PD-ABD-945

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: — DOCUMENT CODE: 3

76415

COUNTRY/ENTITY: Worldwide

2. PROJECT NUMBER: 936-4198

4. BUREAU/OFFICE: R&D/AGR [10]

5. PROJECT TITLE (maximum 40 characters): Sustainable Agriculture Systems-CRSP

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 02

7. ESTIMATED DATE OF OBLIGATION (Under "B." below, enter 1, 2, 3, or 4): A. Initial FY 92 B. Quarter 4 C. Final FY 01

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. Total	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. Total
AID Appropriated Total	1,850	-	1,850	36,250	-	36,250
(Grant)	(1,850)	(-)	(1,850)	(26,250)	(-)	(26,250)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1. Mission/Reg. Bur.	-	-	-	10,000	-	10,000
Other U.S. 2. Buy-ins						
Host Country						
Other Donor(s)						
TOTALS	1,850	-	1,850	36,250	-	36,250

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	C. PRIMARY TECH. CODE 2. Loan	D. OBLIGATIONS TO DATE 1. Grant	D. OBLIGATIONS TO DATE 2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	E. AMOUNT APPROVED THIS ACTION 2. Loan	F. LIFE OF PROJECT 1. Grant	F. LIFE OF PROJECT 2. Loan
(1) ARDN	141	099		-	-	26,250	-	26,250	-
(2)									
(3)									
(4)									
TOTALS				-	-	26,250	-	26,250	-

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 059 | 069 | 053

11. SECONDARY PURPOSE CODE: 121

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code							
B. Amount	R/AG 26,250	BR 26,250	INTR 26,250	XII 26,250			

13. PROJECT PURPOSE (maximum 480 characters).

To stimulate and support innovative, integrated systems-based research that will lead to the identification and development of sustainable agricultural production and natural resource management systems in developing countries.

14. SCHEDULED EVALUATIONS: Interim MM 09 YY 94 | | Final MM 09 YY 01

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [ ] 941 [ ] Local [X] Other (Specify) .

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment)

1. The initial obligation year is FY 1992.
2. The final obligation year is FY 2001.
3. The LOP funding is $26,250,000.
4. The project will be implemented through non-competitively and competitively bid grants.

17. APPROVED BY — Signature: [signature] — Title: Hans P. Peterson, Director, R&D/AGR — Date Signed: MM 06 DD 10 YY 92

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

PD-ABD-945

- 4 1992

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, BUREAU FOR RESEARCH AND DEVELOPMENT

From: H. P. Peterson, Director, RD/AGR

Subject: Authorization of the Sustainable Agriculture Systems Collaborative Research Support Program (CRSP) (936-4198) Project.

PROBLEM: Your authorization is requested to initiate a new centrally-funded project entitled "Sustainable Agriculture Systems" (936-4198), in the amount of $ 26,250,000 from the Agriculture, Rural Development and Nutrition account.

DISCUSSION: In recognition of the critical roles that agricultural goods and services and environmental concerns play in promoting broad-based economic development and human welfare, and in response to growing support for sustainable agriculture and natural resource strategies, the U.S. Congress recommended that the Agency for International Development (AID) develop a new Collaborative Research Support Program (CRSP) that would focus on research needed to improve natural resource management for sustained agricultural production.

In FY 1990, AID awarded the Sustainable Agriculture Systems CRSP planning activity to the National Academy of Sciences (NAS) through an existing Cooperative Agreement with the Science Advisor's Office. The activity was implemented for a period of one year to identify constraints to development of sustainable agricultural systems and to prepare a research plan for a program that would bring about sustainable agriculture in developing countries under a management scheme consistent with the Agency's CRSP Guidelines. The Academy's final report identified researchable constraints to sustainable agriculture, identified required component disciplines, identified program criteria required for the selection of the institution(s) to undertake the integrated research program, and recommended the organizational structure needed to implement the research and disseminate the results.

The technical and program outline prepared by the NAS provided AID and the scientific community with a general approach for a project. One recommendation by the NAS was that, in order to promote the creativity of the scientific community, the final research design should be the responsibility of the proposer. The new design activity was identified as the Sustainable Agriculture and Natural Resource Management (SANREM) Project.

After careful consideration the AID Project Committee approved the continuation of the planning process up to the issuance of the award of the final global research plan. A copy of the authorization is attached for your information. This

decision resulted in AID issuing competitive Requests for Applications, awarding (competitively) individual and institutional planning grants, and implementing a unique proposal review process: AID controlled all contracting actions and the NAS was contracted to undertake an external, technical peer review and rating of all final proposals.

Other Offices and Bureaus have been encouraged to participate in the design of the project. The interbureau Sustainable Agriculture/Integrated Pest Management Subgroup of the Agency's Environmental Working Group was actively involved with general policy and design issues up to the competitive contracting stage. As a result, a strong interest and serious proposals to fund the program have been made by the Africa and Latin America Bureaus, and the Offices of Economic and Institutional Development, and Forestry, Environment and Natural Resources. AID field missions have been involved from the beginning starting with the sharing of the NRC report through the concurrence and interaction with the country site visits by the CRSP design teams. The missions will comment on the final CRSP design. Although faced with diminishing funding and personnel resources, missions continue to strongly endorse the program.

To support the proposed SANREM CRSP and other CRSP and non-CRSP research activities managed by the Office of Agriculture, an integrated set of information sharing and monitoring activities and a number of small research support grants are being developed. All of these activities will relate to international SANREM research programs and will serve to increase technical knowledge or communicate research findings and increase the efficiency and creativity of ongoing and planned research.

PROJECT DESCRIPTION:

This project is composed of three components, Part A, Part B, and Part C:

Part A: Cooperative Agreement for a new CRSP.

A cooperative agreement with a U.S. university under the CRSP Guidelines will have a 10 year implementation time frame, however the initial cooperative agreement will be for 5 years. This component will stimulate and support innovative, integrated systems-based research needed for the maintenance of the environment. The research will promote a greater understanding of the interactions of agricultural production systems with the socio-economic-political environment. The research will place priority on those agricultural activities which build on a country's comparative advantage and optimize present and future uses of natural resource endowments in an environmentally sound manner. The SANREM CRSP will permit R&D/AGR and related R&D

offices to provide a greater balance and integration among agriculture, ecological and socio-economic policy goals and provide additional analytical methodologies for evaluating results on the basis of multiple criteria including productivity, profitability, stability, equity, environmental quality and sustainability. In addition, to the fullest extent possible, farmers will actively participate in each phase of the research process, from initial planning and testing to technology development, dissemination, and other extension-related activities.

Specifically, the CRSP will finance a series of research, training and outreach activities in support of four critical areas of inquiry and include:

1) integrated nutrient management which seeks to integrate chemical, biological and cultural sources of nutrients essential for crop production. Although the concept is applicable in all agricultural systems, it is of particular importance in areas where the quality and productivity of the soils are deemed poor;

2) integrated pest management which seeks to control pre- and postharvest weeds, arthropod and vertebrate pests, and pathogens by using multiple chemical, biological, and cultural tactics to maintain pest damage below an economic injury level while providing protection against hazards to humans, animals, plants and the overall environment. The focus will be in the integrated management of inputs for control;

3) integrated institutional management which seeks to guide the complex interactions between food and fiber production and the policy, trade and political environments; and,

4) the social, economic, political and institutional context within which on-farm and off-farm activities take place in order to identify and suggest remedial steps that can help remove constraints to sustainability.

The SANREM CRSP will target its investments on the above areas and provide research and development opportunities that:

(a) integrate interdisciplinary research and systems analysis during design, implementation, and evaluation of all activities;

(b) encourage collaboration among U.S. agricultural scientists, the international community and their developing country partners; and,

(c) provide mechanisms for dissemination of information on components and systems developed through Agency and other donor programs and professional networks.

A copy of the detailed research and implementation plan is attached to this memo.

Part B: Research Support Grants on Sustainable Agriculture.

This component will award a number of grants to support research of direct and immediate relevance to the goals of the Sustainable Agriculture Systems Project. This grant mechanism will permit the program to have access to and incorporate

research results on aspects of sustainability which are under current investigation but external to the project.

These research grants will be awarded based on both solicited and unsolicited research proposals only after undergoing an external technical peer review. Grants will be limited to a maximum of three years duration and maximum funding of $100,000 per year.

Part C: Information Management System.

This component will support the knowledge building activities of the sustainable agriculture and natural resource management sectors by concentrating on enhancing information access, retrieval, and sharing among researchers working in theme areas which support the Agency's developmental activities in these sectors.

An integrated set of information sharing and monitoring activities related to international sustainable agriculture and natural resource management programs will be designed to assist with the dissemination of research findings, increase the efficiency and creativity of ongoing and planned research (a two-way information flow) and support the overall Office of Agriculture's portfolio. Additional specialized program staff will also be acquired to help direct and review research activities, and to provide support to professional staff already involved in these activities.

This component has the following three subcomponents:

1) establish an international information exchange program which will: (a) establish a periodic newsletter that will notify program participants of upcoming events, workshops, meetings, recent research activities, publications and other documents, and serve as an open forum for readers to

exchange views and discuss research findings. Two groups have been targeted for this information: international researchers and local producers (farmers); (b) explore the feasibility of electronically linking computers of international researchers and publishers to facilitate information, data and publication exchanges on sustainable agriculture topics; and (c) distribute literature and publications on topical subjects of sustainability to AID/W and field mission technical staff.

2) contract additional staff to support the sustainable agriculture systems program to provide design, evaluation and technical analysis in program areas to AID/W and field support to field Missions.

3) provide sponsorships and funding for international conferences, workshops and colloquia which encourage and provide a means by which the global agricultural and natural resource community can discuss new ideas and provide alternative perspectives on timely topics and subject matter, among themselves and other decision and policy makers.

PROJECT DATA: The initial obligation year is FY 1992, and it is planned that a total of $1,850,000 of central funds will be obligated the first year. The final year of obligation is FY 2001.

In addition to the amount proposed above, an estimated $10,000,000 may be contributed to this project by Missions, Regional Bureaus, and other offices of AID. Funding may be provided from the Economic Support Fund (ESF) or the Development Fund for Africa (DFA), as well as the accounts authorized for R&D funding under this project.

Attached are copies of the project budget and approved Initial Environmental Examination.

SPECIAL INTEREST IN THE PROJECT: The FY 1990 Reports of the House and Senate Appropriations Committees recommend that AID, in collaboration with BIFAD, commit $10 million over three years to establish a new Collaborative Research Support Program in Sustainable Agriculture and Natural Resource Management. We view the previous planning activity under Project 396-4193 and the CRSP element of this program as AID's response to this recommendation.

WAIVERS, SPECIAL CLEARANCES, PROVISIONS AND DETERMINATIONS: It is anticipated that this project will not require any special

waivers, clearances or provisions and determinations.

BIFADEC REVIEW: BIFAD formally reviewed this project on March 15, 1990 and approved the planning and design elements for the new CRSP. On April 18, 1991, JCARD formally reviewed the proposed program and approved the modified CRSP design and management approach of the program.

CONGRESSIONAL JUSTIFICATION: A substantive Congressional notification will be sent to Congress as soon as this project has been authorized.

PROCUREMENT PLAN AND BUDGET: The project will be implemented in FY 1992 by means of a competitively bid Cooperative Agreement for Part A, competitive and non-competitive grants for Parts B & C, and IPA agreements and other forms of contracts for Part C. The FY 1992 OYB has $1,850,000 to initiate the project; the FY 93 CP has programmed $2,200,000. A copy of the approved procurement plan is attached.

RECOMMENDATION: That you sign the attached project authorization.

Attachments:

1. Project Data Sheet
2. Project Authorization
3. Project Planning Action Memo/Authorization
4. Collaborative Research Program Description
5. Life of Project Budget
6. Initial Environmental Examination
7. Life of Project Procurement Plan

Clearances:

RD/AGR/EP:VCusumano _____ Date: 4/3/92
RD/AGR:ECarter _____ Date: 4/9/92
RD/AGR:AHurdus _____ Date: 4/10/92
RD/PO:DErbe _____ Date: 4/27/92
GC/RD:GWinter (draft) Date: 04/02/92
FM/OP/B/LA:JBergman (subst) Date: 04/03/92

RD/AGR:JBonner/MBlakeney:04/01/92:auth3

Project Data Sheet

Project Authorization

PROJECT AUTHORIZATION

Entity: Worldwide

Name of Project: Sustainable Agriculture Systems

Number of Project: 936-4198

1. Pursuant to section 103, Agriculture, Rural Development and Nutrition, of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Sustainable Agriculture Systems project involving planned obligations of not to exceed $26,250,000 in grant funds, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process.

The initial obligation year for the project is FY 1992, the final obligation year is FY 2001.

In addition to the amount authorized above, an estimated $10,000,000 may be contributed to this project by Missions, Regional Bureaus, and other offices of A.I.D. Funding may be provided from the Economic Support Fund (ESF) or the Development Fund for Africa (DFA), as well as accounts authorized for R&D funding under this project.

2. The project purpose is to stimulate and support innovative, integrated systems-based research that will lead to the identification and development of sustainable agricultural production and natural resource management systems in developing countries.

The project will enhance the ability of developing countries to improve the welfare of their growing populations by sustaining both agricultural production and environmental quality. The project has three components: (1) a Collaborative Research Support Program (CRSP) to support innovative, integrated systems-based research needed for the maintenance of the environment and the promotion of a greater understanding and integration of agricultural production systems with the socio-economic-political environment; (2) Research Support Grants to permit the project to have access to and incorporation of research results on aspects of sustainability which are currently under investigation but external to the project; and, (3) an Information Management System to support the knowledge building activities of the sustainable agriculture and natural resource management sectors, and provide technical assistance support to field missions and AID/W.

3. The agreements which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to

the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate:

a. Source and Origin of Commodities, Nationality of Services. Commodities financed by A.I.D. under this project shall have their source and origin in the "cooperating country" or the United States, except as A.I.D. may otherwise agree in writing. (Each country in which research, training, or technical or other assistance takes place under the project shall be considered a "cooperating country.") The suppliers of commodities or services shall have the cooperating country or the United States as their place of nationality, except as A.I.D. may otherwise agree in writing.

Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

Signature: _____
Richard E. Bissell
Assistant Administrator
Bureau for Research and Development
Date: April 26, 1992

Clearances:

RD/AGR/EP:VCusumano		Date: 4/2/92
RD/AGR:ECarter		Date: 4/6/92
RD/AGR:AHurdus		Date: 4/10/92
RD/PO:DErbe		Date: 4/23/92
GC/RD:GWinter	(draft)	Date: 04/02/92
FM/OP/B/LA:JBergman	(subst)	Date: 04/03/92

RD/AGR:JBonner/MBlakeney:04/01/92:projauth.sa

XD-ARD-945-A
7649

Project Planning Authorization

COPY FOR YOUR INFORMATION

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, BUREAU FOR SCIENCE AND TECHNOLOGY

THRU: S&T/FA, Bradshaw Langmaid (Acting)

FROM: S&T/AGR, David Bathrick

SUBJECT: Project Authorization Amendment for the Sustainable Agriculture Systems Collaborative Research Support Program - CRSP (Planning) Project 936-4193 (Doc. # 41931)

PROBLEM: The centrally-funded Sustainable Agriculture Systems CRSP Planning project 936-4193 was authorized June 7, 1990. Your authorization is requested to amend the project as specified below:

a. to change the PACD from 9/30/91 to 9/30/92.
b. to change the final obligation year from FY 1990 to FY 1991
c. to increase the authorized centrally-funded LOP from $700,000 to $2,330,000 from the Agriculture Rural Development and Nutrition account.

Background: In FY 1990, A.I.D. began the planning phase of the Sustainable Agriculture Systems Collaborative Research Support Program. An amendment to the Cooperative Agreement (DPE-5545-A-00-8068-00) between the National Academy of Sciences (NAS) and A.I.D., administered by the Office of the Science Advisor, was issued to provide A.I.D. with a conceptual framework upon which to develop a global research and development plan for addressing problems of natural resources management and sustainable agriculture.

NAS convened a series of expert panel meetings to obtain the best of the scientific community's expert knowledge in sustainable agriculture. A February 15, 1991 report entitled "Toward Sustainability: A Plan for Collaborative Research on Agriculture and Natural Resource Management" was issued to A.I.D. The NAS-appointed panel recommended that the program, which was designated the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM/CRSP), organize its research agenda around four themes:

1) integrated pest management which seeks to control pre- and postharvest weeds, arthropod and vertebrate pests, and pathogens using biological and cultural techniques along with minimal levels of synthetic pesticides;

2) integrated nutrient management which seeks to provide plant nutrients through the optimal use of on-farm biological resources (including manures, plant rotations, cropping patterns, and legumes) and, where necessary, purchased inputs;

3) integrated institutional management which seeks to guide the complex interactions between food and fiber production and the policy, trade and political environments; and,

4) the social, economic, political context within which on-farm and off-farm activities take place in order to identify and suggest remedial steps that can help remove constraints to sustainability.

Three types of competitive grants were also recommended by the NRC Panel in order to carry out the project objectives and include:

1) planning grants which would encourage enhanced interdisciplinary interaction, on-site visits to potential host countries, and the development of links with cooperating institutions in the process of preparing and refining proposals for the core grant;

2) a research and development core grant which would support the long-term interdisciplinary collaborative research program on sustainable agriculture and natural resource management in one or more of the world's principal agroecosystems; and,

3) research support grants in support of the goals of the program and include type A grants to be awarded by the CRSP management entity and type B to be awarded by A.I.D. in support of promoting linkages among existing projects.

At the same time, the expert panel recommended that the Title XII CRSP guidelines be utilized to finalize the global research and development plan of the SANREM CRSP. A competitive process would be used to select the recipient of the planning grants and finally to select the best global research and development plan which would be used to negotiate the final core grant with a Title XII management entity.

This report was received by the BIFAD/AID Joint Committee on Agriculture Research and Development (JCARD) and accepted with the following changes:

- A.I.D. would issue three institutional planning grants instead of six as suggested in the NAS report.

- A.I.D. would issue up to 12 individual planning grants from scientists working through their institution and bidding only on parts of the total program. The NAS report did not include these individual planning grants in its recommendations.

-In the area of Pest Management, A.I.D. would issue a planning contract to an IQC contractor to design a CRSP or CRSP-like Pest Management program. A.I.D. would also strengthen its own technical capacity in the Pest Management area by retaining the expertise of a qualified integrated pest management specialist.

-Finally, A.I.D. would begin to build its institutional capacity in the area of sustainable agricultural systems by supporting activities in information management and technical experts qualified to address issues of integration of sustainable agriculture systems, etc.

The purpose of this project authorization amendment is to permit A.I.D. to continue the planning phase of the SANREM/CRSP. The result of the activities described in the following sections will be to implement the NAS/JCARD/A.I.D. recommendations for aiming at the final design of the SANREM CRSP.

Discussion: The Office of Agriculture proposes an extension of this project's PACD to 9/30/92. This extension will be comprised of four parts as follows:

PART A: Amended Scope of Work for the existing Cooperative Agreement (DPE-5545-A-00-8068-00). This part will provide for the continued NAS involvement in the review of technical designs. This provides a unique opportunity to complete the planning effort with an institution fully aware of the technical and institutional issues involved in an extremely complex and interdisciplinary project.

The NAS will appoint an expert panel to review and rank order the proposals and identify proposals that merit receipt of planning grants. Subsequently, the NAS will review and rank order final global research and development plans for the CRSP.

PART B: Issuance of Planning Grants/Contracts. This part will support the contracting process as described in the CRSP guidelines for the award of the final global research and development plan by funding a limited number of planning grants to institutions and individuals thereby allowing them to strengthen their design and broaden international participation.

A.I.D., will receive from NAS a technical peer review and a rank ordering of the proposals for the overall project design submitted by universities/consortia, etc. Another rank order will be provided by NAS of the proposals submitted by the individual scientists bidding on individual element(s) of the project.

Up to three comprehensive planning grants will be awarded by A.I.D. to finalize the research proposals in the form of global research plans as described in the CRSP guidelines, conduct site visits to confirm feasibility of their technical plan, arrive at an institutional arrangement for a management entity for the project, and assist efforts to integrate individual grantees into the overall global plan.

A.I.D. will issue up to twelve individual planning grants, not to exceed $15,000 each, to permit the individual scientists, working with their institutions, to finalize their technical plans and demonstrate how they plan to integrate their work into the broader global plan being developed for the proposed Sustainable Agriculture and Natural Resource Management CRSP program by the recipients of the three comprehensive grants.

A.I.D. will also issue a contract for the Pest Management planning activity under an Indefinite Quantity Contract (IQC). This component will provide a plan for a collaborative, prioritized approach to overcoming constraints to the development and implementation of economically and environmentally sound crop and livestock protection methods through integrated pest management (IPM).

PART C: Information Management Services Agreement.

This part will support the knowledge building activities of the sustainable agriculture and natural resource management areas by concentrating on enhancing information access, retrieval, and sharing among researchers working in theme areas which support the Agency's developmental activities in this sector.

To support the Office of Agriculture's portfolio, including the new proposed sustainable agriculture CRSP and other associated CRSP and non-CRSP research activities, an integrated set of information sharing and monitoring activities related to international sustainable agricultural and natural resource management research activities will need to be developed to communicate research findings and increase the efficiency and creativity of ongoing and planned research. Additional program staff will need to be acquired also to help guide and review research activities, and to provide support to professional staff already involved in these activities.

