PDWAN592

SOIL M

PRO

FOR

SEPT. 25, 1

TABLE OF CONTENTS

SOIL MANAGEMENT CRSP

PROGRESS REPORT

SEPTEMBER 25, 1981 - NOVEMBER 30, 1983

ORGANIZATIONAL ACHIEVEMENTS

In planning for the Soil Management CRSP, written commitments were obtained from potential collaborating countries. However, these statements lacked official approvals for government sanction, personnel perquisites and duty-free importation privileges. Therefore, formal agreements were negotiated. In keeping with the concept of a collaborative program, these are tripartite Agreements that involve the collaborating country, the participating university and the Management Entity. While enthusiasm prevailed among all parties and efforts were made to implement the programs as early as practical, obtaining official approvals required substantially more time than was anticipated. The dates at which these were completed were: Semi-arid Tropics (Niger), May 3, 1983; Acid Savannas (Brazil), June 30, 1983; Humid Tropics (Indonesia), June 22, 1983; Humid Tropics (Peru), September 19, 1983. The late date on final action had no impact on implementation of the Peru program since it was developed out of a pre-existing one and Agreements in place were utilized. However, delays caused some problems for initiating the research in Niger and resulted in a substantial impediment to on-site investigations in Brazil and Indonesia. Consequently, the accomplishments to date differ among the research sites.

The local USAID missions participated throughout the negotiations on the Agreements. Their personnel were fully supportive of the programs, provided wise counsel on deliberative procedures and gave words of encouragement during periods of apprehension.

Programs have been planned and are being implemented jointly between the collaborating country and the participating university at all sites. Each university has one or more senior scientists and one or more graduate students on location in the collaborating country.

An external evaluation panel has been formed and is actively involved in developing operational guidelines and procedures. Schedules are being considered for visits to research sites in the collaborating countries.

The acronym "TropSoils" has been adopted for the Soil Management CRSP and a logo developed for use on informational materials. A newsletter TropSoils Communiqués has been created and will be issued periodically to a broad-based audience.

RESEARCH HIGHLIGHTS

HUMID TROPICS - PERU

Research objectives were established with considerations given to recommendations from an intensive review of a previous project conducted shortly before initiation of the CRSP supported research. The scope of the program has been modified to include weed and erosion control and various management options for soils on different landscape positions.

Results continue to support earlier evidence that continuous cropping is an agronomically feasible alternative to shifting cultivation. Inputs of lime and essential nutrients necessary to achieve desirable production levels are being defined, consistent with soil-nutrient dynamics over time of cropping. Low input soil-crop management systems have been identified and are being evaluated. The importance of land clearing operations on soil physical properties and methods for ameliorating adverse effects have been identified. The evidence and experience gained from research on site, extrapolative studies and general analysis have been used to develop a model for soil management options. The model incorporates soils, landscape position and infrastructure development. While the specific immediate application is to the Selva of Peru, it has potential utility for other humid environments.

HUMID TROPICS - INDONESIA

A preliminary geostatistical map has been completed of soil variation in the transmigration region of West Sumatra. The data set was used to identify and map microvariations of soils in an area with the size representative of those of the typical transmigrant land holding. Other locations have been identified for field research related to land clearing and land restoration. Thirteen fertility and land management experiments were planted at the onset of the wet season at these sites in farmers' fields.

The objectives for the soil management and socioeconomic research are designed to be collaborative, farmer based and interdisciplinary to mutually benefit from collaborating country experience and inputs.

SEMI-ARID TROPICS

A detailed map of the soils of the Sahelian Research Center, an ICRISAT facility near Niamey, Niger, has been finalized and the chemical and physical characterization of the soils is nearing completion. This information will be useful in designing experiments to be conducted at the Center and interpreting

results obtained from them. A team of geomorphologists have studied the soils and landscapes on the Center and surrounding area and concluded that those at the Center are representative of a broad region. This similarity will be valuable in extrapolating results of research. Exploratory studies have been initiated to obtain baseline data for refining objectives and methodology on water utilization and soil management research.

