the most important system of soil classification in the world and its internationalization is a fact. The response of SCS, however, has not quite measured up to this situation as the Advisory Panel has already pointed out. SMSS should I believe continue to support the existing international committees but not undertake new activities of this type until a more effective response from USDA is seen.

2. Training and Workshops

I regret that my other duties have enabled me to participate personally in only one of the Soil Classification workshops. But that experience was enough to convince me of the substantial value of this activity which I hope will continue. Soil Taxonomy is not easy to interpret - nobody would ever expect it to be so - and the Soil Classification workshops are a cost effective way to help standardize its interpretation around the world. If funds were available the numbers of workshops should be increased.

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3. Technical Assistance

This is a very valuable aspect of SMSS' work. It should be carried out in response to requests from countries but it is appropriate for SMSS to help stimulate those requests. We all know that USAID missions around the world rarely have inhouse expertise in soil survey and national research and conservation administrations do not give soil survey high priority for external technical assistance even when they recognize its importance and provide adequate support for its ongoing activities.

I confess to being a bit disappointed that SMSS activities in India have declined and hope that the advent of Dr. Sehgal to the directorship of the National Bureau of Soil Survey and Land Use Planning will lead to a revival of interest and support. Soil Taxonomy and the methodologies of soil survey developed in the United States are in standard and continuing use in this country, but in recent years there has been a significant turnover in senior staff in soil survey due to retirements and the untimely death of Dr. Murthy. SMSS support to the Indian program of Soil Survey and Land Use Planning could be very effective now.

I would hope that the External Review Panel will resist the temptation to call for more coordination and planning of SMSS activities. It is a small operation and must have flexibility to be effective. The discussions in the Advisory Panel lead me to believe that support and guidance for SMSS within USDA is done well and I hope that you will agree that the Advisory Panel has also provided good suggestions and recommendations for SMSS operations. The experience and judgement of the SMSS Program Leader are excellent; he would just become less effective if he were required to answer to more committees and administrators. He must be held accountable for his decisions of course.

4. Benchmark Soil Activities

Let me take this opportunity to comment favorably on the formation of ICOMSOLE within SMSS and in cooperation with IBSNAT and other U.S. soil-related foreign assistance programs. In line with my comments in the previous paragraph I stress that this should not be a coordinating committee but something with a practical purpose. It should support but not try to develop global schemes of land evaluation. The ICOMSOLE committee can help to ensure that existing approaches are fully utilized to make soil survey more useful to governments and the people.

5. Future Activities

I have only one suggestion for SMSS and its External Review Panel to consider in the way of new directions. The developing world needs efficient procedures for agricultural interpretations of soil survey. Here is an opportunity for SMSS to sponsor and catalyse the development of such methodologies and to allow scientists in the developing world to take the leadership in this activity. I do not know how best this activity might be undertaken, but agricultural interpretation workshops of a similar nature to the successful soil classification workshops are worth considering. Perhaps ICOMSOLE could be asked to take charge of this activity if it were initiated. The suggestion is in line with the Advisory Panel's recommendations that SMSS should become more involved in soil management

activities.

I thank you for giving me this opportunity to comment upon what is in my view a highly successful program of activities run with meagre funds but a great deal of enthusiasm by its leaders and participants.

With kind regards,

Yours sincerely

L.D. Swindale
Director General

cc: Dr. Hari Eswaran
Dr. Sehgal
Dr. A.H. van Wambeke
Dr. McCracken

LDS:jg

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Dr. T. S. GILL,
Chief, S & T/AGR/RNR
Agency for International Development
WASHINGTON D.C. 20253
USA

GENT, April 30, 1986

Subject : external review of soil management support services

Dear Dr. Gill,

Enclosed you will find my assessment of the SMSS-Project.

Yours sincerely,

Prof. Dr. R. TAVERNIER.

R. TAVERNIER

EVALUATION OF THE SOIL MANAGEMENT SUPPORT SERVICES PROJECT

ISSUE 1. SOIL TAXONOMY

SMSS has been thoroughly involved in activities for refining Soil Taxonomy for better use in the intertropical countries, in promoting the use of the system and, although often indirectlt, in helping to make soil interpretations.

a. Successfulness of the Eighth International Soil Classification Committees

Some committees, like ICOMLAC, already started their activities before the creation of SMSS, while other ICOM's, like ICOMOD, have only been created recently. One can state that all ICOM's contributed to a large extent to a better understanding of the problems related to refinement of Soil Taxonomy for the intertropical zones. ICOMLAC has virtually terminated its activity. However, since the conclusions of ICOMLAC also affect the classification of the Oxisols, no decision could be taken before ICOMOX made its final proposals.