PART D: Integrated Pest Management Specialist. In FY 1990 S&T/AGR brought on board a qualified integrated pest management specialist to address the Congress' interest as well as A.I.D.'s. This component of the Sustainable Agriculture Systems project will continue to support the Integrated Pest Management Specialist to address integrated pest management which is a critical element in sustainable agricultural programs.

FUNDING: PART A: $250,000 will be obligated through the existing Cooperative Agreement with NAS, PART B: $1,030,000 for the issuance of institutional and individual planning grants and the Integrated Pest Management IQC, PART C: $220,000 for the establishment of an Information Management Services Agreement, PART D: $130,000 will be provided to an existing Task Order contract (Task Order IV with T. Head and Company) for the continued services of the Integrated Pest Management specialist.

RECOMMENDATION: That you sign the attached project Amendment Number 1.

Clearances:
S&T/AGR/EPP:VCusumano _____ Date 5/20
S&T/AGR:JBonner _____ Date 5/20
S&T/AGR:ECarter _____ Date 5/21/91
GC/S&T:GWinter (In draft by C.Stephenson) Date 5/20/91
SCI:HLarew _____ Date 5/28/91
S&T/PO:DSheldon _____ Date 5/31/91
S&T/RD:WDouglass _____ Date 5/31/91
S&T/AGR/AP:HHortin _____ Date 5/31/91

Attachments:
Project Data Sheet
Project Authorization Amendment Sheet

17

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete) — Amendment Number: 1 — DOCUMENT CODE: 3

COUNTRY/ENTITY: Worldwide

3. PROJECT NUMBER: 936-4193

4. BUREAU/OFFICE: S&T/AGR — 10

5. PROJECT TITLE (maximum 40 characters): Sustainable Agr. Systems-CRSP Planning

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM DD YY: 09 30 92

7. ESTIMATED DATE OF OBLIGATION (Under "B" below, enter 1, 2, 3, or 4): A. Initial FY: 90 — B. Quarter: 4 — C. Final FY: 91

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 90			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	700	-	700	2,330	-	2,330
(Grant) S&T/AGR	(500)	(-)	(500)	(1,935)	(-)	(1,935)
S&T/RD	(200)	(-)	(200)	(395)	(-)	(395)
Other U.S. 1.						
Other U.S. 2.						
Host Country						
Other Donor(s)						
TOTALS	700	-	200	2,330	-	2,330

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	C. PRIMARY TECH. CODE 2. Loan	D. OBLIGATIONS TO DATE 1. Grant	D. OBLIGATIONS TO DATE 2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	E. AMOUNT APPROVED THIS ACTION 2. Loan	F. LIFE OF PROJECT 1. Grant	F. LIFE OF PROJECT 2. Loan
(1) ARDN	141	099		700	-	1,630	-	2,330	-
(2)									
(3)									
(4)									
TOTALS				700	-	1,630	-	2,330	-

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 059 | 069 | 053

11. SECONDARY PURPOSE CODE: 121

12. SPECIAL CONCERNS CODES (maximum 4 codes of 4 positions each)

A. Code							
B. Amount	R/AG 2,330	BR 2,330	INTR 2,330	X11 2,330			

13. PROJECT PURPOSE (maximum 480 characters):

To identify constraints to development of sustainable agricultural systems and to prepare a research plan for a program that will bring about sustainable agriculture in developing countries.

14. SCHEDULED EVALUATIONS: Interim MM YY MM YY — Final MM YY

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [ ] 941 [ ] Local [ ] Other (Specify) ____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment)

1. To change th PACD from 9/30/91 to 9/30/92.
2. To change the final year of obligation from FY 1990 to FY 1991
3. To increase the authorized centrally-funded LOP from $700,000 to $2,330,000. from the Agricultural Rural Development and Nutrition account.

17. APPROVED BY — Signature: [signature] — Title: David Bathrick, Director, S&T/AGR — Date Signed: MM DD YY: [illegible]

18. DATE DOCUMENT RECEIVED BY AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY: 01 24 91

PROJECT AUTHORIZATION AMENDMENT NUMBER 1

Name of Project : Sustainable Agriculture Systems
Collaborative Research Support Program - CRSP
(Planning)

Number of Project: 936-4193

Country : Worldwide

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, the Sustainable Agriculture Systems, Collaborative Research Support Program - CRSP (Planning) project was authorized on June 7, 1990. That authorization is hereby amended as follows:

a. The authorized centrally-funded life-of-project funding is increased from $700,000 to $2,330,000.

b. The final obligation year is changed from FY 1990 to FY 1991.

c. The PACD is changed from 9/30/91 to 9/30/92.

2. The authorization cited above remains in force except as hereby amended.

Signature: _____
Richard Bissell
Assistant Administrator
Bureau for Science and
Technology

Date: 5/31/91

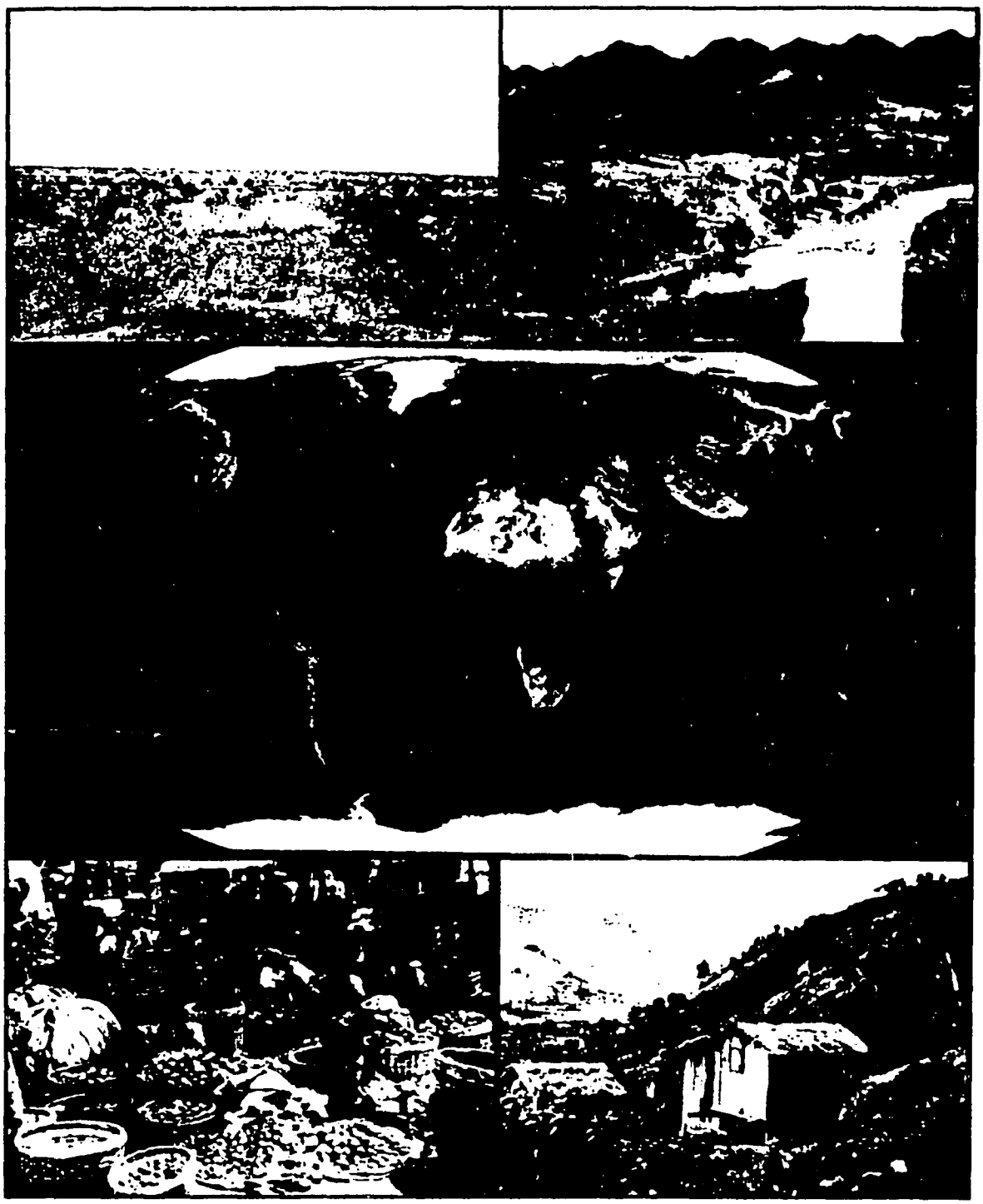
Clearances:
S&T/AGR/EPP:VCusumano _____ Date _____
S&T/AGR:ECarter _____ Date 5/21/91
SCI:HLarew _____ Date 5/28/91
GC/S&T:GWinter (In draft by C.Stephenson) Date 5/20/91
S&T/RD:WDouglass _____ Date 5/27/91
S&T/AGR/AP:HHortik _____ Date 5/24/91

S&T/AGR:JBomer/MBlakeney:4/8/91:WANG#8214e

Life of Project
Collaborative Research Support Program

A LANDSCAPE APPROACH TO SUSTAINABILITY IN THE TROPICS (LAST)

The Global Plan for the SANREM CRSP
Submitted by a Consortium Led by
The University of Georgia



THE CONSORTIUM

U. S. Institutions

University of Georgia, Lead Institution and Proposed Management Entity
Auburn University
Colorado State University
Tuskegee University
Virginia Polytechnic Institute and State University
Washington State University
University of Wisconsin
Center for PVO/University Collaboration in Development
USDA - Agricultural Research Service

Private Voluntary Organizations

Heifer Project International (all sites)
Christian Children's Fund (Philippines)
Plan International (Burkina Faso)
CARE (Honduras and Guatemala)

International Research Centers

Asian Vegetable Research and Development Center
Centro Internacional de Mejoramiento de Maiz y Trigo
User's Perspective with Agricultural Research and Development (CIP)
International Center for Research in Agroforestry
International Center for Research in the Semi-Arid Tropics
International Rice Research Institute

Host Country Institutions

SOUTHEAST ASIA
University of the Philippines at Los Baños
Central Mindanao University
Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development
National Power Company
CENTRAL AMERICA
Universidad del Valle
Instituto de Ciencia y Tecnología Agrícolas
Escuela Agrícola Panamericana
Ministry of Natural Resources
WEST AFRICA
University of Ouagadougou
Institute National Etude et Recherche d'Agricole
Institute Recherche Biologie Ecologie Tropical

TABLE OF CONTENTS

Volume II. Cost/Management Portion C.5.

C.5.(a)	Cost Information Year 1 Budget Year 2 Budget Year 3 Budget Year 4 Budget Year 5 Budget Total Budget, Years 1-5
C.5.(b)	Management Information
C.5.(b)(1)	Salary History
C.5.(b)(2)	Negotiated Indirect Cost Rate Agreement
C.5.(b)(3)	Practices and Policies
C.5.(b)(4)	Evidence of Responsibility and Eligibility
C.5.(b)(5)	Procurement of Goods and Services
C.5.(b)(6)	Authority to Negotiate on Behalf of, and to Bind, the ME
C.5.(b)(7)	Certifications, Assurances, and Other Statements of Applicant/Grantee

VOLUME I. TECHNICAL PORTION

C.4.(b)(3)(A) Integrated Research Plan

Rationale and General Approach

Farmers of the first two decades of the 21st century will have to produce more food in those twenty years than has been produced since the agricultural revolution began. This staggering accomplishment, which will be required to meet the nutritional needs of a growing population, will be carried out on an increasingly scarce and fragile resource base. As population pressures bear on this vulnerable base of soil, water, genetic, human, and economic resources, food insecurity in tropical regions will be exacerbated, potentially resulting in widespread famine and social and political unrest. For these reasons, a new approach to food production and natural resource management within an ecological framework is urgently required.

We propose to utilize a landscape ecology approach to the study of sustainable agriculture and natural resource management in the tropics. We use the term "landscape" to indicate the appropriate scale of our approach which emphasizes interactions between ecosystems. The landscape is a mosaic of interacting ecosystems with both commonalities, such as soils, climate, and natural vegetation; and uniqueness, such as biodiversity, land use patterns, and socioeconomic structure (see Fig. 1). The landscape is the niche with human beings as inhabitants, and, more significantly, as manipulators of the component ecosystems. In this way, these end-users become the "lifescape" that is superimposed onto the landscape. By definition, agricultural sustainability requires the recognition of not only the complex array of interactive processes ongoing within an ecosystem, but also of the interactions among ecosystems on a landscape scale. Heretofore, the emphasis of most agronomic and ecological studies has been on the internal dynamics of ecosystems, neglecting the interdependence and interactions between ecosystems, as well as the indigenous knowledge and primary interests and actions of the end-users, including individual farmers, farm households, and rural and urban communities within the landscape. That is, traditionally the end-users have been considered "last", if at all, in the research/development process.[1,2]

Because a landscape ecology approach is unique in its integration of individual ecosystems within the larger ecological and human vista, it is a novel, cutting-edge approach that promises to focus on both end-user and societal benefits, such as fulfilling human needs and environmental, social, and economic goals. In other words, it puts the traditionally "last" first by including the farmer in the identification, design of potential

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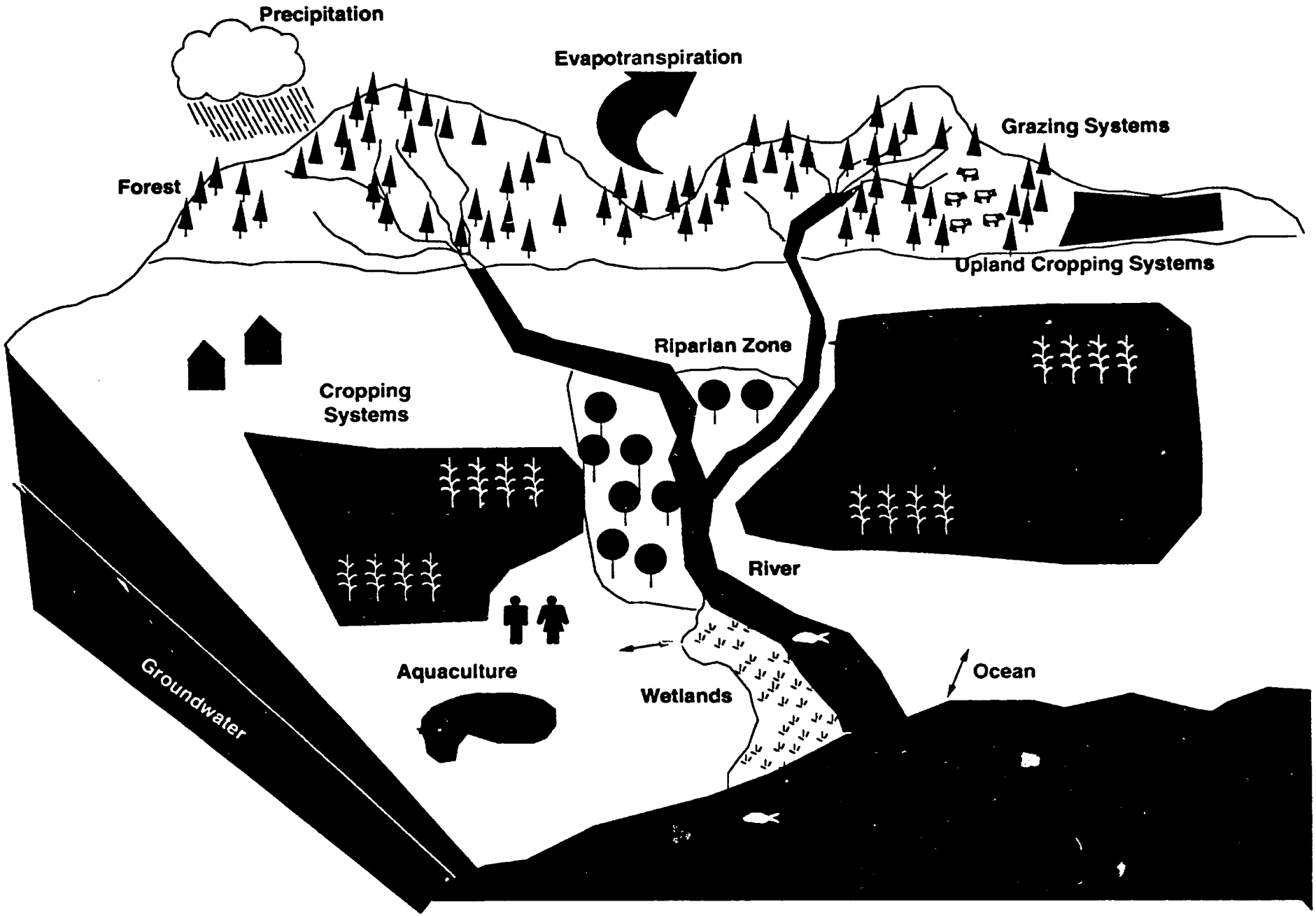
[1] Chambers, R. 1983. Rural Development: Putting the Last First. Longman Scientific & Technical Publishing. London, England.

[2] Chambers, R., A. Pacey, and L.A. Thrupp. 1989. Farmer First: Farmer Innovation and Agricultural Research. Longman Scientific & Technical Publishing, London, England.

Fig. 1. Conceptual model of the landscape.



solution, and formulation of recommendations, and the final decision on the appropriateness of the technology. This has been elegantly described by Rhoades (see Fig. 2).[3]

Additional requirements of this approach include integrating scientific disciplines more fully than traditional agricultural, ecological, or social science approaches, and inclusion and integration of service groups, such as private voluntary organizations (PVOs), into the research process. To meet these challenges, we have built a unique consortium that has the breadth of disciplines and expertise and the participation of a broad array of agencies, universities, and service groups with diverse interests but one common goal: **the development of a new paradigm for agriculture and natural resource management that includes an integrative, interdisciplinary approach to research, training, and farmer adoption activities, centered around the end-users and an improved understanding of the landscape.** It is anticipated that this program will serve as a new and LASTing model for rural development activities.

Mission Statement

The mission is to implement a comprehensive, farmer-participatory, interdisciplinary research, training, and information exchange program that will elucidate and establish the principles of sustainable agriculture and natural resource management on a landscape scale. A landscape ecology approach will be used to describe and understand the complex internal, external, and interactive processes within and between the individual ecosystems of a toposequence transecting two or more agroecological zones. This will include human and social, as well as physical and biological dimensions of ecosystems. Interventions, appropriate to the farmer (male and female) and other end-users, will be designed and evaluated in concert with those end-users in terms of agricultural, environmental, economic, and social sustainability. The wide applicability of these principles and methodologies in fragile environments will be demonstrated. Through training, institutional strengthening, and networking, local and regional contributions to agricultural sustainability and improved natural resource management will be enhanced.

Objectives

1. Agroecological Landscapes. Develop, utilizing existing data bases, survey data, multiple scale evaluations, and/or remote sensing, a data base for each transect that will include existing climate; soil and water resources; natural biodiversity; agricultural, silvicultural, and aquacultural diversity; pest populations and pressures; and the social, political, economic, and institutional framework.

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[3] Rhoades, R. E. 1984. Breaking New Ground: Agricultural Anthropology. Lima, International Potato Center.