Acid Savannas

Research objectives have been refined to reflect the funding situation, broad scale soil management information needs for the acid savannas agroecological zone and priorities of the collaborating country. Nitrogen continues to be a limiting factor for nonlegume crop production in this region. Fertilizer nitrogen is too costly to be a practical source for many farmers and those who are using it need technology to increase its efficiency and reduce dependence on this expensive input. Major emphasis is being given to research designed to enhance utilization of organic sources of nitrogen consistent with minimum inputs of other nutrients. A portion of the research will be devoted to developing a scientific data base and a portion to developing practical management schemes for farmers.

Studies have been initiated to determine the native status and critical levels of micronutrients in representative soils. An extensive soil sampling survey and field experiments are expected to close the knowledge gap on critical levels of selected micronutrients needed for crop production in the region.

Current Research Topics

Humid Tropics - Peru

Cropping Systems:High Inputs - Soil dynamics, soil fertility depletion; weed control; erosion control; mechanized farming.

Cropping Systems:Low Inputs - Cultivar screening for acid soil tolerance; minimum tillage and nutrient interactions.

Legume-Based Pastures - Grass-legume mixture under grazing; pasture reclamation; pasture quality and nutrient cycling; germplasm evaluation.

Intensive Management of Alluvial Soils - Varietal adaptation; land preparation and planting systems; nitrogen and phosphorus fertilization; weed control.

Tree Based Production Systems - Intercropping with Gmelina Arborea; agroforestry species germplasm collection; alley cropping; Gmelina and peach palm fertilization; peach palm-legume cover crops; managed fallows.

Validation and Extrapolation - Soil characterization and FCC refinement; studies with INIPA research stations, universities and farmers involving high input technologies; acid tolerant species of rice and cowpea; grass-legume pasture systems; paddy rice pilot farms.

HUMID TROPICS - INDONESIA

Soil Reclamation - Tillage treatments; lime rates and placement; phosphorous rates, crop rotations.

Fertilization - Magnesium sources, rates and time of application; phosphorous sources and rates; urea characteristics and rates.

Grass-legume mixtures - Evaluation of species for tolerance to soil acidity and low phosphorus for use as ground covers after land clearing.

Soil Acidity Management - Lime source, rates and placement; aluminum saturation; species tolerance.

Soil Variability - Spatial variability of chemical and physical properties on a regional (5-50 km) and on a micro (0.5-5 m) scale; effects on crop productivity.

Farming Systems - Research in farmers' fields with commonly grown food crops; effect of time allocation and work distribution among family members on adoption rate of research findings.

SEMI-ARID TROPICS

Soil/Plant/Water Relationships - Water balance for different soils and cropping systems; soil temperature characterization and modification; wind erosion control; soil crust causation and amelioration; effect of annual windbreaks; soil water balance and crop yields.

Pedological Investigations - Completion of soil survey of Sahelian Research Center; reconnaissance of soil/geomorphological relationships in vicinity of primary research site.

Soil and Water Conservation - Basic and applied research.

ACID SAVANNAS

Nitrogen Management - Fixation and mineralization of organic nitrogen from green manure crops and uptake by maize; model for nitrogen movement and loss in agricultural soils.

Soil Acidity Management - Calcium-phosphorus interactions; calcium movement to subsoils; aluminum chemistry of Ultisols and Oxisols.

Micronutrients - Critical levels and current status in soils.

Sulfur - Critical levels, recycling and losses.

Characterization of Soils - Methodology for using satellite imagery to extrapolate soil management technology.