In general the pace of work of the ICOM's has been satisfactory to very good, but up till now the Soil Survey Division of the USDA . SCS has officialized very few of the proposals made by the various ICOM's, although many of the proposals are apparently well received (such as the introduction of a new order of Andisols, extension of Mollisols in tropical conditions). Most probably, because of the sound and well-founded recommendations, the ICOM's propositions will have a strong impact on the refinement of Soil Taxonomy in the near future.

A very important contribution of SMSS to improve the use of Soil Taxonomy has been the publication in 1983 of the "Keys to Soil Taxonomy". Those keys not only provide the data required for the classification but also serve as a means of providing an up-to-date edition of Soil Taxonomy that includes all revisions that have been approved. Already a new edition of these keys was published in 1985, incorporating amen nents accepted in August 1984 and December 1984.

Another important contribution to the use of Soil Taxonomy has been the publication by SMSS of a series of monographs on Soil Moisture and Temperature Regimes of the various continents.

Nowadays, Soil Taxonomy is used in most of the developing countries as the national classification system. A few countries, like Brasil, and some of the former French colonies still have their own national system but all use Soil Taxonomy as an adjunct system for international correlation. This increased acceptance is due to a large extent to the organisation of ICOM's meeting in the developing countries (with large attendance of local soil scientists) and to the organisation of Forum, especially in French speaking countries.

In general the SMSS supporting activities have been successful and cost-effective, the more that very often other organisations have co-operated with SMSS.

ISSUE 2. WORLD BENCH MARK SOIL PROJECT (WBSP)

The WBSP started its activities before the creation of SMSS. However, WBSP has been a strong support for the later established ICOM's in providing standardized descriptions and analyses of soils, particularly in relation with the organisation of ICOM's workshops.

In the beginning the information contained in traditional surveys was not always adequate in order to make accurate and specific prediction on soil behavior (often the mapping units that not include data on the soil family). However, mainly due to support of SMSS great progress has been made (better and more complete profile descriptions and standardized analyses). WBSP has proved that agrotechnology transfer by analogy is possible but rather costly. The first results of the International Benchmark Sites Network indicate that simulation models may be not only a successful but a more cost-effective approach. SMSS has already contributed to this new approach, mainly through the organization of Forums.

ISSUE 3. TRAINING AND WORKSHOPS

The training program of SMSS (Forums) was focussed in the beginning mainly on training in Soil Taxonomy. However, gradually more emphasis has been given to soil survey interpretation. All the Forums I attended have been very successful, adn resulted generally in a co-operation with international and national institutions. I believe that SMSS should extend its training activities in the LDC in the future, certainly in the French speaking countries. Perhaps SMSS might be more helpful in making, in co-operation with the local scientists, better standardized profile descriptions, and particularly in providing soil analytical data. This approach has recently been very successful for the Ruanda-Burundi Forum.

ISSUE 4. TECHNICAL ASSISTANCE

It seems an adequate approach for SMSS to respond only on requests. However, it seems to me worthwhile to focus on a certain number of selected countries where USAID Missions are very active. This could extend the role played by SMSS in network activities.

ISSUE 5. STRATEGY

In the future, in LDC countries where Soil Taxonomy is already well understood and that have a sufficient number of well trained Soil Scientists and laboratory facilities,more emphasis could be given to soil survey interpretations, land-use evaluation and soil conservation. However, there are still a great number of LDC where a better understanding of Soil Taxonomy is of paramount importance, particularly in Africa, especially in the French speaking countries of that continent. Since SMSS is now preparing a French translation, not only of the Keys, but also of a major part of Soil Taxonomy, the conditions are now very favorable.

ISSUE 6. BACKSTOPPING

SMSS has been an effective mechanism for transferring of US soil science resources, providing benefits to both LDC and the US. Presently at least for the next few years there seems no need to redesign the program.