Farmer-Back-To-Farmer

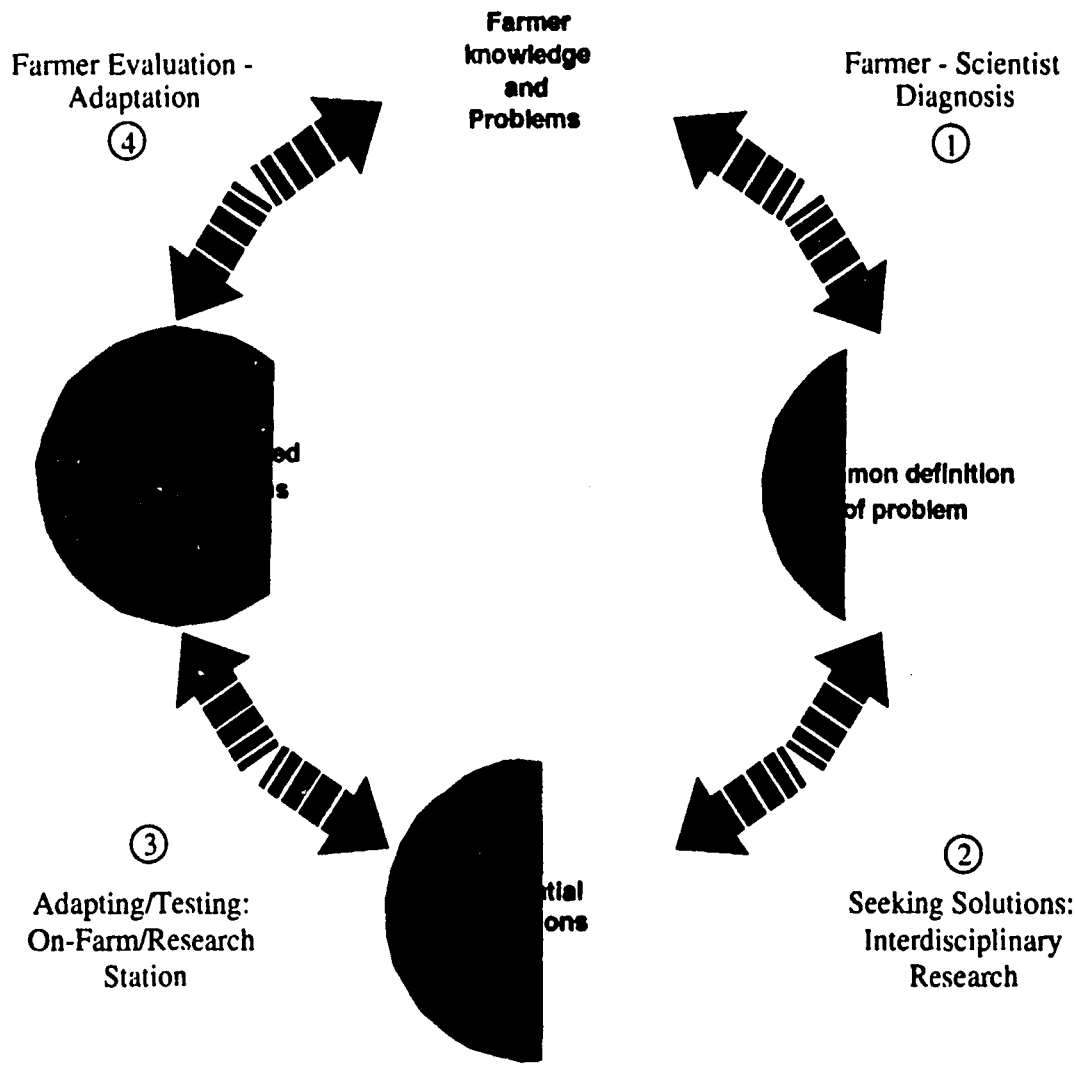

Fig. 2. The farmer-back-to-farmer model assumes that the final decision on the appropriateness of a technology rests with the people who will ultimately use the technology, not the scientists. It involves four major activities each with a goal. The green-shaded areas in the circles indicate an increasing understanding of the technological problem as research progresses. Note that the process can recycle.

2. Defining Problems. Define and assess the problems relating to sustainable agriculture and natural resource management over each ecological transect using the descriptive data collected under Objective 1 and the perspectives of those living and working within the transect, including farmers (male and female), rural and urban households, consumers, government and non-governmental agencies, private voluntary organizations, and professionals including agricultural, ecological, and social scientists.

3. Principles of Sustainability. Identify, describe, and understand the complex internal and interactive processes within and among the individual ecosystems of each toposequence. This will require multiple scale experimental units including small plots, fields, watersheds, and landscapes, and a combination of experimental and simulation modeling techniques. Through this process, the principles of sustainable agriculture will be established. Qualitative and quantitative markers of sustainability will be identified.

4. Integrated Strategies. Design and evaluate widely applicable strategies that integrate appropriate socio-economic, cultural, environmental, long-term productivity, and farmer adoption criteria.

5. Hierarchical Approach. Test the above strategies in terms of socio-economic, cultural, environmental, long-term productivity and farmer adoption criteria. This will require multiple scale evaluations including small plot experiments, on-farm trials, watershed studies, remote sensing and the use of extrapolation and decision support tools such as geographic information systems, and bioeconomic and simulation modeling. The design and testing of new strategies will be a dynamic process that allows for continued reevaluation and refinements.

6. Training. Train in-country personnel in interdisciplinary, farmer participatory approaches to sustainable agriculture and natural resource management. Both non-formal and formal training will be stressed for host country non-governmental organizations (NGOs), private voluntary organizations (PVOs) and extension personnel. A high priority will be given to training women. U. S. personnel will also receive training in innovative research and development methods, including landscape ecology, participatory methods, and gender sensitivity and analysis.

7. Information Exchange Networks. Utilize and enhance networks for information exchange including agricultural producers and laborers (male and female), professionals, families, rural and urban community groups, and PVO/NGOs, in both the U.S. and developing countries.

8. Transferability and Extrapolation. Demonstrate applicability of the established principles of sustainable agriculture and natural resource management and the integrated research methods to other fragile environments.

Changes To Be Achieved Over 10-20 Years

Through the farmer-participatory approach to designing, testing, and demonstrating suitable interventions that will lead to sustainability, we expect that farmer adoption of improved strategies will be enhanced. Through improved understanding of the interactive mechanisms that contribute to complex processes like desertification, for example, and improved farmer-adoption of sustainable agriculture management strategies, we anticipate changes within our "sphere of influence" over a 10 to 20 year period. Some of these include: 1) reduced soil erosion and soil nutrient depletion, 2) reductions in the rates of deforestation and/or desertification, 3) reductions in the rates of loss of biological and genetic diversity, 4) improved food availability and/or quality, 5) improvements in the socio-economic status of women agricultural producers, 6) improvements in effective information exchange, 7) improved research capabilities in host countries, as a result of training and our collaborative research, 8) improved ability to monitor and evaluate changes in the natural resource base, and 9) increased governmental and nongovernmental capacity to support and promote sustainable agriculture and natural resource management.

Ecological Zones of Focus

We will focus on two broad ecological zones (mega-zones): the humid tropics and the semi-arid/sub-humid tropics. Both of these ecological zones have several general characteristics that make them of keen interest in studying sustainable agriculture and natural resource management in a landscape setting. For the mountainous and humid tropics, these include: 1) reserves of plant genetic diversity; 2) centers of both cultural and biological diversity; 3) high rates of soil loss and sedimentation; 4) significant downstream impacts (pesticide contamination, salinization, siltation, destruction of coastal resources and living aquatic resources); 5) zones of human migration; and 6) significant forest resources. For the semi-arid and sub-humid tropics, these include: 1) desertification; 2) high spatial variability; 3) human populations generally exceeding the carrying capacity of the land; 4) food supplies that are highly dependant on the vagaries of rainfall and tropical storms; and 5) critical vulnerability to famine.

Within these broad ecological zones, a sequence of topographic, climatic, and vegetative features and a mosaic of agricultural and urban activities and natural biological communities exist and comprise various agroecological zones that, in turn, comprise the landscape. For each of our experimental sites, transects or watersheds have been identified in which a sequence of these agroecological zones will be studied, using the landscape ecology approach. Following is a brief description of some of the agroecological zones of interest within each broad ecological zone.

Humid Tropics

Coastal zone aquaculture. This is a zone comprised of bays, estuaries, and wetlands, with food production closely tied to the aquatic resource base. Capture fisheries and marine/brackish water aquaculture are important activities. This zone can be also be characterized by siltation and pollution as a result of mismanagement upstream.

Lowland agriculture and aquaculture. This is a zone comprised of wetlands and somewhat poorly to poorly drained soils predominately based on wetland rice aquacultural activities.

Permanent crop and animal agriculture. This is a zone comprised of the well suited lands for agriculture and often contains high-input, management-intensive production systems, such as cattle, cotton, sugar cane, upland rice, pineapples, and inland fresh water fish on a commercial scale.

Shifting agriculture on fragile uplands. This is a zone of sloping uplands and mountain lands with mixed forested and open lands that are usually considered marginal with respect to their potential for crop agriculture, but are nonetheless cultivated, usually by subsistence farmers who practice shifting cultivation and integrated livestock/fish/crop production systems. It is in this zone where much of the environmental degradation occurs.

Secondary and mature forest. This is a zone of steep sloping uplands and mountain lands consisting of logged forests (>20-30 year old) and mature forests (>60-80 year old). Except on the very steepest of slopes or microcosms of protection, these areas are typically threatened by commercial logging and fire. Human uses include firewood, building materials, and medicinal plants. These areas potentially house enormous biological diversity.

Semiarid and Subhumid Tropics

Floodplain agriculture along permanent and/or ephemeral streams. This is a zone of alluvial soils and permanent cultivation of crops such as rice, fruits, and vegetables, especially in the irrigated perimeter.

Shifting agriculture on fragile lands. This is a zone of gently rolling to steeply sloping lands that are highly vulnerable to degradation and where shifting animal and/or crop agriculture is practiced, generally by subsistence farmers/pastoralists.

Shifting pastoral agriculture on degraded lands, plateaus, and/or steep slopes. This is a zone of lands generally deemed unsuitable for crop agriculture because of poor soils, but where animal grazing is common and the vulnerability to degradation is high.

Research Site Descriptions

We are proposing four sites for SANREM CRSP activities, one in Southeast Asia (Philippines, humid tropics), two in Central America (Guatemala, humid and semiarid tropics, and Honduras, semiarid/subhumid tropics) and one in West Africa (Burkina Faso, semiarid/subhumid tropics).

Humid Tropics: Site Descriptions

Southeast Asia. In Southeast Asia, there are many serious problems of agricultural sustainability and natural resource management associated with all major ecosystems. The Philippines, a representative Southeast Asian country, is accustomed to typhoons and other natural and man-made disasters. Recent examples include the flooding in Ormoc, Leyte which killed thousands of people. This event is widely viewed as resulting from man's destruction of the area's forest which began in the late 1940's. Due to the commercial logging of hardwoods and forest clearing for agriculture, the Philippines' forested areas contracted from about 57 percent of total land area in the 1930's to approximately 21 percent in 1988. Although not stemming from natural resource mismanagement, the eruption of Mt. Pinatubo caused widespread destruction of agricultural, urban, and natural environments. These two disasters served to build a consensus regarding the absolute importance of protecting the vulnerable natural resource base in the Philippines. Loss of forests, coral reefs, wildlife and productive agricultural lands threaten the Philippines' agricultural and natural resource base, jeopardizing food production in a landscape representative of much of the humid tropics.

Watershed development in Asia is not a new concept. Although intensive lowland and floodplain agriculture is of great economic importance, the fragile upland areas constitute from 60 to 90 percent of the land of the respective countries and thereby provide a unique resource[4]. About 65 percent of the region's rural population live and earn their livelihood in these watershed areas. The mismanagement of land resources within the watershed results in profound effects both on uplands and lowlands[5].

Two watersheds have been selected for research and development in the Philippines. One has historically been a site of considerable research and intervention based on a

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[4]Garrity, D.P. 1992. Sustainable land use systems for the sloping uplands of southeast asia. In Technologies for sustainable agriculture for the tropics. American Society of Agronomy. Madison, WI

[5] Magrath, W. B. and J. B. Doolette. 1990. Strategic issues in watershed development. In Watershed development in Asia. J. B. Doolette and W. B. Magrath (ed.) The World Bank. Washington, D.C.

farmer-participatory approach, while the other has been a site of few development and research activities. Given their contrasting backgrounds, the first will utilize the present research infrastructure and the second will serve as an extrapolation zone having had less outside influence. This allows for immediate start up of research initiatives while providing a location for transferability during the latter stages of this project.

Both sites are located on north-central Mindanao (longitude 125°W, latitude 8°N). The first is the catchment which surrounds the municipality of Claveria, in Misamis Oriental Province 30 kilometers northeast of Cagayan De Oro City. This watershed, covering the Mati and Matibog River watersheds, is approximately 30,000 hectares in size and drains into the Macajalar Bay. The second watershed is that of the Manupali River which drains approximately 80,000 hectares and is a tributary of the Pulangi River Basin. The Manupali watershed is located 20 kilometers south of Malaybalay and 85 kilometers south of Cagayan De Oro City (See Fig. 3).

The Claveria and the Manupali sites are characterized by the ecosequence outlined in Figure 4. Both watersheds share moderate to steep slopes, with greater than half of the land area having a slope of >15 percent, fragile soils and severe erosion. Soils in both areas are well-drained, highly erodible clays of low pH. The mean annual rainfall in Claveria is 2,200 mm which occurs from May to December. Forested areas have been reduced by half over the last 40 years. A rapid increase in small-scale farms with insecure land tenure and a necessity to provide food for the family, has resulted in unsustainable agricultural practices on the uplands. Farm sizes are typically 0.25 to 19.5 hectares with an average size of 3.0 hectares. Farm sizes less than 3.2 hectares typically are tenant or leasehold farms. At the Claveria site, maize, upland rice and cassava are the dominant crops, with a substantial area of small scale vegetable production, primarily market tomatoes. Coffee is the major perennial crop. The Manupali watershed has a diversity of agricultural crops. There are large tracts of irrigated wetland rice, sugarcane, and pineapple which utilize high external inputs. In addition, production of lettuce, potato, cassava, tomato and some small vegetable gardens are present in the uplands. The upper reaches of the Manupali watershed is occupied by the Katanglad Philippine and National Park, a primary forest bio-preserve.

The Claveria site is presently an upland farming systems research site for the International Rice Research Institute (IRRI) in collaboration with the Philippine Department of Agriculture. IRRI has office, laboratory and computer facilities on site. Ongoing research includes conservation farming, agroforestry and contour hedgerow systems, both researcher-directed studies and farmer participatory activities. Anthropological studies are related to farmer adaptation and farmer-to-farmer training methodology. Several farmer groups have been established including the Tree Growers Association of Claveria. The Department of Environment and Natural Resources (DENR) is active in reforestation efforts and farm forestry projects including nurseries for exotic species such as Gmelina arborea. The Department of Agriculture is also promoting Sloping Agriculture Land Technology (SALT) projects. The TropSoils CRSP

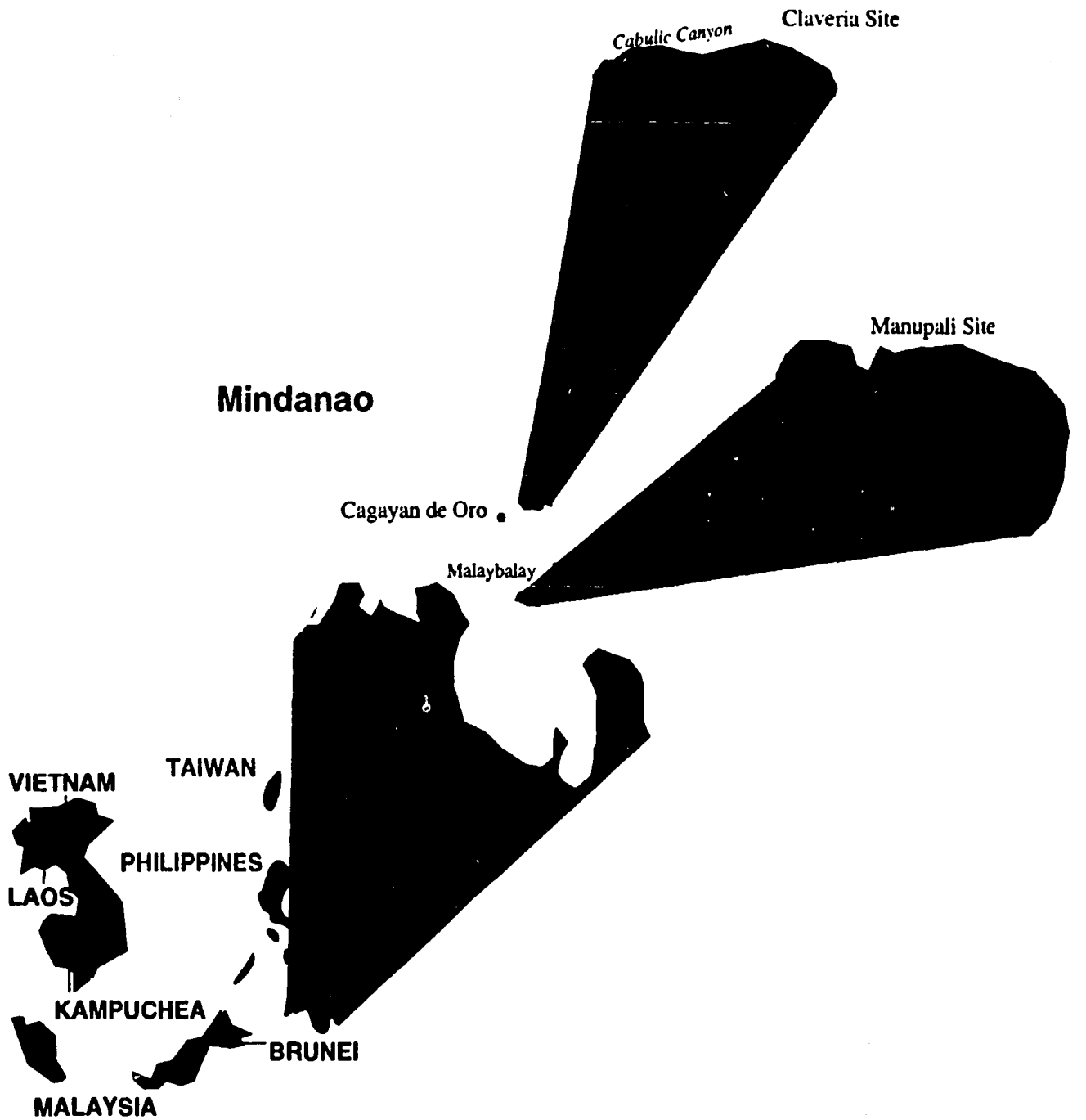

Fig. 3. Location of research sites in the Philippines

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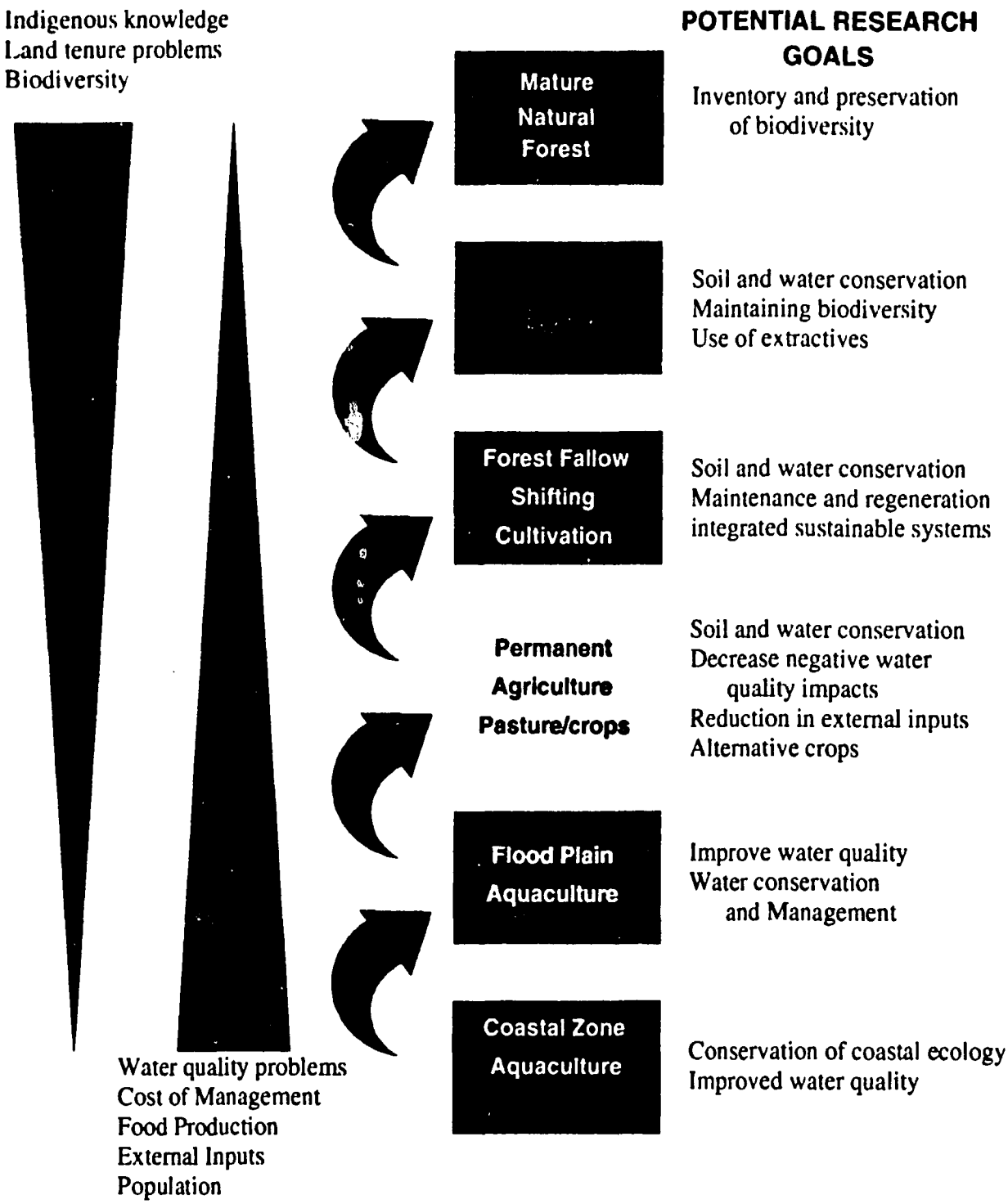

Fig. 4. Characteristics of and potential research goals for the typical ecosystem sequence in the humid tropics.

in collaboration with IRRI is investigating nutrient runoff and leaching on sloping land under alternative upland management systems.