Collaborating Institutions

Humid Tropics - Peru

North Carolina State University
Instituto Nacional du Investigacion y Promocion Agraria (INIPA)
Centre Internacional de la Papa (CIP)

Humid Tropics - Indonesia

University of Hawaii
North Carolina State University
Center for Soils Research, Agency for Agricultural Research and Development (CSR/AARD)

Semi-arid Tropics

Texas A&M University
Institut National de Recherches Agronomiques du Niger (INRAN)
International Crops Research Institute for the Semi-arid Tropics (ICRISAT)
Purdue University

Acid Savannas

Cornell University
North Carolina State University
Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA)

Leadership Personnel

Humid Tropics - Peru

Robert H. Miller - Board of Directors, North Carolina State University
Victor Palma - Board of Directors, INIPA, Lima, Peru

Pedro A. Sanchez - Co-Principal Investigator, North Carolina State University
John J. Nicholaides, III - Co-Principal Investigator, North Carolina State University
Victor Palma - Country Coordinator, INIPA, Lima, Peru
Robert H. McCollum - Team Leader, North Carolina State University
J. R. Benites - Senior Scientist, North Carolina State University

Humid Tropics - Indonesia

Ada B. Demb - Board of Directors, University of Hawaii
D. Muljadi - Board of Directors, CSR/AARD, Bogor, Indonesia
Goro Uehara - Principal Investigator, University of Hawaii
Pedro A. Sanchez - Co-Principal Investigator, North Carolina State University
John J. Nicholaides, III - Co-Principal Investigator, North Carolina State University
M. Sudjadi - Country Coordinator, CSR/AARD, Bogor, Indonesia
John R. Thompson - Team Leader, University of Hawaii
Carol J. Colfer - Senior Scientist, University of Hawaii
Michael K. Wade - Senior Scientist, North Carolina State University

Semi-arid Tropics

Edward C. Runge - Board of Directors, Texas A&M University
Mamadou Ouattara - Board of Directors, INRAN, Niamey, Niger
Frank G. Calhoun - Principal Investigator, Texas A&M University
Mamadou Ouattara - Country Coordinator, INRAN, Niamey, Niger
Robert G. Chase - Team Leader, Texas A&M University

Acid Savannas

Edward B. Oyer - Board of Directors, Cornell University
Elmar Wagner - Board of Directors, EMBRAPA, Brasilia, Brazil
Douglas J. Lathwell - Principal Investigator, Cornell University
Pedro A. Sanchez - Co-Principal Investigator, North Carolina State University
John J. Nicholaides, III - Co-Principal Investigator, North Carolina State University
Edson Lobato - Country Coordinator, EMBRAPA, Brasilia, Brazil
Eric Stoner - Team Leader, Cornell University

MANAGEMENT ENTITY

J. Lawrence Apple - Coordinator, North Carolina State University
Charles B. McCants - Director, North Carolina State University
Kim S. Stevens - Administrative Assistant, North Carolina State University

EXTERNAL EVALUATION PANEL

John K. Coulter - World Bank
Peter E. Hildebrand - University of Florida
Marlowe D. Thorne - University of Illinois

AGENCY FOR INTERNATIONAL DEVELOPMENT

John L. Malcolm - Program Manager, S&T/RNR

FINANCIAL

AID Funding Authorized September 25, 1981 - February 29, 1984	$5,635,718
AID Funding Committed September 25, 1981 - February 29, 1984	$5,450,000
AID Funds Expended September 25, 1981 - September 30, 1983	$2,877,753

Soil Management Collaborative Research Support Program

Administrative Report

for the Period

September 25, 1981 - February 28, 1983

Prepared by:

Charles B. McCants
Kim S. Stevens

Management Entity
Soil Management CRSP
North Carolina State University
Raleigh, North Carolina

Soil Management Collaborative Research Support Program

Administrative Report

for the Period

September 25, 1981 - February 28, 1983

BACKGROUND

The final program proposal for the Soil Management CRSP was submitted to the Agency for International Development (AID) by the Planning Entity on October 14, 1980. It provided a high degree of specificity on research strategy, collaborating host country institutions, participating U.S. universities, staffing patterns and budgets. These recommendations were based on information obtained from detailed on-site discussions with potential host country participants, expressions of interest from local AID missions, written proposals from universities and suggestions by an External Advisory Panel composed of scientists experienced in international agricultural development.

The grant to the Management Entity was effective September 25, 1981. The duration is five years and differs from the proposal submitted by the Planning Entity only in limitations caused by budget constraints. The number of agroecological zones for research was reduced from four to three, the number of participating U.S. universities from six to four and the authorized AID budget from $25,851,000 to $12,750,000.

Subgrants between the Management Entity and the participating universities were completed in January, 1982, and actions initiated at that time to develop the protocol to permit on-site posting of personnel in host countries. The humid tropics/Peru program is based on one initiated with previous AID funding; the Memorandum of Agreement (MOA) developed for it has continued to be used. For the other countries, the Director of the Management Entity and the Principal Investigator for the respective agroecological zone prepared a draft MOA, transmitted it to the country and later made on-site visits to discuss the MOA in detail and make mutually acceptable revisions. The dates of these visits were: humid tropics/Indonesia--March and September, 1982; semi-arid tropics/Niger--February and September, 1982; acid savannas/Brazil--April, 1982. In addition, exploratory discussions have been held with the government of Mali, the government of Upper Volta and with ICRISAT. The MOA with Niger is the only one that has been officially approved.

CURRENT STATUS

Management Entity

The staff of the Management Entity consists of the Director and an Administrative Secretary. Initial steps have been undertaken to upgrade the support position to Administrative Assistant and to establish a secretary and a communication specialist position.

The Board of Directors and Technical Committee approved the acronym "TropSoils" for the program and a logo has been developed. The first issue of the periodical news organ TropSoils Communiqués was issued on October 1, 1982. The intent is that it be published on a quarterly basis. However, the absence of a communication specialist, the high priority given by the Director to negotiating host country agreements and the assistance provided by the Management Office to the participating universities have prevented preparation of the second issue.

Growth of the program has resulted in a dramatic increase in the number of questions that need attention. Many of them relate to policies, procedures and allowable expenditures that are not addressed in sufficient detail by current references. In response to an evident need, the Management Office, in collaboration with the participating institutions and AID, is developing a policy and procedures manual.

Humid Tropics/Indonesia

The lead institution, University of Hawaii, has employed an on-site coordinator[1/] and a research leader; the support institution, North Carolina State University, has employed a research leader. Both research leaders have extensive experience in working in developing countries. However, the inability to obtain approval of a MOA has prevented the posting of any personnel in the host country.

Each University has made a commendable effort to initiate such research as can be done under the constraints. Data from 88 soil profiles from the transmigration area in West Sumatra have been obtained. A geostatistical analysis of these data shows that there is considerable structure in the variance indicating that it will be possible to produce computer generated maps of the distribution of soil pH, phosphorus, aluminum saturation and sand, silt and clay content. The objective is to use geostatistics to develop soil constraints maps for guiding the application of soil management inputs into locations of greatest influence.

[1/] On-site coordinators for each agroecological zone also conduct independent research.

Humid Tropics/Peru

The internal situation in the host country has not been conducive to opening negotiations for developing a MOA for the Soil Management CRSP. This action will be taken as soon as appropriate. Previous agreements with a host country institution and with the International Potato Center provide a satisfactory umbrella for current operations.