Activities in the Manupali area include a large scale reforestation effort by the DENR, including several large tree nurseries. The National Irrigation Agency has a diversion dam on the lower end of the watershed for lowland rice irrigation. The Mindanao Upland Stabilization and Utilization through proper Agroforestry Networking (MUSUAN) Program of the Central Mindanao University (CMU) has been working in social forestry programs and research in the Bukidnon uplands. This work includes socio-economic baseline data as well as soil and biological data. The Ford Foundation is actively involved in reforestation and agroforestry research activities in conjunction with CMU. The User's Perspective with Agricultural Research and Development (UPWARD) of the International Potato Center has been involved in sociological studies in the area of Mount Kitanglad. The Manupali watershed empties into the Pulangi River which is the site for several proposed National Power Company (NPC) Dams. No dam sites are proposed for the Manupali River; however, NPC is interested in technical assistance in erosion control efforts and reforestation.

There are strong outreach programs as well as facilities for training in norther Mindanao. Institutions working in sustainable agriculture include the Xavier University Agricultural Extension Service, Heifer Project International, Christian Children's Fund, Tawili Foundation, Bukidnon Integrated Service Assistance Program, Association for Community and Rural Development, Mindanao Grassroots Development Institute, Servus Human Development Program, and Muslim Christian Agency for Rural Development. Heifer Project International-Philippines links with several NGO coalitions in the area including Bukidnon United Non Government Agencies (BUNGA), Network for Environmental Concerns (NECO) and Philippine Partnership for the Development of Human Resources in the Rural Areas (PHILDRRA).

Excellent projects related to gender issues, such as ECOGEN and Women in Rice Farming Systems, are in place in the Philippines . There are also numerous programs related to land tenure and management such as the Certificate of Stewardship Contracts, Integrated Social Forestry, Community Forestry Stewardship Agreements which DENR is in the process of implementing. The World Bank also has active programs in place for community and watershed development.

Other organizations in the Philippines which have related expertise and have expressed interest in the projects are The Soil and Water Conservation Foundation, the Center for Alternative Development Initiatives, the International Institute for Rural Reconstruction, the Peace Corps, and the Association of Independent Consultants-Philippines Incorporated (ACIPHIL).

The Philippines is fertile ground for encouraging an integrative approach to the research of SANREM. Currently there are large numbers of NGOs and national programs

working to improve the ecological and agricultural sustainability in the Philippines. The necessary expertise and will to address these problems is present in the Philippines, but current efforts are fragmented. Coordination of various groups is poor and typically the farmer or local community voice is not heard. The landscape approach to sustainability of the SANREM CRSP seeks to bring the efforts of many groups involved in sustainable agriculture and natural resource management together in a coordinated manner. Within the Philippines, there exists enormous potential for researchers and development workers to break the old paradigm of reductionist thinking, and begin to take part in the mosaic of an integrative, people-based system.

The Philippine Council for Agriculture and Resources Research and Development (PCARRD) coordinates agricultural and forestry research at the national level. The SANREM CRSP will develop strong linkages between these sectors through an explicitly integrative team research approach. By targeting the research to specific watersheds and institutionalizing a coordinated research design and implementation, the project will evolve and test a unique model suited to the efficient conduct of systems research at the landscape level.

Central America. The region comprising the Polochic river valley, the adjacent northern slopes of the Sierra de las Minas, and Lake Izabal in **Guatemala** (Fig. 5) has been identified as the humid tropics site in Central America. The landscape embodies a microcosm of the agricultural, environmental, economic, and social challenges, and opportunities that affect much of the humid tropics.

The Sierra de las Minas mountains (peaks to 3000 m) run roughly west to east, and separate the dry Motagua river valley from the humid Polochic river valley, with average rainfall in the Polochic watershed ranging from 4000 mm yr^{-1} in the uplands to 2000 mm yr^{-1} at the level of Lake Izabal. In the Polochic watershed, natural vegetation grades from cloud forest on the mountain tops, to premontaine rainforest on the lower slopes, to freshwater swamp forest in the wetlands bordering Lake Izabal.

The Sierra de las Minas contain a large Biosphere Reserve, rich in natural biodiversity, that is administered by Defensores de la Naturaleza, a newly formed, private Guatemalan conservation organization with close ties to The Nature Conservancy. Defensores is currently compiling a natural resource inventory of the Biosphere Reserve, but at present has only a cursory survey, obtained in part through cooperation with the Universities of San Carlos and del Valle. Bordering the reserve is a 5-km wide transition zone administered by DIGEBOS, the Guatemalan Agency for Forests and Wildlife, in which a variety of extractive practices and land uses are permitted. DIGEBOS is cooperating with CARE, and the Peace Corps in a country-wide agroforestry project that has been active in communities on the northern slopes of the Sierra de las Minas. CARE and Defensores are collaborating in an environmental education project in dominantly indian communities within and around the reserve.

Agriculture is diverse in the Polochic watershed (area 2811 km^2). Plantations of coffee and cardamon dominate the upper valley's steep slopes. Small holdings of cardamom occur in scattered patches at high elevations throughout much of the watershed. In the lower valley, as the river bottom widens and farm size increases, the production emphasis shifts to rice, sugarcane, cattle, banana, and oil palm, with a limited amount of rubber, and citrus. Maize, and a wide array of vegetables and legumes are grown on small, hillside farms throughout the Polochic valley. Defensores has begun work with Kekchi communities in the Biosphere Reserve to help them develop and implement sustainable agricultural practices (soil conservation, green manuring, etc). Near El Estor, our cooperator CIMMYT has collaborated on-farm with ICTA, the Guatemalan Agency for Agricultural Science and Technology, to identify well-adapted legume cover cropping/intercropping and soil conservation systems. ICTA is developing a socioeconomic analysis of farm enterprise in Izabal Department, which includes communities in the lower Polochic valley and along the shores of Lake Izabal.

Through extensive wetlands that are currently under development pressure, the Polochic river empties into Lake Izabal. Auburn University, a member of our consortium, has performed fisheries inventory of the lake periodically for many years. The lake supports regionally important artisanal and sport fisheries, but because it overlies potentially significant oil reserves, is under development pressure by the oil industry .

Thus, within a reasonably well-defined area are found (1) small, hillside farms that produce cash crops, food for household consumption and feed for farm animals, as well as large perennial-crop plantations perched also on steeply sloping land, (2) river-bottom, commercial agriculture based on wage labor and purchased inputs, (3) natural areas of great biodiversity that are under varying degrees of development pressure, (4) fisheries that receive the effluent of land under intensifying agricultural development pressure, (5) ethnic diversity, with significant representation by both indian and ladino populations, and (6) PVO/NGOs, governmental research and extension agencies, and host-country universities involved in sustainable agriculture and natural resource issues, whose efforts SANREM CRSP would strengthen and multiply.

Semiarid and Subhumid Tropics: Site Descriptions

Central America. Adjacent to our Central American humid tropics site in **Guatemala**, opportunities exist for dry-site comparative studies on the southern slopes of the Sierra de las Minas, and in the adjoining Motagua river valley (Fig. 5). Streams rising in the Sierra de las Minas are the main source of water for farms, villages, and industry in the central Motagua valley, Central America's driest region (average rainfall 500 mm yr^{-1}).

Logging pressure is great along the southern slopes of the Sierra de las Minas, endangering the survival of native conifer species. With 17 conifer species, the Sierra de las Minas is considered the world's most important genetic resource for tropical conifer

germplasm. Poor forest management also threatens water quality and supply in the Motagua valley, where large commercial producers depend on surface streams for irrigation of melon, grape, tomato, lime and tobacco crops. Brewers, vintners, and soft-drink bottlers are similarly dependent on degraded upland catchment areas to supply the water they use. Much of the commerce moving into and out of the country passes through the Motagua valley, location of Guatemala's principal port, Puerto Barrios. In contrast to the Polochic valley, the Motagua valley is fully integrated into the national economy, and its population is dominantly ladino.

In the Motagua watershed, members of our consortium are active in community development projects, and in agricultural research that focuses on grain production in small, hillside farms. Near Chiquimula, Heifer Project International, with assistance from the regional campus of the University of San Carlos (CUNORI), is working with small farmers in several small communities to spread the adoption of small-scale goat-keeping ventures. Also near Chiquimula, CIMMYT has on-farm maize and sorghum trials, with similar trials near Zacapa as well. CIMMYT's sites near Chiquimula and Zacapa would yield valuable comparisons with sites established in the wetter Polochic valley, allowing an assessment of the degree to which rainfall limits agricultural production in the region.

Despite the utility of a dry, satellite site in Guatemala, the watersheds of the Choluteca, Sampile and Negro rivers in southern Honduras (Fig. 5) have been identified as the primary sub-humid site in Central America. The deciding factor for choosing Honduras was the presence of considerable activity by existing CRSPs. Existing CRSP activity has been appreciable in southern Honduras, where the Sorghum/Millet (INTSORMIL), Pond Dynamics/Aquaculture, Bean/Cowpea CRSPs have long-established programs. Opportunities for significant contribution by the Soil Management (TropSoils), Peanut, Fisheries Stock Assessment, Human Nutrition, and Small Ruminant CRSPs are also present in the region. Working in close cooperation with the inter-CRSP Council formed by these 8 CRSPs, SANREM CRSP would provide an integrative, coordinating, and mobilizing function for CRSP activities that address sustainable agriculture and natural resource management in southern Honduras.

These watersheds, limited by moisture for much of the year, are characterized by a pronounced, 6-month dry season (from November to May), and a bimodal rainy season. Somewhat independent of its seasonal distribution, long-term average rainfall varies greatly across the region due to complex orographic effects, ranging from just over 700 to nearly 2800 mm $year^{-1}$.

In these extensively degraded watersheds (combined area 9400 km^2) only undisturbed mangrove forests survive, the natural upland forests having been removed by uncontrolled fires, extensive logging, and severe long-term pressure from firewood gatherers and hillside farmers. Small farms cover much of the fragile, steeply sloping land, and are dominated by the production of sorghum, maize, pigeon peas, cowpeas, and

CENTRAL AMERICA

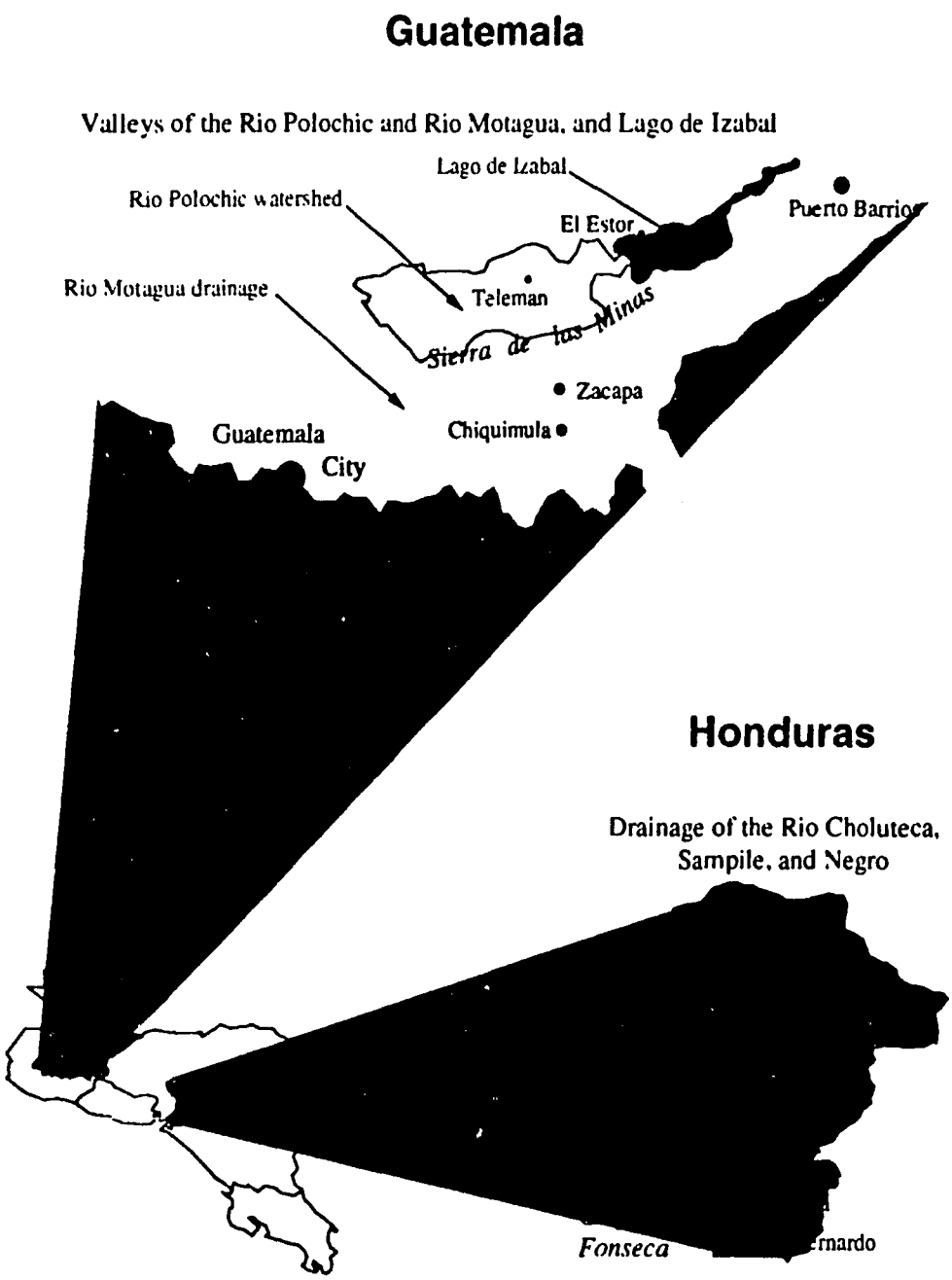

Fig. 5. Location of research sites in Central America.

cassava. PVO/NGOs active in agricultural/environmental education and community development in southern Honduras include Heifer Project International, Christian Commission for Development, Centro Internacional de Enseñanza-Aprendizaje, CARE, Christian Children's Fund, and World Neighbors. There also, the Honduran Ministry of Natural Resources (SRN) is collaborating with AID/Honduras in the Land Use and Productivity Enhancement (LUPE) project, an extension initiative to increase agricultural productivity, and improve resource conservation on small, hillside farms.

Export-crop production on the gently sloping coastal plains historically has been, and continues to be, an important land-use. Currently, melons are the export commodity riding the crest of a production upswing. As did previous generations of export-crop producers, melon farmers commonly respond to insect pests by intensively spraying broad spectrum insecticides on a frequent, calendar schedule. This practice, unsustainable on numerous counts, selects rapidly for pest resistance, threatens the health of farm workers, impairs the quality of drinking-water supplies, and disrupts the functioning of linked aquatic ecosystems. Recognizing the problem's severity, the Panamerican Ag School (EAP) is cooperating with melon producers on the Pacific coastal plain (and regionally) to devise viable IPM strategies for combating insect pests and insect-borne crop diseases. Vital to any research program addressing the presence of pesticides in the environment, the Honduran Foundation for Agricultural Research (FHIA) has the capability to perform pesticide residue analysis of soil, water and crop samples.

The Choluteca, Sampile and Negro rivers discharge into the Gulf of Fonseca through estuaries that support considerable shrimp production, on which a burgeoning industry is based. Aware of one aspect of the landscape linkages involved, the shrimp farmers and fishermen near San Bernardo voice concern that inadequate soil conservation and excessive pesticide use upstream may be limiting downstream shrimp production.

West Africa. Burkina Faso was chosen for the West Africa research site because it encompasses several agroecological zones of interest, it has a strong national research organization and university, and the University of Georgia, as well as several of the other consortium members, have had long-term collaboration there. The long-term plan for the West Africa site is to be implemented in two phases. In the first phase, a site will be initiated in the 750-800 mm rainfall zone northeast of Ouagadougou, the capital. This is an area of human out-migration and one that has national priority in terms of sustainable agriculture. In the second phase, a site in a slightly higher rainfall zone (approx. 1000 mm) in the southern part of the country will be initiated. This is an area of human in-migration and one where there are several areas of important natural biodiversity such as national forests or wildlife preserves. We are taking this approach because both areas are of interest to their government policy agencies as well as to researchers, and a two-phase approach will allow efficient use of personnel and financial support.

The initial site is located in the Sudano-Sahelian zone (750-800 mm annual rainfall) of

Burkina Faso, and includes the village of Donsin (approximately 12°, 45' N latitude, 0°, 39' W longitude) and the surrounding area (Fig. 6). Donsin is located approximately 100 km northeast of the capital city of Ouagadougou, and requires a 2.5 to 3-hr drive. The watershed is approximately 8,500 ha and contains approximately 1500 inhabitants.

As is typical in the Sudano-Sahel, the annual rainfall is extremely variable. Last year the watershed received 900 mm, while in the previous year (1990), 450 mm were received. The native vegetation is typical of the West African savannah and the agriculture is comprised of millet, sorghum, groundnuts, and livestock, primarily cattle, sheep and goats. There are small amounts of cotton, rice, and cowpeas also grown in the area.

The soils are derived from igneous materials, primarily granite. The soils are highly weathered, acid, and ferruginous. They are very low in phosphate. The topography ranges from plateaus to the savannah plain to low-lying, ephemeral streams. There are some outcrops of granite within the watershed.

In the village of Donsin, the RSP program (a farming systems program) of INERA has a project, primarily focused on the evaluation and introduction of improved varieties of sorghum and millet. The RSP program and Plan International, a PVO, both have houses in Donsin where personnel can stay overnight.

The RSP program has already conducted socio-economic, soil, natural vegetation, and land use surveys in the watershed, creating a preliminary database. Therefore, there is a data base from which to start. The primary research goal initially will be to define and assess the problems relating to sustainable agriculture and natural resource management over the watershed, using the data base available and the perspectives of those living and working within the transect, including the farmers and residents within the watershed, and the government and non-governmental agencies, PVOs, and scientists working in the watershed.

In the second phase, we will establish a watershed site in the southern part of the country, where annual rainfall is in the 800-1000 mm range. In this region, an influx of people has begun to exert development pressure on natural areas of significant biodiversity. We visited one potential site for this phase, a site near Thiougou, which is approximately 150 km due south of Donsin. This would make an interesting contrast to the Donsin site and would allow us to test the transferability of results from Donsin and to study a different rainfall zone, a sub-humid zone. Other sites would be considered for the second phase site as well.

We have identified backup sites for West Africa, in event there is political instability in Burkina Faso. These backup sites include the Hamdellaye watershed in Niger, where TropSoils is currently working, and the Gambia where the University of Wisconsin already has a significant research activity. Our planning team visited both of these sites and were assured collaboration from INRAN, TropSoils, and the AID Mission in

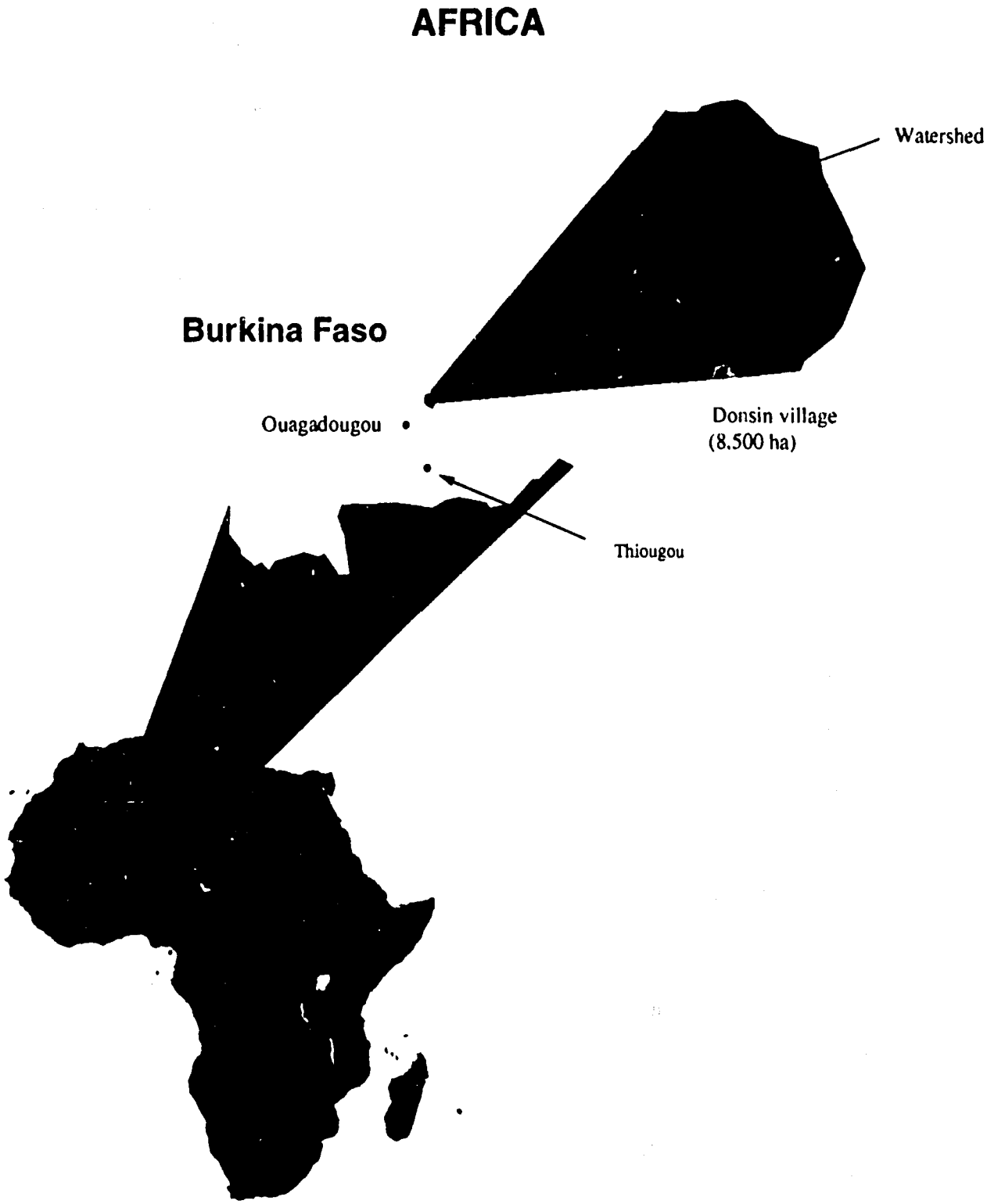

Fig. 6. Location of research site in Africa.

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Niger, and from the AID Mission, the Department of Agriculture, the Department of Environment, ACTION AID, and the Methodist Mission in the Gambia.

Constraints To Be Addressed in the First Five Years

Based on our site visits and discussions with the end-users, end-user groups, government and non-government organizations, PVOs, and other scientists, we have identified eight broad constraints to be addressed in the first five years of this project. These constraints form the framework for project design and implementation in its first phase.

Constraint #1. Lack of information on and consideration for the problems and goals of end-users (male and female)

Constraint #2. Failure to share and integrate existing knowledge bases (including indigenous knowledge)

Constraint #3. Inadequate physical, biological, and socioeconomic baseline data

Constraint #4. Lack of understanding of the cultural, socioeconomic, political, and institutional framework

Constraint #5. Incomplete understanding of important ecosystem processes and critical ecosystem linkages in a landscape setting

Constraint #6. Lack of quantifiable "markers of sustainability", measurable parameters that will indicate improvements in sustainability

Constraint #7. Lack of viable agricultural management strategies for achieving sustainability

Constraint #8. Lack of education, training, and information exchange in sustainability issues

Research Goals and General Methodologies

Although, the research goals will ultimately be developed in concert with the end-users, the following is a broad list of goals, and the methodological framework that we will use to address the constraints identified from field visits and discussions with end-users, local organizations, PVO/NGOs, national programs, AID missions, IARCs and host country universities. These goals are broadly applicable to all sites, and the methodological framework capitalizes on the strengths and diverse capabilities of our consortium. Depicted in Figure 7, our approach is well-integrated and thorough.

Goal #1. Identify and describe the problems relating to sustainability using farmers' and other end-users' goals and perspectives.

The creation of sustainable agricultural and natural resource systems depends on the generation of technologies and management practices that will be perceived as appropriate and beneficial by the ultimate users. Successful adaptive interdisciplinary research must begin with, and end with users, their households and communities. If end-users are not involved from the earliest stages in (1) identifying problems, (2) designing solutions, and (3) evaluating the outcomes, they will be unlikely to adopt proposed solutions, or refine the solutions as their own. This methodological focus on end-users is premised on the tenet that rural households are creative, experimental, and excellent decision makers in their own right. An end-user focused approach taps indigenous knowledge, utilizes traditional methods of experimentation, values local taxonomies of natural resources, and appreciates native technologies.

To utilize the vast storehouse of end-user knowledge and skills in problem-solving, our approach to SANREM CRSP brings with it a diverse toolkit of innovative, participatory methods for working with resource-poor farmers, and other end-users. This toolkit stands in sharp contrast to top-down approaches that frequently involve lengthy questionnaires, complicated researcher trials in farmers' field, and other scientist-driven techniques. Instead, by using community meetings, end-user group interviews, key informants, group treks, village preference rankings and other methods, the end-users themselves will have the opportunity to help design the research agenda from the earliest stages. Scientists (expatriate and local), public officials, community leaders, PVO/NGO representatives, extension agents, and end-users will regularly and systematically come together in the watershed context to identify goals, problems, and solutions to problems. Instead of focusing narrowly on individual farmers in isolation, diverse actors in the food and land use systems (e.g. farmers, fishermen, processors, traders, consumers, and resource managers) will be involved in this strategy. In addition, LAST teams will systematically conduct participatory topical research (soils, genetic resources, animals, water, labor, etc.) with the various users in the human and biological ecosystems that collectively define the landscape in question. This research, which may include focused surveys, will yield information that is simultaneously quantifiable, qualitative, comparable and valid to both users and outside scientists. To insure that this information is appropriate, it will be regularly shared with the users who, through debate and discussion, will maintain an active intellectual interest in what is happening in their community. Precisely because a landscape is a mosaic of interacting ecosystems, achieving sustainability on this scale requires that all end-user constituencies represented within the landscape collectively define broad goals and seek solutions to the problems that are common to all; otherwise, the divergent and conflicting interests of separate user groups are likely to undermine the sustainability of the landscape as a unit.

Goal #2. Identify and collate existing biophysical and socioeconomic baseline data, including relevant indigenous knowledge and determine the need for additional baseline data collection.

Progress toward sustainability in agriculture and natural resource management is frequently not limited by a lack of information assets, but by the failure to pull into one account relevant information that has been banked in separate vaults. It is essential that integration of existing knowledge bases begin early in the implementation of SANREM CRSP. Agroecosystem Analysis[6] provides a mechanism for systematic organization of existing knowledge of the resource base. Our approach to this integrative process requires that representatives from key PVO/NGOs, governmental agencies, host-country universities, established in-country CRSPs, and SANREM CRSP U.S. member institutions meet in each host-country: (1) to clearly define and identify the component agricultural and natural ecosystems of each landscape in question, the ecosystem boundaries within each landscape, the subsystem hierarchies within each ecosystem, and (2) to describe and summarize the properties of each landscape. In this process, (1) relevant data in the possession of separate group participants is shared and integrated, and (2) gaps in the collective understanding of the systems are revealed.

Our adaptation of this process will involve conventional systems analysis[6], simulation modeling and GIS (Fig. 7) and incorporate indigenous knowledge gathered in formal and informal meetings with end-users. The collective understanding of the landscape units under study will be refined continually as SANREM CRSP develops and matures. For the purpose of information exchange, meetings and interaction of this sort will be scheduled on a regular and systematic basis, adding new information and fresh perspective to the collective knowledge base, weaving the threads of indigenous knowledge throughout.

Goal #3. Collect and integrate additional physical, biological, and socioeconomic baseline data.

Baseline information gaps, identified by integrating existing knowledge bases, could limit our understanding of the ecosystem and their component processes and interactions. These gaps will be filled monitoring and/or survey data. For example, 1) biotic surveys (e.g. natural vegetation, aquatic biota) could be used to establish or supplement measurements of biodiversity, and serve as an index of environmental conditions prior to system manipulation, or 2) social surveys could be conducted to assess the role of women in agricultural production.

Certainly, because weather is a "driving force" in biological production, and a major

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[6] Conway, G. R. 1985. Agroecosystem analysis. Agricultural Administration 20:31-55.

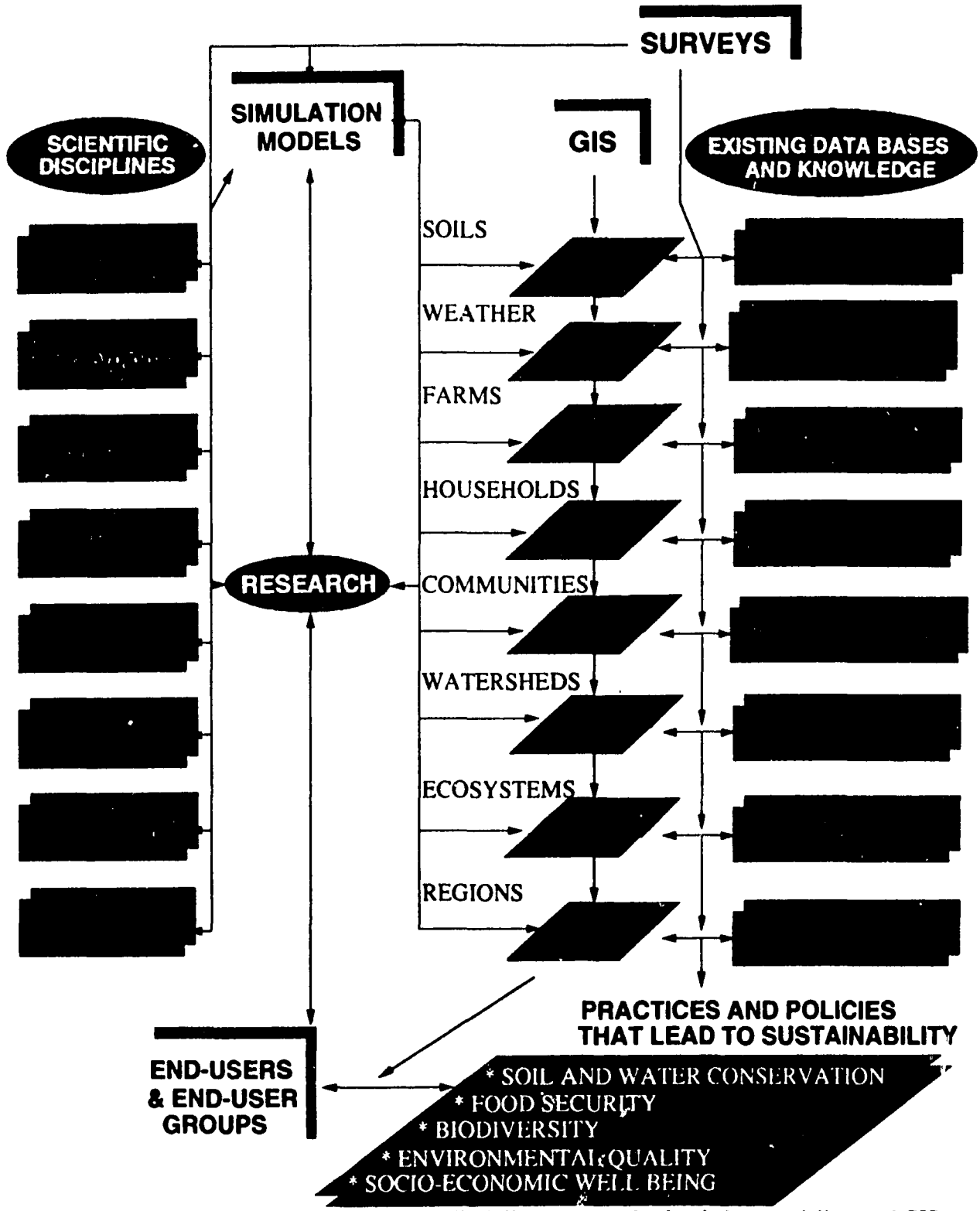

Fig. 7. Conceptual model of the roles of interdisciplinary research, simulation modeling, and GIS in the development of practices and policies that lead to sustainablity.

source of uncertainty and risk in farming, meteorological monitoring networks will be necessary. We will establish a network of weather stations at each of our sites. Also, because water is a primary link between ecosystems in a landscape, a major determinant of ecosystem type and function, and a critical indicator of good and bad land use, baseline hydrologic data will be required. A network of hydrological stations and a regular monitoring program will be established in key watersheds to measure: 1) precipitation and the effects of contrasting land uses on 2) evaporation, 3) runoff, 4) stream flow, and 5) the concentration of sediment and nutrients in runoff and stream flow.

Goal #4. Recognize and understand the cultural, socioeconomic, political, and institutional framework.

All natural resource management and agricultural production decisions are made within an existing social, political, economical, and institutional framework. It is imperative to recognize, evaluate, and understand this framework as an early step toward identifying and overcoming the constraints to sustainability. Armed with the knowledge of this framework and with the full participation of the end-user, a research agenda can be formulated that focuses on critical issues and their interrelationships. Some of the issues to be addressed include: 1) gender issues, 2) age issues, 3) impacts of production alternatives on social structure, 4) land tenure and common land allocation, 5) spatial and temporal food availability, 6) inequitable food distribution, 7) agricultural policies related to taxation and pricing, 8) power structure issues, 9) human migration, 10) trade issues, 11) distribution of credit, and 12) educational infrastructure.

Analysis of the existing framework would also reveal programs and policies that undercut the sustainability of agriculture and the natural resource base. For example, tax structures that favor widespread deforestation under the guise of "land improvement" are clearly counterproductive. Priority should be placed on the development of incentives and national policies that encourage the adoption of sustainable agricultural production and natural resource management, consistent with the economic welfare of end-users.

An important tool in the analysis of the human structural framework will be modeling. Through simulation modeling, incorporating both qualitative and quantitative information, multi-level constraints can be accounted for, and possible alternative management practices can be evaluated in a comprehensive manner.

Goal #5. Improve the understanding of important ecosystem processes and critical ecosystem linkages in a landscape setting.

Critical physical, chemical, biological, socio-economic, and cultural landscape linkages

will be identified employing aspects of Agroecosystem Analysis[7]. In this process, we will engage the key PVO/NGOs, governmental agencies, host-country universities, and U.S. member institutions by meeting to describe and summarize ecosystem properties by analyzing patterns of space, time, flow, and decision-making within each landscape, within each component, and within each hierarchical subsystem level, identifying those elements and linkages which appear to be pivotal. With this information, the need for additional monitoring, evaluation, or other experimentation becomes apparent.

Of particular interest are water quality issues and negative "downstream" impacts of agricultural practices. Heavy sediment loads, high nutrient concentrations, and pesticide contamination are all problems that threaten potable water supplies, fish and wildlife resources, and natural areas. Prime goals of this project will be improved understanding of: 1) the hydrologic cycle at each site, 2) how ecosystems are linked through the hydrologic cycle, and 3) how agricultural practices impact other ecosystems in the landscape. In particular, it will be necessary to quantify rainfall, runoff, run on, evapotranspiration, infiltration, deep percolation, soil water storage, and ponding on sites of contrasting land use.

A thorough knowledge and understanding of nutrient cycles and their component processes are essential also, as nutrients are often the source of negative off-site impacts as well as being key to long-term soil fertility and productivity. Other factors related to long-term soil productivity, such as soil erosion impacts, soil organic matter maintenance, and the preservation of favorable soil physical condition are poorly understood also and will be an area of critical inquiry.

Another critical area of research is the management of transition zones, which function to shield natural areas from zones of intense human activity. There is clearly a need for research to determine the type and intensity of management that allows transition zones to maintain their buffering function, while permitting productive use of the land.

The tools for accomplishing this will include not only experimental field studies of varying scale (plots, fields, watersheds), but also simulation modeling and GIS. Simulation models will provide a framework for understanding complex processes; GIS will organize existing information and facilitate its integration with newly acquired data.

Goal #6. Identify quantifiable "markers of sustainability", measurable parameters that will indicate improvements in sustainability.

A crucial intellectual challenge of this project is to identify quantifiable "markers of sustainability", measurable parameters that will indicate improvement or success. The

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[7] Conway, G. R. 1985. Agroecosystems analysis. Agricultural Administration 20:31-55.

identification of these markers is a research problem in itself. In a preliminary way, we have identified several indicators that might serve as markers of sustainability. However, we anticipate that the understanding of sustainability and of the relative importance of these markers will evolve with this project.

Biophysical Markers. The primary on-farm biophysical markers of sustainability derive from measurements of edaphic and biotic factors that influence, or serve as indices of, the productive capacity of the farm. On experimental and control farm sites, changes in biophysical resource sustainability during the life of the CRSP would be indicated by repeated measurement of:

(a) soil properties, including organic matter content (C, N, P, and S; labile and other), cation and anion exchange capacities, base saturation, pH, water-holding capacity, infiltration rate, structural stability, and mechanical strength.
(b) biotic activity, including soil microbial respiration, weed and insect populations (pests and beneficials), crop disease incidence and severity, and crop growth rates and yields.

The sustainability of on-farm production is impacted when soil, water, nutrients and chemicals move off-farm. Further, such off-farm movement can drastically alter the functioning of aquatic and terrestrial ecosystems that receive these unintended farm exports. In this regard, important markers of biophysical sustainability would include:

(a) hydrologic measurements, such as quantities of water runoff, depth to water table, changes in surface water storage, etc.
(b) water quality measurements, such as sediment and nutrient loads, and sequential measurements of aquatic invertebrates community structure, an approach that provides an index of the impact of organic contaminants on aquatic ecosystems.[8,9]
(c) changes in the biodiversity of protected and managed lands and waters would follow from a periodic census of key taxa (that will act as a surrogate measure of overall biodiversity) in ecosystem sites receiving varying degrees of protection and management.
(d) change in land use would be periodically measured by remote sensing (aerial and satellite). Satellite imagery (LANDSAT and SPOT) would detail patterns of agricultural land use, urban development, and the distribution of natural vegetation, and would facilitate the synthesis of regional

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[8] Deutsch, W. G. and M. Collette. 1991. Environmental studies related to integrated aquaculture and water quality in Rwanda, Central Africa. Report on research supported by a contract between the Auburn University International Center for Aquaculture and Development Alternatives, Inc.

[9] Hilsenhoff, W. L. 1988. Rapid field assessment of organic pollution with a family-level biotic index. Journal of the North American Benthological Society 7:65-68.

environmental reports. Such documentation of the historical trends in regional land use would build a data base for current and future environmental policy decisions.

Socioeconomic Markers. With respect to social indicators of sustainability, we will analyze changes in demographic trends that result from the adoption of key interventions. For example, we foresee that education in environmental and natural resource issues and the adoption of improved agricultural and land use practices will affect household size and structure, the fertility and status of women, child mortality, and the seasonal and permanent out-migration of men and families. Consequently, it is logical to expect that measurement of such key demographic variables will provide social indicators of change in resource sustainability.

With respect to economic indicators, there are two principal types of economic indicators of sustainability. First, economics can provide an integrated indicator that combines diverse changes in components related to sustainability. One version of this descriptive economic indicator would measure from year to year, or project to future years, the combined annual value of resource-based goods and services. Another version would measure the change from year to year in the real value of resource assets such as cropland, forests, groundwater, etc. Second, economics provides methods for comparing the long-run benefits of increased sustainability to the more immediate costs of implementing the alternative measures and strategies required for the improvement. The costs of necessary investments of labor and capital, and of current production opportunities foregone can be compared to the benefits of maintaining or increasing quantities or qualities of resource services. A comparison of market or monetary costs and returns (i.e. net profit) can provide a good indication of whether private farmers and resource owners are likely to adopt innovations designed to conserve resources and enhance the sustainability of agriculture. But, from society's point of view, there is a need also to consider effects that do not affect private farmers' profits, and consequently, a need for a social benefit/cost analysis of conservation/sustainability improvements that includes consideration of changes in public, non-market values.

Goal #7. Develop and evaluate viable management strategies for achieving sustainability in agricultural and natural ecosystems

Embedded in this goal are several critical problem areas that need to be addressed. These include: excessive use of pesticides, excessive grazing and cultivation on fragile soils, inappropriate use of fire, lack of technology for reclamation of degraded lands, lack of information on extractable forest products, lack of economically viable alternatives, and lack of sensitivity to gender issues in natural resource management. To address these constraints, we will employ the farmer-first methodology combined with a cadre of expertise in innovative technologies such as integrated resource management, integrated pest management, and agroforestry and integrated social forestry systems.

Integrated Resource Management. The goals of integrated resource management are the restoration of productivity of degraded lands, maintenance of long-term productivity, and conservation and preservation of natural biodiversity. At the core of integrated resource management is improved soil, water, and nutrient management, which can lead to an alleviation of the pressure to expand onto marginal lands. Indigenous knowledge of soils, water management, and cropping systems is the starting point for developing integrated resource management strategies. Water is of particular interest in developing improved management strategies because it is excessive or meager water resources that often constitute the primary constraint to production; thus, water management strategies that enhance water capture and impoundment, water conservation, and overall watershed management are critical. Improved soil husbandry, including control of soil erosion, crusting, enhancement of soil organic matter and plant nutrient availability and supply, and preservation of favorable soil physical condition, is a prerequisite to the maintenance of long-term productivity and reduced reliance on purchased inputs. Improved nutrient management, including recycling of organic sources of nutrients, greater reliance on legumes, and innovative cropping systems and management alternatives to the use of fire in land clearing and crop residue management, is key to the development of economically viable and environmentally sound systems that are not purchased-input-intensive. Nutrients are also of particular interest because they are often the source of negative off-site impacts. Thus, improved nutrient management strategies are needed that result in greater use efficiency and recycling.

Integrated Pest Management. Because pesticides are a source of human health risk and loss of beneficial biological resources, management strategies that reduce dependence on pesticides are needed also. These strategies include the coordinated use of multiple tactics, including biological control, to assure stable crop and animal production and maintain, pest damage below the economic injury level. The development of appropriate local and regional IPM programs must capitalize on indigenous management strategies, give consideration to gender divisions of labor, and build upon an understanding of the complex interactions within and between ecosystems. IPM requires a knowledge of the biology and ecology of pest organisms, and this will be a critical area of integration and additional inquiry. Because IPM is consistent with the low-purchased-input goals of sustainable agriculture, it emphasizes management techniques that are appropriate for cash-poor farmers.