Attention has been given to revision of the previous program to meet the CRSP objectives. New and continued field research experiments, mostly near Yurimaguas, are concentrated on the following subjects.

a. Evaluating the medium and long-term stability of fertilizer-based continuous cropping systems. The three-crop-per-year rotation, which averages nearly 10 t/ha yield, is very good as long as the required fertilizer inputs are made. Weed control is becoming a limiting factor and major research efforts are being initiated on this topic.

b. Developing minimum input crop production systems. The most promising components appear to be 1) use of acid-tolerant species and varieties leading to a new rotational system of rice-peanuts-cowpeas which requires little lime and 2) use of rock phosphate which allows the soil's acidity to solubilize the phosphorus rather than employ an expensive industrial process. Other potential components are minimum tillage and managed kudzu fallows.

c. Developing alternate farming systems for soils on various landscape positions. Major efforts are underway on 1) legume-based pastures; 2) agroforestry and 3) intensive management of alluvial soils.

d. Extrapolating, validating and adapting improved agronomic technologies on 1) surrounding farm lands; 2) research sites in other areas of the Peruvian jungle and 3) areas of the Brazilian jungle near Manaus.

e. Characterizing soils, especially via the Fertility Capability Classification (FCC) System to assist the extrapolation efforts; including 1) refinement of FCC and near completion of an FCC map of the developing world and 2) soil genesis research on pockets of Alfisols within the Amazon Basin.

f. Fostering technology transfer via participation in 1) research networks; 2) conferences and symposia; 3) publishing technical and general articles and 4) formal training of soil scientists from developing and developed countries.

Semi-Arid Tropics/Niger

The MOA to permit posting of personnel in Niger is expected to be approved in March, 1983. Texas A&M University has an employee prepared to move to the host country shortly thereafter.

A report is nearing completion on a soil survey made by Texas A&M personnel of the ICRISAT Sahelian Center near Niamey, Niger. Field work for the survey of this 500 ha research station was finished in 1982 and laboratory characterization of soil samples is in progress. The data and associated text will be compiled in a formal document which will include classification of the soils by both the U.S. and French systems. The publication will be printed in English and French languages.

Details have been developed on two research projects: 1) soil temperature modification and 2) amelioration of wind erosion/sand blasting by soil surface manipulations. Components of these will be conducted in Niger and in Texas.

The potential for establishing secondary research sites have been examined in Upper Volta, Mali and Cameroon. Some encouraging evidence has developed.

Campus-based research supportive of the program objectives is in progress. It includes studies on the role of iron in soil crusting and on cropping systems, wind erosion control and water management for dryland conditions.

Acid Savannas/Brazil

The original grant did not provide for research in this agroecological zone. However, a communication from the Administrator of AID requested that consideration be given to work in this region. In November, 1981, a formal recommendation was made that Cornell University shift its research from the humid tropics/Peru to the acid savannas. However, formal action was not completed until October, 1982. During the interim, discussions were initiated with EMBRAPA, the Brazilian research organization, and following AID approval for the program a MOA submitted to Brazil for action. The verbal response has been positive, but formal approval has not occurred. Thus, it has not been possible to post on site the senior scientist and junior scientist employed by Cornell University and, thus, to initiate the research.

Considerable effort has gone into developing analyses of research needs and proposals for investigations at the Cerrado Center of EMBRAPA at Planaltina, Brazil. A high priority objective is to maximize the utilization of nitrogen in the cropping system. With the high cost of synthetically fixed nitrogen, the use of biologically fixed nitrogen becomes more attractive. Along with this is the

need for soil erosion control and development of long-term cropping systems. The conventional lime, phosphorus and potassium requirements will be developed as part of longer term management systems.

A specific research proposal has been prepared with the objectives of identifying tropical legumes capable of accumulating large amounts of nitrogen and which have good potential as green manure crops on acid savanna soils. An associated objective is to evaluate management requirements necessary to utilize the potential of these tropical legumes as nitrogen fixers. The goal of this particular research is to develop a legume green manure management program that can be used within a non-legume cropping system.

PERSONNEL

Management Entity

Management Office
Charles B. McCants, Director
Kim S. Stevens, Administrative Secretary

Board of Directors
Morris E. Bloodworth, Chairman
Ada B. Demb
J. Lawrence Apple
Edwin Oyer

Technical Committee
Frank G. Calhoun, Chairman
Douglas J. Lathwell
Goro Uehara
John J. Nicholaides

External Evaluation Committee
John K. Coulter, Chairman
Marlowe D. Thorne
Peter E. Hildebrand

Country Programs

Name	Position	Percent Salary from CRSP Funds
	Humid Tropics/Indonesia University of Hawaii	
Uehara, Goro	Principal Investigator	0
Thompson, John	On-Site Coordinator	0
Colfer, Carol	On-Site Research Leader	100
Cagauan, Bernardino, Jr.	Research Associate	10

Name	Position	Percent Salary from CRSP Funds
Chan, Clement P. Y.	Computer Specialist	10
Chang, Annette	Administrative Assistant	25
Manuelpillai, George	Administrat· . Manager	25
Murabayashi, Naomi	Clerk Typist/Word Processor	100
Sakumoto, Suemi	Account Clerk	10
Tsuji, Gordon	Project Manager	10
Yost, Russell	Assistant Agronomist	15
	Humid Tropics/Indonesia	
	North Carolina State University	
Nicholaides, J. J.	Principal Investigator	84
Wade, M. K.	On-Site Research Leader	100
Makarim, K.	Junior Scientist	0
	Humid Tropics/Peru	
	North Carolina State University	
Nicholaides, J. J.	Principal Investigator	84
McCollum, R. E.	On-Site Coordinator	100
Benites, J. R.	On-Site Research Leader	100
Alegre, J. R.	Junior Scientist	100
Ara, M. A.	Junior Scientist	100
Bandy, D. E.	Assistant Professor	10
Buol, S. W.	Professor	20
Cassel, D. K.	Professor	25
Gichuru M. P.	Junior Scientist	100
Gill, D. W.	Junior Scientist	50
Hoag, R. E.	Junior Scientist	50
Johnson, D. F.	Secretary	8
Katz, L. B.	Junior Scientist	100
Miller, R. H.	Department Head	10
Monar, B. I. 2/	Administrative Assistan	100
Piha, M. I. 2/	Research Assistant	100
Powell, J. A.	Research Technician	100
Sanchez, P. A.	Professor	10
Silsbee, D. M.	Secretary	100
Smithson, P. C.	Research Technician	100
Szott, L. T.	Junior Scientist	100
	Semi-Arid Tropics/Niger	
	Texas A&M University	
Calhoun, F. G.	Principal Investigator	25
Chase, R. G.	On-Site Coordinator	100

2/ Terminated October 31, 1982.

Name	Position	Percent Salary from CRSP Funds
Bui, Elisabeth	Junior Scientist	100
Caldwell, Kimberly	Secretary	100
Gardiner, James	Junior Scientist	100
Landeck, Jonathon	Junior Scientist	100
Moreno, Christiana C. de	Clerk	100
Pearcy, Carol A.	Student Researcher	100
Ramirez, Alejandro	Student Worker	100
Shadfan, Harbi	Research Associate	100
Yerima, Bernard P. K.	Junior Scientist	100
	Acid Savannas Cornell University	
Lathwell, D. J.	Principal Investigator	0
Stoner, Eric R.	On-Site Coordinator	100
Bowen, Walter T.	Junior Scientist	100

FINANCIAL STATEMENT

AID Funding

Unit	Allocation	Expenditures	Balance
Management Entity	$ 451,000.00	$ 198,863.48	$ 252,136.52
Cornell University	185,000.00	19,870.47	165,129.53
Univ. of Hawaii	663,000.00	85,434.46	577,565.54
N.C. State Univ.	1,461,000.00	1,149,722.08	311,277.92
Texas A&M Univ.	690,000.00	229,957.05	460,042.95
Total	$3,450,000.00	$1,683,847.54	$1,766,152.46

University Cost Sharing

Cornell University	$ 33,293.34
N.C. State University	404,706.62
Texas A&M University	80,954.42
University of Hawaii	20,890.00