Agroforesty and Integrated Social Forestry. Agroforestry is a collective name for a land use system in which woody perennials such as trees or shrubs are combined with components of agriculture such as annual or perennial herbaceous crops or animals. Some of the benefits of including trees within agricultural systems are: soil stabilization; fodder production; supply of mulch for improving soil; improving microclimate; and production of wood for firewood, pulpwood, charcoal, and boards for local construction. Another important aspect of agroforestry systems is their increased temporal and spatial structural diversity, as compared to monocultures. The higher structural diversity results in a greater number of habitats or niches, which can result in enhanced biological

diversity, important for genetic, aesthetic, and pest management reasons.

Various traditional labor intensive systems of production in the tropics fall under the category of agroforestry. While some agroforestry systems are vintage, there are some which are of recent origin. For example, the adaptation of alley cropping to steep slopes appears to be recent innovation, at least in some regions. Here, the technique of hedgerows along the contour can replace the more difficult traditional rock terraces, and at the same time provide fuelwood, fodder, and mulch. There is yet much that can be done to recover abandoned, traditional systems and to improve new systems and this will be an important focus of work.

Integrated social forestry or community forestry differs from agroforestry in two ways. In agroforestry, the goal is to improve agricultural crop production or to diminish external inputs. Tree products are a secondary consideration, and species are chosen to enhance the agricultural production system. In social forestry, tree production is the primary goal on the land under consideration. Agricultural crops are complementary or supplementary.

Another distinction is that agroforestry does not necessarily include a social or community component. In contrast, an integrated social forestry system may be part of an established community or village that seeks to diversify local production systems and to increase community self-reliance on wood products. As this meshes well with our end-user methodologies, we will seek opportunities to develop integrated social forestry, especially in recently cleared, newly settled regions, where the necessity for immediate food production has precluded the longer range need for environmental stabilization and wood production.

Goal #8. Promote education, training, and information exchange in sustainability issues.

Reversal required by the new paradigm in sustainable production and natural resource management must also be accompanied by equally novel turnabouts in educational training and information exchange. In the past, technical agriculture either in schools or in specialized courses has been taught within a narrow framework which failed to emphasize holism, interdisciplinarity, farmer wisdom, and creative approaches to technology design. In order to overcome these conventional models of training, LAST will design and test new approaches to both training and information exchange.

Community-Based Education in Environmental and Ecological Awareness. A major emphasis in community based education will be the "training of trainers". This training can take place in the various communities of our landscape sites. After the training, the individuals will disperse to their own locales and conduct "echo" courses on an informal basis. In addition, based on a community desire to aid in child/family connections and understanding of sustainable agriculture and natural resource management (agriculture,

forestry, animal production), the possibility of implementing a program based on the 4-H program will be explored. In this same vein, rural communities will be encouraged to write their own textbooks, much like the "foxfire" type books from rural Appalachia.

In primary and secondary schools, there will be an evaluation of the present status of environmental education. Evaluations will be done by a panel of teachers made up of U.S. and host country primary school and adult education specialists (PVO/NGOs). Based on these evaluation, programs which can be integrated into the present system will be designed.

Information Exchange. With farmer-back-to-farmer as a central model for this proposal, the organization and training of farmers and resource managers will be approached using this method. As research and trials will be on farm, organized and informal on-site farmer gatherings will be necessary. This approach has been shown to be effective[10]. The self-organization of farmers and resource managers, such as the Conservation Farmers Association and the Tree Growers Association in the Philippines, have been extremely successful in the promotion and adoption of working practices. The promotion and utilization of these associations will be a part of the training and extension activities within this project.

To promote networking and exchange of indigenous knowledge, a farmer exchange will be conducted. This will be done via the National Association of Conservation Districts. The Soil and Water Conservation District concept within the United States consists of a panel of 5 farmers who coordinate and evaluate activities of USDA-SCS within each county/community. This concept could be readily adapted to implement community based management and decision making for research and adaptation within the farmer-back-to-farmer model.

Formal Training. Formal training will be at the undergraduate, graduate and visiting scientist levels. In the host country, undergraduate scholarships will be made available on a competitive basis (perhaps through the new Conservation Districts). Graduate students in the host country will be trained either in the host country or at the Land Grant Universities in the U.S. within the consortium. Focused non-degree training in the form of intensive shortcourses will be made available to strengthen the capabilities of extension personnel and development specialists. Professional/graduate training of host country women will be a strong component. The SANREM CRSP will also provide a means by which U.S. students do graduate research in collaboration with consortium members in host countries. We also foresee the exchange of scientists from host country and U.S. institutions on a short term basis (0.5 to 3 months). In addition to the

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[10] Fujisaka, Sam. Participation by farmers, researchers, and extension workers in soil conservation. IIED Gatekeeper Series No. SA16. Sustainable Agriculture Programme, International Institute for Environment and Development.

collaboration of scientists within host countries and the U.S., this will enable training in specific methodologies or course work for individual scientists.

Innovative Research Components

Gender Analysis and Sensitivity

"Women as fetchers of water, collectors of firewood, tillers of the land and as mothers are usually the first to feel the effects of environmental degradation in the developing world. They are also in the best position to manage the environment but their role is frequently ignored by policymakers and planners."[11] We plan to make gender analysis and sensitivity a central technical component of our project. This is essential with a farmer-first approach. The working thesis of this proposal is that gender and development research should not be conducted by women researchers in isolation, but rather that it should be integrated into the mainstream of all the initiatives of the SANREM Global Proposal. For this to take place it is necessary to expand the human resource base in undertaking such analysis. We plan to address these problems through four project components. These components are common to all project sites but will vary in intensity and nature depending on site characteristics. These components are training; gender analysis/research; monitoring, evaluation, and impact analysis; and transferability analysis.

Training. Gender analysis will be incorporated through training in several ways: 1) preliminary training of research teams; 2) team building; and 3) training of trainers. Preliminary training of the multidisciplinary research teams in gender analysis will be provided to researchers prior to initiating any field work. The team building component will take place first in the US followed by training of the multinational teams at the regional sites. Lastly, gender trainers will be recruited at each site to prepare materials to train the multinational teams utilizing gender-specific farmer-first methodology. The training of trainers will establish a cadre of competent gender analysis trainers who would then service new personnel throughout the life of the project.

Gender Analysis. Gender analysis when an integrated part of research design and implementation, can help identify key sustainability issues and problems and the technical solutions most likely to solve them. Gender analysis provides the methodology and insights on how to identify in whose domain, men's or women's (old or young) a particular activity or enterprise falls, the actual user of technology or output and the contribution to family income and income use. It is, therefore, relevant and applicable to any research which intersects with the farm and farmer operations, management

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[11]Vickers, Jeanne. 1991. Women and the world economic crisis. UN/NGO Group on Women and Development, ZED Books Ltd. London/New Jersey.

practices (i.e., soil, pests, water, biomass, livestock, crops, household incomes, investments, etc) as well as the use of resources and preferences.

Examples of major areas of research where gender issues are important and in which we will apply gender analyses are: indigenous knowledge, cropping systems and management, natural resource management, land tenure/legislation, food security and household food consumption, migration, and local organization.

Monitoring, Evaluation, and Impact Assessment. A system will be devised to monitor and evaluate the research efforts in order to give regular feedback on the gender consequences of the research underway and to measure the gendered impact of the technology once developed. Indicators that would signal changes in the practical and strategic needs of women and that could be compared across sites will be identified. In addition, monitoring will take place to identify social constraints to project success, particularly those related to the gender division of labor -- and its differences by social class and ethnicity -- and gender division of resources within the landscape.

Transferability. The data base established in the process of evaluation, monitoring, and impact assessment will generate complete data for all project sites. These data will be compiled and analysis will be done for the purposes of making comparisons, identifying commonalities and developing general principles that may be generalized to other areas of the world and to the U.S. These analyses will be especially valuable in gaining insight and possibly drawing inferences to similar sustainable questions facing the U.S., as well as other areas of the developing world.

Systems Analysis and Simulation Modeling

Although modeling should never be a sole research objective, it should play an integral part in the research process through improvement of the science and the application of the results. Modeling can be a useful tool in analyzing and integrating research results for many different disciplines, identifying research gaps, and recommending further experimentation (Fig. 8). Two other features of systems analysis and models also stand out : repeatability across space and repeatability over time. Models can be run for many locations for one season to determine spatial variability; they can be run for many years for one location to determine temporal variability; or they can be run in sequence for one or more years for one or more locations to determine sustainability and evaluate resource use.

The concept of sustainable agricultural production incorporates problems with long timeframes, uncertain and changing environments, and variable social and economic settings. It is impractical to rely upon empiricism to demonstrate that a particular set of farming practices is sustainable (or not sustainable) over a 50 year time frame. The judicious use of simulation models will permit predictions which we can use to evaluate practices which are most likely to be sustainable.

Modeling and the Research Process

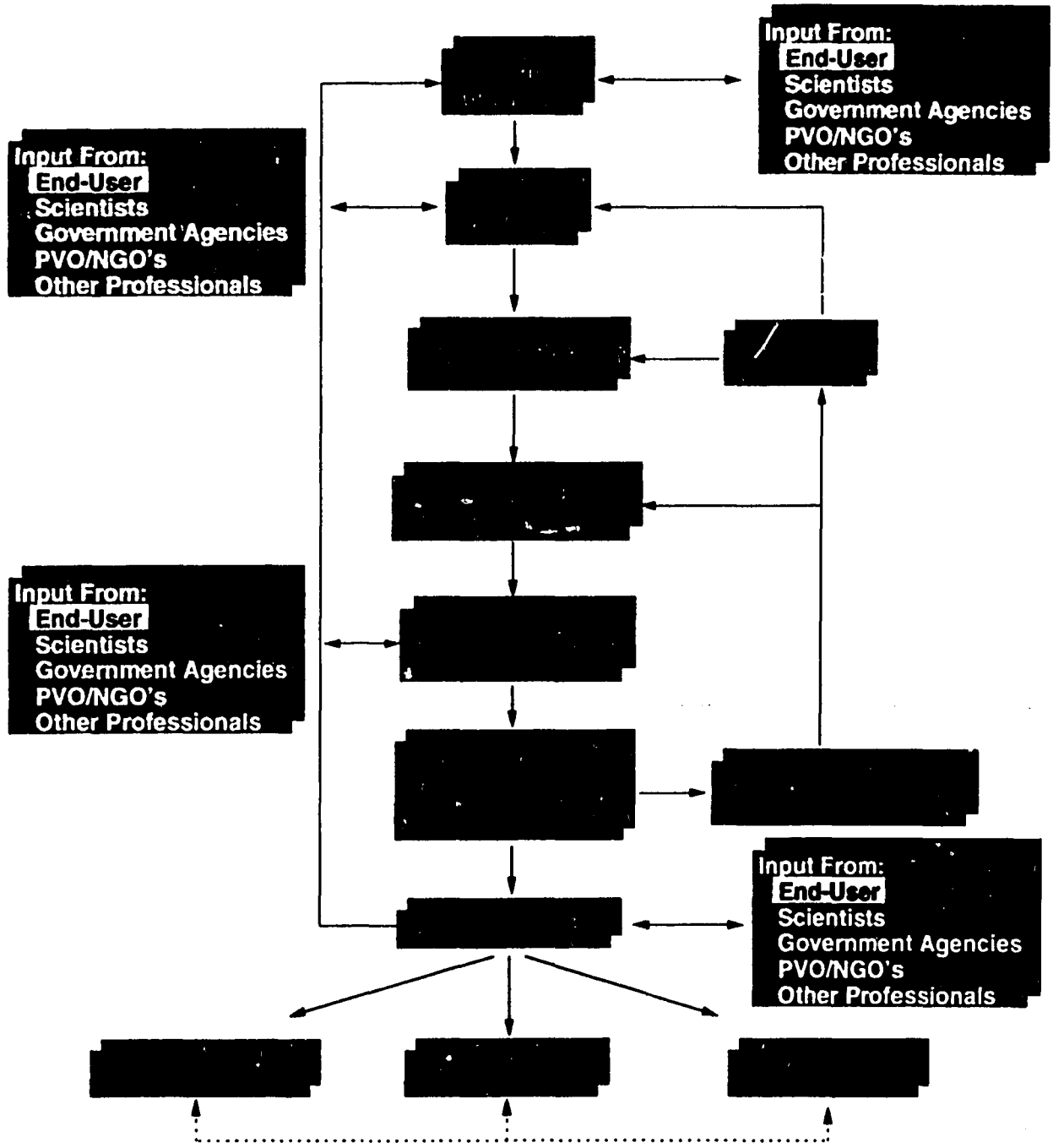


Fig. 8.

Once models have been validated and tested they will be applied at different levels to study issues related to sustainability in agriculture and the interaction with both the biophysical and social environment (See Fig. 7). Models will be used: 1) at the field level to study the interaction between the crop and its climatic and edaphic environment and to determine optimum crop management practices; 2) at the farm level to study the interaction with the various farm enterprises; 3) at the household level to study issues related to the economics and net-income of the households; 4) at the community level to study the traditional farming practices, indigenous knowledge, and the effect of modified farming practices on the economics and social well-being of the entire community; 5) at the watershed level to study the effect of current and modified farming practices on soil erosion and water pollution; 6) at the ecosystem level to study the interaction of farming practices with the environment; 7) at the regional level to integrate the individual farm responses and to study regional production patterns; and 8) at the national level to provide information on long-term policies and practices for policy and decision makers. At each level these models will be used by interdisciplinary research teams as a tool to link with current data bases, to analyze existing knowledge and information, to determine knowledge gaps, to screen research options, and to further test the most promising results from experiments, trials, and surveys.

Geographic Information Systems

Geographic Information Systems (GIS) provide a set of tools for collecting, storing, retrieving, transforming, and displaying spatial data. It is emerging as a powerful framework for analyzing, interpreting, and transferring/extrapolating natural resource data (Fig. 7). A rich array of data and analytical options can be managed by GIS and include: spatial (e.g., land cover from remotely-sensed imagery, topography from terrain models, transportation networks, soils, geology, and hydrography from published surveys); attributes (e.g., crop yield, disease infestation, census) that can be related to spatial entities; spatial interrelationships (e.g., covariance among soils, topography, hydrography, and land cover); and simulation modeling (e.g., watershed response to land cover change).

GIS is well-suited for complimenting major goals of our study since data of multiple themes will be collected from a variety of sources with one common descriptor, that of geographic location. Therefore, state-of-the-art cartographic and spatial analysis techniques will be suited to manage the data, and to analyze and model the interactions of socio-economic, anthropogenic, and natural resource factors. Advanced GIS have proven effective for providing this capability, and provide the broad advantages of 1) a common framework for storage and analyses of data, which should facilitate the integrative/interdisciplinary goals of the project and, 2) a "product" that can be used and embellished by the host country after project activities have concluded.

We will use GIS to provide the following:

(a) Register and merge disparate multitheme data to a common base for multivariate analyses and modeling
(b) Provide effective data management and data awareness to link the multiple investigators
(c) Provide efficient data distribution in a readily useable form to the investigators and others who would benefit from the data
(d) Analyze spatial relationships and map patterns of interrelated variables
(e) Conduct standard variance and covariance analyses and modeling to establish thematic and spatial linkages of the multiple data types
(f) Evaluate the impact of scale and detail of information on the resultant model for investigation locational dependencies and spatial extrapolation of the results to other watersheds and to larger regions
(g) Facilitate effective visualization and communication of results to decision makers

Prioritization of Research Initiatives and Rationale

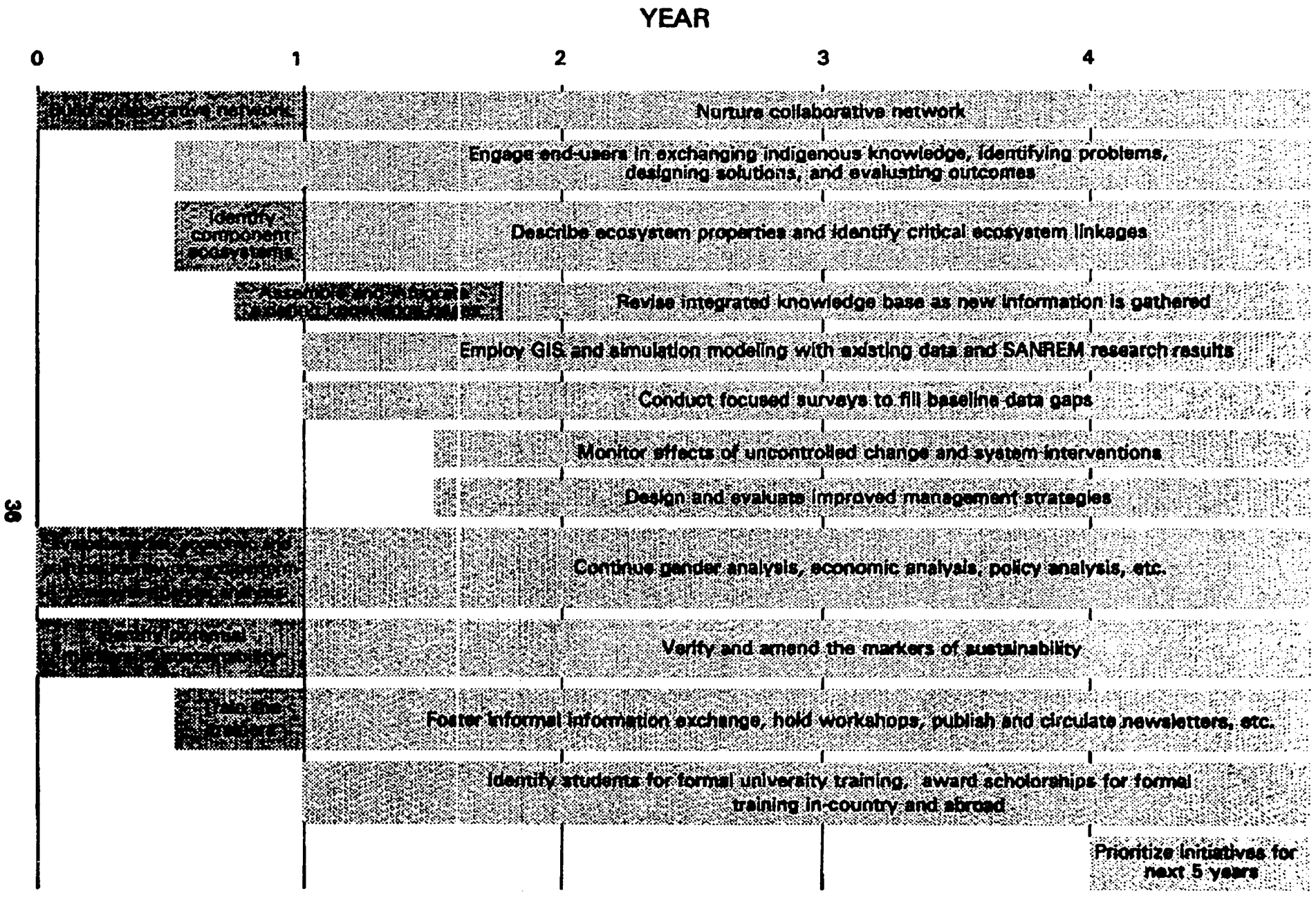
A general timeline that illustrates the prioritization of our research initiatives is presented in Fig. 9.

The "farmer first" methodology dictates that the program begins with the end-user. Therefore, the number one priority is building the collaborative network to include farmers, other end-users, and end-user groups. Concomitantly, we must evaluate the social, economic, and political framework within which the end-user lives and works. Of particular importance in this evaluation is gender analysis. These are the foundation upon which we will build our research agenda.

After building the collaborative network, it will be necessary to inventory and describe both the physical resource base and the indigenous knowledge base. Therefore, we will identify the component ecosystems and assemble and integrate existing knowledge bases employing GIS and simulation modeling. As necessary, missing baseline data will be completed. Using these data bases, we will describe ecosystem properties and identify critical ecosystem linkages and in concert with the end-user, identify problems and design potential solutions.

Once we have engaged the end-users, understand the framework, both biophysical and socio-economic, and identified the problems and goals, the design, execution, and implementation of research, into sustainable agriculture and improved natural resource management is a continual process. Training, education, and information exchange and dissemination are also a continuing process and will be involved in all phases of the project.

Fig. 9. Prioritization of Research Initiatives for First 5 Years



Innovative Roles for Participating Groups

Our consortium is ideally and uniquely suited to implement an interdisciplinary, user-oriented research program that will lead to sustainable agricultural systems and improved natural resource management in the tropics. Our consortium has the necessary balance of disciplines, including strong agricultural, ecological, and social sciences, from an impressive array of universities and research organizations. In addition, we have enlisted the collaboration of several highly qualified institutions who will serve in innovative roles in this effort. Some of these are described below. (Additional details of the consortium and the roles of the participants are given in the section entitled "Commitment of the Scientists and the Institutions".)

End-Users. The end-users are not only incorporated in the consortium, they are fully integrated into the fabric of the project. End-users comprise the lifescape upon the landscape and consist of farmers, as well as processors, traders and consumers. Sustainability must begin with end-users because "what gets done or not done depends, in the final analysis, on what human beings perceive as worth doing or not doing".[12] We will be working in collaboration with several farmers, local organizations, and womens organizations to insure appropriateness of interventions as well as empowerment of these end-users to train their own people.

Center for PVO/University Collaboration in Development. As an association of 16 private voluntary organizations serving end-users at the grassroots level and 17 universities with development research and implementation interests in over 130 countries, the PVO/University Center is uniquely positioned to provide critical linkages among key CRSP participants. In particular, this refers to CRSP participants who have not traditionally collaborated in on-going research activities — U.S. PVOs, and host country NGOs serving the rural poor, farmers/end-users, and both host country and U.S. international researchers. Specifically, the PVO/University Center will have major responsibility for facilitating the linkage between and among researchers, PVOs/NGOs and end-users/beneficiaries. This will include such activities as: 1) designing and facilitating on-going, site-specific mechanisms for integrating end-users into CRSP research activities, including building and nurturing networks; 2) applied and technical information dissemination, especially, but not exclusively, to PVOs, NGOs, farmers, and other end-users, and government agencies; 3) sustained support for PVO/NGO and end-user participation in CRSP activities.

PVO/NGOs. Key organizational elements in this project are PVOs/NGOs as frontline partners in the research and development process. They are appropriate as

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[12] Sandoval, Virginia. 1991. A Concept Paper from the User's Perspective with Agricultural Research and Development and Development Network. Los Baños, Laguna, Philippines.

intermediaries and as direct links to end users, the rapport and confidence already established between the local population and on-site PVO/NGOs, and their understanding of the social, political, cultural and environmental factors which influence end-user behaviors, values and attitudes affecting research issues, strategies and practices.

Through full participation in the research agenda, PVOs/NGOs working at each research site will: 1) help ensure that the research agendas for the project are adequately formed; 2) assist researchers in specific site selection, target populations, potential lead farmers or cooperators, potential methodological problems involving end-users, establishing rapport with informants, and the designing and implementing of field activities; 3) assist farmers and researchers in identifying indigenous knowledge, skills, and practices that can be harnessed to improve the sustainability of agriculture and natural resource management; 4) facilitate feedback from end-users to researchers throughout the course of research activities; 5) contribute to the understanding of socio-economic and cultural variables, formal and informal practices that affect behavior, the ability to mobilize resources, and the understanding and implementation of government policies; and 6) serve as information channels so that research findings reach end-users in a timely, usable form through information dissemination and training both at the specific research site and in other countries/locations where the PVO/NGO conducts sustainable agriculture and natural resource management activities.

Each research site has a number of PVO/NGOs with whom we plan to collaborate. Heifer Project International has been involved in our consortium from its inception. Others include CARE, Save the Children, Christian Children's Fund, and Plan International. We have involved a number of host country NGOs as well, such as Defensores de la Naturaleza in Guatemala, Association pour le Development de la Region de Kaya in Burkina Faso and the Network for Environmental Concerns in the Philippines. They are variously involved in sustainable agriculture, rural development, environmental programs, working with women's groups, child health and nutrition, or small enterprise development at the community or farm level.

Tuskegee University. Tuskegee University, a historically black university, offers a long-term history of research and education programs dealing with management of eroded, infertile soils, water conservation and protection of water quality, and management of forested lands, as well as programs to address the needs of less-advantaged rural and urban populations. Because of its long-term commitment to the less-advantaged, Tuskegee offers a unique perspective to this project. Tuskegee also has a strong international program and a strong commitment to international research and training programs.

International Research Centers. We have incorporated several of the international research centers directly into our consortium, including AVRDC, CIMMYT, ICRAF, ICRISAT, CIP (UPWARD) and IRRI. They offer excellent research infrastructures and an opportunity to extend and regionalize our research results. In addition to being full

partners in the research process, they will help to regionalize our program by hosting regional workshops and training activities and by testing the transferability of results.

Other U. S. Government Agencies. We have involved several other unique organizations, such as the USDA's Agricultural Research Service (ARS) and the U.S. Geological Survey (USGS). The roles of these two organizations will be to supply expertise in pertinent areas. For USDA-ARS, a full consortium member, this is expertise in soil quality and productivity, experience in watershed studies, and simulation modeling expertise, primarily from their National Soil Tilth Lab in Ames, Iowa. USGS, is not a full member, but has agreed to cooperate by providing expertise in the use of GIS. The Peace Corps will collaborate in training and extension activities throughout the Philippines.

Methodology for Collaboration

Because we are proposing a "putting the last first" approach, the end-user's participation and collaboration with other partners will be the starting point of the network of interactions and collaborations. This network will be the foundation upon which we will build our research and development program. Our consortium is uniquely suited to this purpose, since it includes the Center for PVO/University Collaboration in Development, Heifer Project International, other PVOs, and several universities and international research centers, each with established infrastructures, including strong ties with grassroots level research and development activities. PVOs are particularly important to this activity as often they have gained the confidence and trust of local people and host governments. Together with the PVOs and host country institutions and agencies we will build and sustain a collaborative network of end-users and end-user groups.

Another facet of collaboration is inter-institutional interactions. One catalyst for inter-institutional collaboration in this project is the Center for PVO/University Collaboration in Development, an organization dedicated to facilitating collaboration between universities and PVOs working in development. The PVO/University Center has successfully capitalized on collaboration by forming institutional networks of universities and PVO/NGOs. Their proven experience and capabilities will open the door for enhanced inter-institutional collaboration and strengthening of expertise.

Of paramount importance to the success of this program is effective interdisciplinary collaboration. In recognition of the immense breadth of issues that must be addressed and the ambitious agenda that is proposed, some unique institutions and expertise have been identified for collaboration. Several of these institutions provide expertise on pervasive issues or on integrative methodologies that will cut across sites and ecological zones. We have organized our research plan around interdisciplinary teams for each research site, and we have organized the funding by site, rather than by institution.

Furthermore, the University of Georgia has demonstrated strengths in interdisciplinary programs. The University of Georgia's College of Agricultural and Environmental Sciences, School of Forest Resources, and Institute of Ecology have been engaged in interdisciplinary research on sustainable agriculture, agroecology and agroforestry for the past several years and have well established programs in these areas. These successes in interdisciplinary research will serve as the model for fostering and nurturing interdisciplinary research in this project.

Expected Benefits

True to the spirit of "putting the last first", prime beneficiaries of this innovative approach will be the end-users, whose expected benefits are an overall improvement in quality of life, including a more stable income of equal or greater magnitude, increased soil productivity, reduced dependence on and more efficient utilization of purchased inputs, improved food quality, and improved nutrient cycling efficiency. Secondary beneficiaries are both local communities and the "world community", whose expected benefits are reduced environmental degradation as a result of agricultural activities, enhanced soil and water conservation, decreased deforestation and/or desertification, preservation of biodiversity, improved quality of life, and decreased pressure for environmentally and economically motivated migration. Tertiary beneficiaries are members of the research community including agricultural, environmental, and social scientists whose expected benefits are improved methodologies arising from the farmer-participatory, interdisciplinary, landscape approach.

The LAST participatory methodology will also be widely applicable and replicable in other sustainable agricultural projects. In fact, the ultimate benefits of the LAST methodology will be not just in the targeted watershed sites, but in widely scattered sites in developing countries where the methods have been replicated. Experience in Asia by the UPWARD network (User's Perspective in Agricultural Research and Development) has shown that once researchers and users are exposed to these innovative methods, they utilize them spontaneously, and for many ends. Villages are now known to hold regular meetings and create, for example, village resource maps that point out systematic problems in land use or water management. These maps are used for setting priorities and identification of potential solutions. In Asia, UPWARD has conducted "Training of Trainer" seminars in the new methods, and then later, "Echo" seminars to diffuse the new idea. Since these developments are very recent, LAST will have a unique opportunity to diffuse the new sustainable agriculture methods.

The benefits to the U.S. from the implementation of the SANREM CRSP are many and are expressed at a number of levels. The following discussion shows some of those possibilities.

Farmer and Resource Manager Level

Because the southeastern U.S. shares several commonalities to the sites chosen in the humid tropics (identified earlier), there will be systems which are directly transferable to the U.S. agricultural systems. Agricultural, forestry and aquacultural systems developed under similar climatic and edaphic regimes such as intercropping, agroforestry, and permaculture could be adapted for use by American farmers. Sustainable agricultural practices from the zones of focus may also be directly transferred for remediation of degraded lands in our own backyard. The information which is gained from data collection and modeling is also a primary example which can assist in developing holistic farm level systems. Information exchange between farmers from the U.S. and those in the selected sites will expand the understanding and awareness of global issues by American farmers.

As an example of benefit to forestry, the high conifer diversity in the Sierra de las Minas of Guatemala may provide genetic resources useful in the southeastern U.S. Because these tropical conifers are adapted to low nutrient soils and highly variable soil moisture, they may have genetic traits or associated mycorrhizae that could be usefully introduced into southern conifer plantations. In addition, beneficial soil microorganisms might be useful in U.S. agriculture for biopesticides or as beneficial plant-associated organisms. Also, native crop varieties which are adapted to low input conditions may contain genetic traits useful in U.S. low input crop production. Finally, and perhaps the most durable benefit, execution of the LAST paradigm in lesser developed countries will "echo" back to the U.S. a process for generating acceptable agricultural technology, and lessons for uncovering our own sustainable agriculture.

Formal and Non-Formal Training of U.S. Individuals and Groups

American graduate students will conduct research in the landscapes where SANREM CRSP locates. Not only will this educate them to the severe limitations that confront people in the tropics places, it will also train them in interdisciplinary, end-user approaches to problem-solving, useful not only in lesser developed countries, but also at home in the U.S. Conferences sponsored by SANREM CRSP will also bring together U.S. scientists from a variety of disciplines to exchange ideas and information, forging an effective network for future interaction.

Benefits to the U.S. from the Enhancement of the Global Ecosystem

Interventions likely to slow global "greenhouse" warming, such as the protection of tropical forests, benefit all nations, including the U.S. Similarly, but more directly, other benefits to the U.S., chiefly those related to the stability of future food production and the discovery of valuable medicines, accrue from the maintenance of biological and genetic diversity worldwide. Lastly, interventions that improve the quality of life and standard of living in lesser developed countries diminish factors that compel migration to

the U.S.

Limitations

Some of the limitations to the planning and research process heretofore include: 1) lack of inclusion of and adoption by intended end-users, 2) lack of understanding of interactive processes between ecosystems, 3) lack of understanding of the human, social, political and economic dimensions of ecosystems, and 4) lack of interdisciplinary and holistic approaches. We propose to address these limitations by: 1) involving the end-users directly in the planning and research process, i.e. "putting the last first"; 2) utilizing a landscape ecology approach that will enable us to gain an understanding of the interactive processes between ecosystems; 3) seeking explicitly to characterize and understand the human and social dimensions of the identified ecosystems; 4) combining a wide array of disciplines, including agriculturists, ecologists, and social scientists, with farmers and other end-users in the planning and implementation process. By overcoming these constraints, we seek to establish and promote a farmer-participatory, integrative, interdisciplinary, landscape approach to the research of the principles of sustainable agriculture, training in innovative methodologies, and implementation of improved natural resource management and sustainable agriculture strategies.

C.4.(b)(3)(B) Attributes of Principal Investigators and Key Personnel

A complete list of the principal investigators and key personnel is presented in the Annex entitled "Personnel Roles and Time Commitments". Resumes are also presented for each principal investigator and key personnel in the Annex (arranged alphabetically).

The principal investigators and key personnel in our consortium offer a wealth of international research and development experience, a broad range of technical and scientific expertise, and diverse perspectives to sustainable agriculture and natural resource management issues. Some of the attributes of scholarship, abilities to form collaborative relationships, and history of interdisciplinary approaches are summarized below.

Evidence of Scholarship

We have built a cadre of internationally-known scientists from a broad range of scientific disciplines. Many of our Co-PIs have been the intellectual leaders in farmer-participatory methodologies, landscape approaches to sustainability, and sustainable agriculture technologies. R. E. Rhoades has written over 9 books and 19 articles on agricultural anthropology, food systems research, and farmer-participatory methodologies. C. B. Flora has over 25 years of experience in research in developing countries and has published articles in Spanish and English on gender and agricultural development issues.

J. P. Chavas and the co-investigators from the University of Wisconsin's Land Tenure Center have written extensively on the role of risk and information in the allocation of private and public goods in the agricultural sector and on problems of open access natural resources.

In the ecological sciences, W. D. Davies has worked on projects in 14 countries, has been awarded over $2.5 million in contracts and grants, has 54 publications, and has supervised thesis and dissertation research for 49 students. D. C. Coleman has published over 150 articles on nutrient cycling, soil biology, and sustainable agriculture, and has garnered over $3.5 million in grant funding to support his research program. C. Jordan has edited/authored 5 books, 73 scholarly articles, and 18 chapters on nutrient cycling, agroforestry, and deforestation. His work in agroforestry and integrated social forestry are widely cited.

In the agricultural sciences, S. K. DeDatta is a world reknown scientist, having worked at IRRI for 27 years. He has authored and /or edited several books and over 300 scientific papers in international and national journals. He has been recognized for his scholarship by numerous awards, including the International Service in Agronomy Award and the International Soil Science Award from the Soil Science Society of America. P.A. Sanchez is also a world-reknown scientist who has been at the cutting edge in

development of sustainable agriculture technologies. W. L. Hargrove has provided scientific leadership in the areas of integrated nutrient management, water quality, reduced tillage cropping systems, and cover crop technologies, and has published over 160 articles and 6 book chapters. E. T. Kanemasu is internationally known for his work on evapotranspiration, agrometeorology, and use of remote sensing in agriculture, and has published over 200 scholarly articles, 4 book chapters and 6 symposium papers. From the IARCs, D. P.Garrity has led IRRI's research on rice ecosystems for most of the past decade and has published over 30 scholarly articles on the ecology and management of lowland and sloping hillside agricultural systems. D. Midmore has published over 54 scholarly articles on resource management and cropping systems for vegetable production. To accomplish the data integration and modeling goals, we have a group of cutting-edge systems scientists who have expertise in simulation modelling, including W. Butcher, C. O. Stockle, D. Swift, and G. Hoogenboom.

This group of leading scientists will provide the necessary intellectual leadership to keep the SANREM CRSP at the forefront of scholarship in sustainability and natural resource management issues.

Ability to Form Collaborative Relationships

With our proposed farmer-first approach, collaborative relationships, especially with end-user and other innovative groups, is the foundation upon which our research program will be built. Many of our consortium members have demonstrated particular skills at developing and maintaining these relationships. R. Gurevich and R. B. Montee from the Center for PVO/University Collaboration in Development have extensive training, teaching, research, and management experience with PVO/NGOs and community groups in Africa, Central America, and Asia. The Center's Pilot Village-Level Natural Resource Management Activity, a $2.0 million US-AID-funded project in Burkina Faso, is particularly noteworthy as it is assisting PVOs and local end-user groups to develop and test village-level strategies for improving natural resource management strategies. Heifer Project International personnel, J. DeVries and D. Gudahl, have provided leadership in innovative rural development programs and have established and maintained collaborative relationships in over fifty projects in twenty countries.

We have leading individuals in the development and conduct of on-farm, farmer-participatory research methodologies, demonstrating abilities to establish and maintain collaborative relationships with farmers. S. Fujisaka, R. E. Rhoades, and D. P. Garrity have been leaders in these approaches, particularly in Southeast Asia. C. R. Carroll also has worked extensively with farmers in Liberia and lived and worked in a farming ejido in southeastern Mexico as part of a three-year NSF-sponsored research project. The Women in World Development Program personnel, C. B. Flora and I. Silva-Barbeau, have extensive experience with collaborative relationships with both other research groups and with user groups, especially women's organizations.

The University of Georgia, through the leadership of D. Snyder, has established and maintained a long-term collaborative relationship with the University of Ouagadougou in Burkina Faso. This has resulted in several joint research projects, over 20 students from Burkina Faso being trained at the University of Georgia, and over 30 scientist exchanges between the two universities. His long-term efforts earned him the highest award given by the government of Burkina Faso, and the honor of being the first non-Burkinabe to receive the award.

The University of Wisconsin Co-PIs (J. P. Chavas, K. McSweeney, and J. Reed) and the International Programs Director, K. Shapiro, have had extensive experience in developing and maintaining collaborative relationships, particularly in Africa. The Wisconsin team brings to this effort a strong complement of scientific disciplines with a solid track record in international research.

The Director of the International Center for Aquaculture and Aquatic Environments, B. Duncan, has over 20 years experience in international aquacultural development, has worked in 30 countries, and has considerable experience in design, management, and implementation of collaborative projects. The International Programs Office at Tuskegee University, managed by S. Louis, has also demonstrated experience in successful collaborative international projects, including several projects in Africa. M. S. Ngandu, also a Tuskegee faculty member, has had experience at the World Bank preparing strategies and negotiating financing for collaborative research and training programs between the World Bank and other research and funding institutions.

Lastly, G. Hoogenboom, University of Georgia, has developed several cropping systems models in collaboration with scientists from Central and South America, Central and Eastern Europe, Africa, and Asia, for the International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT) Project funded by US-AID. This network has been a strongly collaborative effort for several years.

History of Interdisciplinary Approaches to Program Management, Implementation, and Monitoring

Scientists at the University of Georgia have been particularly successful at building and maintaining interdisciplinary, collaborative relationships. Faculty from the Institute of Ecology and the College of Agriculture, in particular D. C. Coleman, C. R. Carroll, C.L. Neely, and W. L. Hargrove, have worked and published collaboratively for several years. The recent addition of R. E. Rhoades to the faculty has extended this collaborative network to social sciences, as well as ecological and agricultural sciences. R.E. Rhoades is particularly experienced with interdisciplinary approaches to program management, implementation, and monitoring, since while he was Coordinator for the Food Systems Research Program at CIP, the program received over one million dollars in funding for interdisciplinary research. Also, C. R. Carroll received support from the PEW

Charitable Trust, the Jesse Smith Noyes Foundation and the EPA to establish an interdisciplinary graduate training program in Conservation and Sustainable Development at the University of Georgia, and currently serves as its Program Director.

The International Center for Aquaculture and Aquatic Environments has a history of successful interdisciplinary programs. Its Director, B. Duncan, has extensive experience in implementing, managing, and monitoring interdisciplinary programs that integrate such activities as aquatic ecology, aquatic chemistry, hydrology, systems engineering, human and pathology, human nutrition, and socio-economics.

The PVO Center personnel, R. Gurevich and R. Montee, also have had considerable experience in the design, management, and coordination of collaborative, interdisciplinary programs that promote integrated strategies aimed at improving natural resource management in developing countries. Again, the Center's Pilot Village-Level Natural Resource Management Activity is noteworthy in this regard.

C.4.(b)(3)(C) Commitment of the Scientists and Institutions

Our consortium is ideally and uniquely suited to implement an interdisciplinary, user-oriented research program that will lead to sustainable agricultural systems and improved natural resource management in the tropics. In addition, to the original consortium members for our planning grant, we have incorporated six of the successful individual grantees, including all three projects from the University of Wisconsin, and each of the successful projects from Washington State University, Colorado State University, and the University of Georgia. Furthermore, we solicited additional expertise and collaborators during the planning process.

The consortium has the necessary balance of disciplines, including agricultural, environmental, and social sciences. The University of Georgia, the University of Wisconsin, and Tuskegee University share a long-term history of research and education programs dealing with sustainable agriculture and natural resource management issues including management of eroded, infertile soils, water conservation and protection of water quality, management of forested lands, integrated crop/livestock production systems, land tenure issues, socioeconomic wellbeing, and programs designed to address the needs of less-advantaged rural and urban populations. In particular, the University of Georgia's Institute of Ecology and the University of Wisconsin's Land Tenure Center offer unique expertise to this project that will lead to innovative approaches that are heretofore absent in other CRSP projects.

The University of Georgia is particularly suited to lead this effort as it has a proven record of using a landscape ecology approach in the study of watersheds. The University of Georgia manages an NSF-funded Long-Term Ecological Research Site in the Coweeta

Forest Watershed and also successfully conducted a long-term study of nutrient cycling and ecosystem interactions at the Little River Agricultural Watershed in South Georgia.

In, addition, we have enlisted the collaboration of several uniquely qualified institutions in this effort. The Center for PVO/University for Collaboration in Development (PVO/University Center) has 16 PVO members who have technical assistance, education, and demonstration projects around the world and a wealth of experience in village-level natural resource management projects as well as 17 University members, who possess a wealth of additional expertise and international experience. Thus, the Center will provide not only coordination and support for PVO participation, but also through the Center, we can solicit additional University expertise or additional PVO/NGO collaboration so that our consortium maintains a dynamic vitality that is missing in other CRSPs. The Center will publish a newsletter that targets PVO/NGOs and PVO/University collaboration that will keep PVO/NGOs informed of the SANREM CRSP activities.

We have solicited the direct participation of several PVOs in our consortium. One that will be involved at all of our locations is Heifer Project International (HPI). HPI has a 47-year history of helping limited resource rural families and communities in over 35 countries to help themselves through livestock development using a participatory, holistic, community-based approach. In addition, we have solicited the direct participation of the Christian Children's Fund in the Philippines, Save the Children in Burkina Faso, and CARE in Guatemala and Honduras.

Also, we have solicited the collaboration of several uniquely qualified institutions for specific expertise. These include: 1) Several of the International Agricultural Research Centers (IARC'S), including AVRDC, CIMMYT, CIP, ICRAF, ICRISAT, and IRRI. These centers offer excellent research infrastructures and opportunities to extend and regionalize our research and training activities. 2) Virginia Polytechnic Institute and State University (VPI). The Women in World Development Program is an internationally recognized program in gender analysis and gender sensitivity training. 3) Colorado State University. The National Resource Ecology Laboratory is an internationally recognized laboratory dealing with natural resource issues and offers unique simulation modeling expertise. 4) Washington State University. Washington State University will provide socioeconomic analyses and modeling expertise to the SANREM CRSP. 5) Auburn University. The International Aquaculture Center is a well recognized center for the study of aquaculture and will provide expertise in aquatic production and ecology and other related areas such as hydrology, water chemistry, watershed management, etc. 6) USDA-ARS. The National Soil Tilth Laboratory at Ames, Iowa will provide expertise on soil productivity, soil management for sustainability, water quality issues, and simulation modeling of nutrient cycling, transport of nutrients and chemicals, and soil productivity. 7) USGS. The EROS Data Center in Sioux Falls, South Dakota will provide expertise and technical assistance in the use of GIS for scaling up results from the SANREM CRSP and for policy-making decisions.

12

The host country institutions and agencies who will collaborate include: 1) The Philippines. University of the Philippines at Los Banõs, Central Mindanao University, Department of Agriculture, Department of Environment and Natural Resources, and the National Power Company. 2) Guatemala. Universidad del Valle, ICTA, and Defensores de la Naturaleza. 3) Honduras. Escuela Agrícola Panamericana and the Ministry of Natural Resources. 4) Burkina Faso. University of Ouagadougou, INERA, and IRBET.

A unique institution that has been contacted for collaboration is the Center for Holistic Resource Management in Albuquerque, New Mexico, which has been recently involved in training natural resource managers in an innovative, cutting edge approach to resource management. They have expressed interest in collaborating in the training aspects of this project. We will also seek to enlist the collaboration of in-country Montessori schools in education of children in natural resource issues.

C.4.(b)(3)(D) Institutional Qualifications and Capabilities

The University of Georgia has demonstrated strengths in planning and implementing interdisciplinary programs. The University of Georgia's College of Agriculture and Environmental Sciences, School of Forest Resources, and Institute of Ecology have been engaged in interdisciplinary research on sustainable agriculture, agroecology and agroforestry for the past several years and have well established programs in these areas.

The University of Georgia has also demonstrated strengths in planning and implementing multi-institutional international projects. For example, the University of Georgia has successfully completed such projects as the Agricultural Human Resource Development in Upper Volta, the Agricultural Economic Development Project in Zaire, a reforestation project in Sri Lanka, and an IDR Long Term Planning Project in Burkina Faso. Additional information on past projects are provided as an annex under "Past Performance References". All of these AID funded projects were institutional strengthening activities requiring multi-institutional collaboration.

Internationally, the University of Georgia actively participates in two current CRSPs, the Bean-Cowpea and the Peanut CRSP, and is the management entity for the Peanut CRSP. The success of the peanut CRSP demonstrates our ability to plan, coordinate and implement international research and outreach programs. Also, the University of Georgia has had a long-term relationship with the University of Ouagadougou in Burkina Faso. The University of Georgia has trained faculty from the University of Ouagadougou in ten post-graduate degree programs and over twenty post-doctoral and short-term training programs. The President of the University of Georgia has designated two graduate assistantships for University of Ouagadougou graduates to obtain advanced degrees at the University of Georgia. These are just some of the examples of how the University of Georgia has demonstrated the ability to collaborate and develop effective

multi-institutional linkages. Through these and other AID-funded activities, the ability to collaborate with international scientists, research institutions and universities has been clearly demonstrated.

As testimony to the University of Georgia's willingness to collaborate with other individuals and institutions domestically, the University of Georgia has received more funding from the USDA Low Input and Sustainable Agriculture (LISA) Program than any other single institution in the U. S. This program requires collaborative, interdisciplinary, farmer-participatory research approaches with respect to sustainability domestically, the University of Georgia has established successful collaborative linkages with North Carolina State University, Clemson University, USDA-ARS, USDA-SCS, the Georgia State Soil and Water Conservation Commission, and individual farmers. We have also successfully planned and implemented collaborative interdisciplinary research programs funded by the USDA Water Quality, National Research Initiative and NSF Ecosystems programs. These projects have also required multi-institutional and agency collaboration.

Life of Project Budget

SUSTAINABLE AGRICULTURE SYSTEMS PROJECT
Life of Project Budget (Years 1-5)
($ 000)

Project Component/Activity	FY 92	FY 93	FY 94	FY 95	FY 96
Component Part A					
SANREM CRSP	1,500	1,750	2,500	2,250	2,000
Component Part B					
Research Support Grants	70	125	125	150	200
Component Part C					
INFORUM Exchange Grant	100	50	50	50	40
Staff Support					
Sr. Agroecologist	50	110	120	125	125
Secretary/Supports	20	30	40	40	40
Tech. Consultants	0	25	30	45	50
AAAS Fellowship	70	75	70	75	75
Conference Sponsorship	25	25	25	50	55
Travel	10	10	10	10	15
Equipment	5	0	0	5	0
Project Evaluation	0	0	30	0	50
FY TOTAL	1,850	2,200	3,000	2,800	2,650

SUSTAINABLE AGRICULTURE SYSTEMS PROJECT
Life of Project Budget (Years 6-10)
($ 000)

Project Component/Activity	FY 97	FY 98	FY 99	FY 00	FY 01	Total
Component Part A						
SANREM CRSP	2,250	2,500	2,250	2,000	2,000	21,000
Component Part B						
Research Support Grants	160	185	180	125	0	1,320
Component Part C						
INFORUM Exchange Grant	35	35	35	25	25	445
Staff Support						
Sr. Agroecologist	125	125	125	125	125	1,155
Secretary/Supports	40	45	45	45	45	390
Tech. Consultants	50	75	75	50	50	450
AAAS Fellowship	80	80	80	80	80	765
Conference Sponsorship	45	45	45	40	35	390
Travel	10	10	10	10	10	105
Equipment	5	0	5	0	0	20
Project Evaluation	0	0	50	0	80	210
FY TOTAL	2,800	3,100	2,900	2,500	2,450	26,250

Initial Environmental Examination

INITIAL ENVIRONMENTAL EXAMINATION

PROJECT COUNTRY: Worldwide

PROJECT TITLE AND NUMBER: Sustainable Agriculture Systems Project (936-4198)

LOP FUNDING: $26,250,000

IEE PREPARED BY: James W. Bonner, R&D/AGR/EP

ORIGINATING OFFICE THRESHOLD DETERMINATION:

___ Negative Determination
_X_ Negative Determination (Categorical Exclusion)
___ Negative Declaration
___ Positive Determination
    ___ EA Indicated
    ___ EIS Indicated
___ Delayed Determination

_____
Director, Office of Agriculture

_____
Date

PROJECT GOAL, PURPOSE AND OBJECTIVES:

The project purpose is to stimulate and support innovative, integrated systems-based research that will lead to the identification and development of sustainable agricultural production and natural resource management systems in developing countries.

The project will enhance the ability of developing countries to improve the welfare of their growing populations by sustaining both agricultural production and environmental quality. The project has three components: (1) a Collaborative Research Support Program (CRSP) to support innovative, integrated systems-based research needed for the maintenance of the environment and the promotion of a greater understanding and integration of agricultural production systems with the socio-economic-political environment; (2) Research Support Grants to permit the project to have access to and incorporate research results on aspects of sustainability which are currently under investigation but external to the CRSP; and, (3) an Information Management System to support the knowledge building activities of the sustainable agriculture and natural resource management sectors, and provide technical asstance support to field missions and AID/Washington.

PROJECT DESCRIPTION:

This project is composed of three components, Part A, Part B, and Part C:

Part A: Cooperative Agreement for a new CRSP.

A cooperative agreement with a U.S. university under the CRSP Guidelines will have a 10 year implementation time frame, however the initial cooperative agreement will be executed for 5 years. This component will stimulate and support innovative, integrated systems-based research needed for the maintenance of the environment. The research will promote a greater understanding of the interactions of agricultural production systems with the socio-economic-political environment. The research will place priority on those agricultural activities which build on a country's comparative advantage and optimize present and future uses of natural resource endowments in an environmentally sound manner. The SANREM CRSP will permit R&D/AGR and related R&D offices to provide a greater balance and integration among agriculture, ecological and socio-economic policy goals and provide additional analytical methodologies for evaluating results on the basis of multiple criteria including productivity, profitability, stability, equity, environmental quality and sustainability. In addition, to the fullest extent possible, farmers will actively participate in each phase of the research process, from initial planning and testing to technology development, dissemination, and other extension-related activities.

Specifically, the CRSP will finance a series of research, training and outreach activities in support of four critical areas of inquiry and include:

1) integrated nutrient management which seeks to integrate chemical, biological and cultural sources of nutrients essential for crop production. Although the concept is applicable in all agricultural systems, it is of particular importance in areas where the quality and productivity of the soils are deemed poor;

2) integrated pest management which seeks to control pre- and postharvest weeds, arthropod and vertebrate pests, and pathogens by using multiple chemical, biological, and cultural tactics to maintain pest damage below an economic injury level while providing protection against hazards to humans, animals, plants and the overall environment. The focus will be in the integrated management of inputs for control;

3) integrated institutional management which seeks to guide the complex interactions between food and fiber production and

the policy, trade and political environments; and,

4) the social, economic, political and institutional context within which on-farm and off-farm activities take place in order to identify and suggest remedial steps that can help remove constraints to sustainability.

The SANREM CRSP will target its investments on the above areas and provide research and development opportunities that:

(a) integrate interdisciplinary research and systems analysis during design, implementation, and evaluation of all activities;

(b) encourage collaboration among U.S. agricultural scientists, the international community and their developing country partners; and,

(c) provide mechanisms for dissemination of information on components and systems developed through Agency and other donor programs and professional networks.

Part B: Research Support Grants on Sustainable Agriculture.

This component will award a number of grants to support research of direct and immediate relevance to the goals of the Sustainable Agriculture Systems Project. The grant mechanism will permit the program to have access to and incorporate research results on aspects of sustainability which are under current investigation but external to the project. Research grants will be awarded by either the solicited or unsolicited research grant processes, and will be subject to stringent external technical peer review.

Part C: Information Management System.

This component will support the knowledge building activities of the sustainable agriculture and natural resource management sectors by concentrating on enhancing information access, retrieval, and sharing among researchers working in theme areas which support the Agency's developmental activities in these sectors.

An integrated set of information sharing and monitoring activities related to international sustainable agriculture and natural resource management programs will be designed to assist with the dissemination of research findings, increase the efficiency and creativity of ongoing and planned research (a two-way information flow) and support the overall Office of Agriculture's portfolio. Additional specialized program staff will

also be acquired to help direct and review research activities, and to provide support to professional staff already involved in these activities.

This component has the following three subcomponents:

1) establish an international information exchange program which will: (a) establish a periodic newsletter that will notify program participants of upcoming events, workshops, meetings, recent research activities, publications and other documents, and serve as an open forum for readers to exchange views and discuss research findings. Two groups have been targeted for this information: international researchers and local producers (farmers); (b) explore the feasibility of electronically linking computers of international researchers and publishers to facilitated information, data and publication exchanges on sustainable agriculture topics; and (c) distribute literature and publications on topical subjects of sustainability to AID/W and field mission technical staff.

2) contract additional staff to support the sustainable agriculture systems program to provide design, evaluation and technical analysis in program areas to AID/W and field support to field Missions.

3) provide sponsorships and funding for international conferences, workshops and colloquia which encourage and provide a means by which the global agricultural and natural resource community can discuss new ideas and provide alternative perspectives on timely topics and subject matter, among themselves and other decision and policy makers.

ENVIRONMENTAL IMPACT CONCERNS:

The project is designed to stimulate and support innovative, integrated systems-based collaborative research into the ecological and socioeconomic characteristics of sustainable agriculture and natural resource management. Sustainability implies a securing of a durable, favorable balance of economic and environmental costs and benefits. The project is a first in this regard; environmental concerns and environmental cost/benefit relationships are examined and programmed into the project design before implementation.

One element of the research design, the integrated pest management activity, which could have potential environmental impact, has been carefully designed to mitigate any potential environmental consequences. Increased concern for environmental and human safety and for the long-term sustainability of agricultural production systems has given added incentive and

importance in this area of research. Integrated pest management research will be integrated with sustainable agriculture and natural resource management in a way to focus the research on fundamental ecological relations and management techniques involving pests and their hosts, parasites, predators, and antagonists. Strategies will be generated in a developing country context; maximizing monitoring and training capacities and minimizing chemical inputs. Any pesticides used for research will follow rigid US Environmental Protection Agency policies and procedures.

RATIONALE FOR THRESHOLD DETERMINATION:

Using the information presented in the preceding sections, it has been determined that a negative threshold determination is appropriate. The project is a series of integrated research and development activities, implemented primarily by a US Title XII University under a Collaborative Research Support Program modality, in coordination with individual research grants, training, document and information transfer, and programs intended to develop the capability of recipient countries. Each of these activities qualify for negative determination by categorical exclusion.

AUTHORITY FOR DETERMINATION:

The authority for a negative determination by categorical exclusion for the project is recommended per AID Environmental Procedures, 22 CFR Part 216, Section 2 (c)(1)(iii) research activities which may have an affect on the physical and natural environment but will not have a significant effect as a result of limited scope, carefully controlled nature and effective monitoring; Section 2 (c)(2)(i) education, technical assistance, or training programs except to the extent such programs include activities directly effecting the environment (such as construction of facilities, etc.); Section 2 (c)(2)(v) document and information transfer; and, Section 3(b)(2)(iii) which exempts pesticide procedures set forth in 216.3(b)(1) used for research or limited field evaluation purposes by or under the supervision of project personnel following EPA or FAO/WHO recommendations.

FURTHER PLANNED ENVIRONMENTAL ANALYSIS:

Activities under the buy-in component will fall under the jurisdiction of Mission projects and will be separately examined through the Mission projects. All activities will be closely monitored and evaluated throughout the life of the project by an independent information management system activity.

Clearances:
RD/AGR/EP:VCusumano_____ Date: 4/3/92
RD/AGR:ECarter_____ Date: 4/7/92
RD/PO:DErbe_____ Date: _____

RD/AGR:JBonner:03/11/92:iee.sa

Life of Project Procurement Plan

Sustainable Agriculture Systems
Project (936-4198)
Life of Project Procurement Plan

Project Objectives:

The project will enhance the ability of developing countries to improve the welfare of their growing populations by sustaining both agricultural production and environmental quality. The project has three components: (1) a Collaborative Research Support Program (CRSP) to support innovative, integrated systems-based research needed for the maintenance of the environment and the promotion of a greater understanding and integration of agricultural production systems with the socio-economic-political environment; (2) Research Support Grants to permit the project to have access to and incorporation of research results on aspects of sustainability which are currently under investigation but external to the CRSP; and, (3) an Information Management System to support the knowledge building activities of the sustainable agriculture and natural resource management sectors,and provide technical assistance support to field missions and AID/W.

Project Funding:

The project has planned obligations not to exceed $26,250,000 in grant funds from the ARDN account, subject to the availability of funds in accordance with the AID OYB/allotment procedure. The initial obligation year for the project is FY 1992, the final obligation year is FY 2001, and the PACD is 09/30/02. In addition to the amount authorized, an estimated $10,000,000 may be contributed to this project by field missions, regional bureaus, and other offices of AID. Funding may be provided from the Economic Support Fund (ESF) or the Development Fund for Africa (DFA), as well as accounts authorized for R&D funding under this project.

Contracting Modality Preferences:

The contracting method for this project will follow AID direct contracting procedures. It is planned that the following contracting modalities will be utilized: (1) a Collaborative Research Support Program (CRSP) implemented by a Cooperative Agreement (CA) with a U.S. university to undertake a series of research, training and outreach activities. The CA will have an associated Basic Ordering Agreement (BOA) and/or discrete grants or

cooperative agreements to permit "buy-ins" by AID field missions; (2) several competitive grants will be awarded to individuals and institutions to support research of direct and immediate relevance to the goals of the project. These grants will be very specific technically, and generally less than $50,000 and two years in duration; (3) grant funding to Rodale Institute, Inc. or the International Information Exchange to Support the Development of Sustainable Land Use Systems (INFORUM) to continue supporting a non-solicited proposal, currently funded under project 936-4193, to assess and design information needs for an international sustainable agriculture information network; and, (4) Individual Personnel Agreements (IPA), AAAS Fellowships, Personal Services Contracts (PSC) and other contractual arrangements to provide limited-time technical and personal services to field missions and the AID/W Office of Agriculture.

Systems/Procedures for Contract Support:

Contracting systems and procedures for contract support will follow existing procurement policies and procedures in the R&D Bureau, Office of Agriculture, in cooperation with other supporting AID/W offices. No problems with availability or experience in AID procurement are anticipated.

Source and Origin of Commodities, Nationality of Services:

Commodities financed by A.I.D. under this project shall have their source and origin in the "cooperating country" or the United States, except as A.I.D. may otherwise agree in writing. (Each developing country in which research, training, or technical or other assistance takes place under the project shall be considered a "cooperating country.") The suppliers of commodities or services shall have the cooperating country or the United States as their place of nationality, except as AID may otherwise agree in writing.

Ocean shipping financed by AID under the project shall, except as AID may otherwise agree in writing, be financed only on flag vessels of the United States.

Special Circumstances:

No special circumstances are anticipated at this time.

91

Waivers:

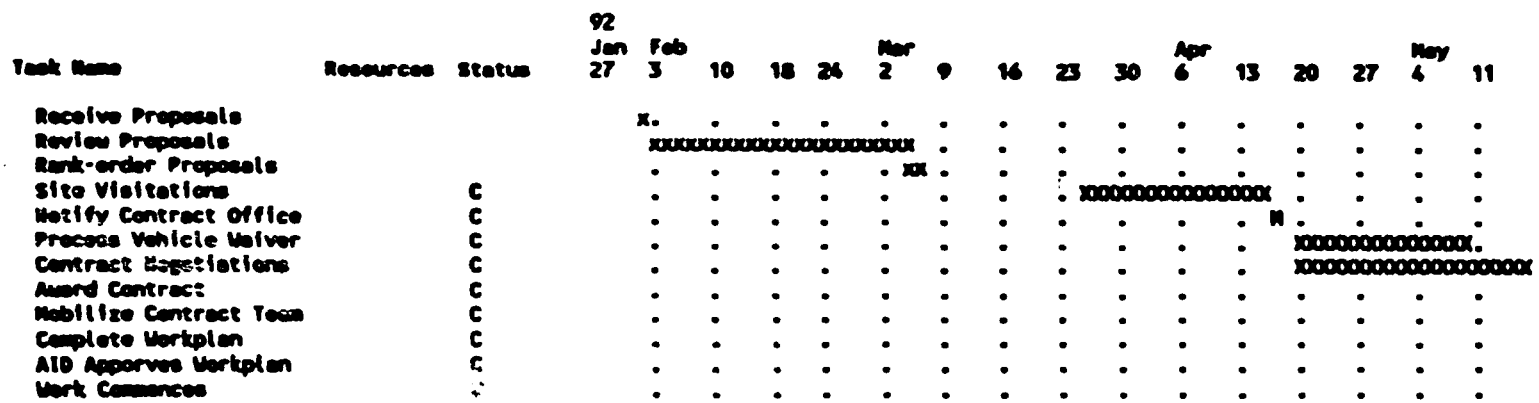
There are no waivers anticipated at this time.

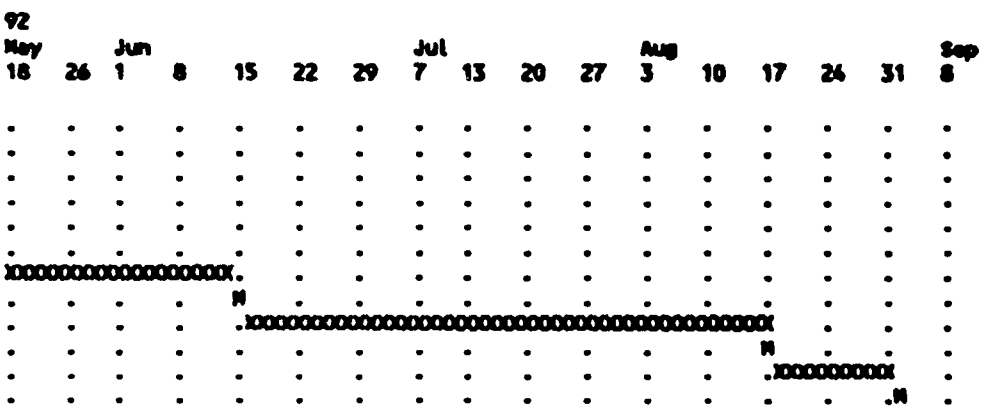
APPROVED: _____
Jay Bergman, Contracting Officer

3/12/92
Date

RD/AGR:JBonner:03/10/92:procure.sa

Schedule Name : Major Contracting Actions-SAHREN CRSP (Est.$10M)
Responsible : Jim Bonner, RD/AGR/EP





TIME LINE Gantt Chart Report, Strip 2