SANREM CRSP

Sustainable Agriculture and Natural Resource Management
Collaborative Research Support Program

A Progress Report

Compiled by the Management Entity at the SANREM CRSP

Semi-Annual Report

June to November 2000

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The University of Georgia

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Section I: SANREM CRSP Five-Year Program

This document describes the accomplishments for the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP) for the period June 1, 2000 to November 30, 2000.

The document is organized into five sections:

I. SANREM Five-Year Program
II. Southeast Asia Regional Project
III. Andes Regional Project
IV. West Africa Regional Project
V. Global Project

Program Objectives

The SANREM CRSP contributes directly to the Strategic Support Objective of USAID's Global Bureau, Office of Agriculture and Food Security, which is "to improve food availability, economic growth and conservation of natural resources." USAID's Intermediate Results (IR's) include creation of an information system to enhance decision-making and technologies, practices and policies that enhance food availability, improve food access and agribusiness opportunities, and enhance long-term conservation of natural resources.

The SANREM Program's Strategic Support Objective is to improve decision-making by natural resource managers at local, provincial, national, regional and global levels.

In order to achieve this longer-term goal, three more-focused objectives that contribute to this general strategic objective have been identified. The relationship between the SANREM CRSP Objectives and USAID's Strategic Support Objective and Intermediate Results is illustrated in Figure 1 on the next page.

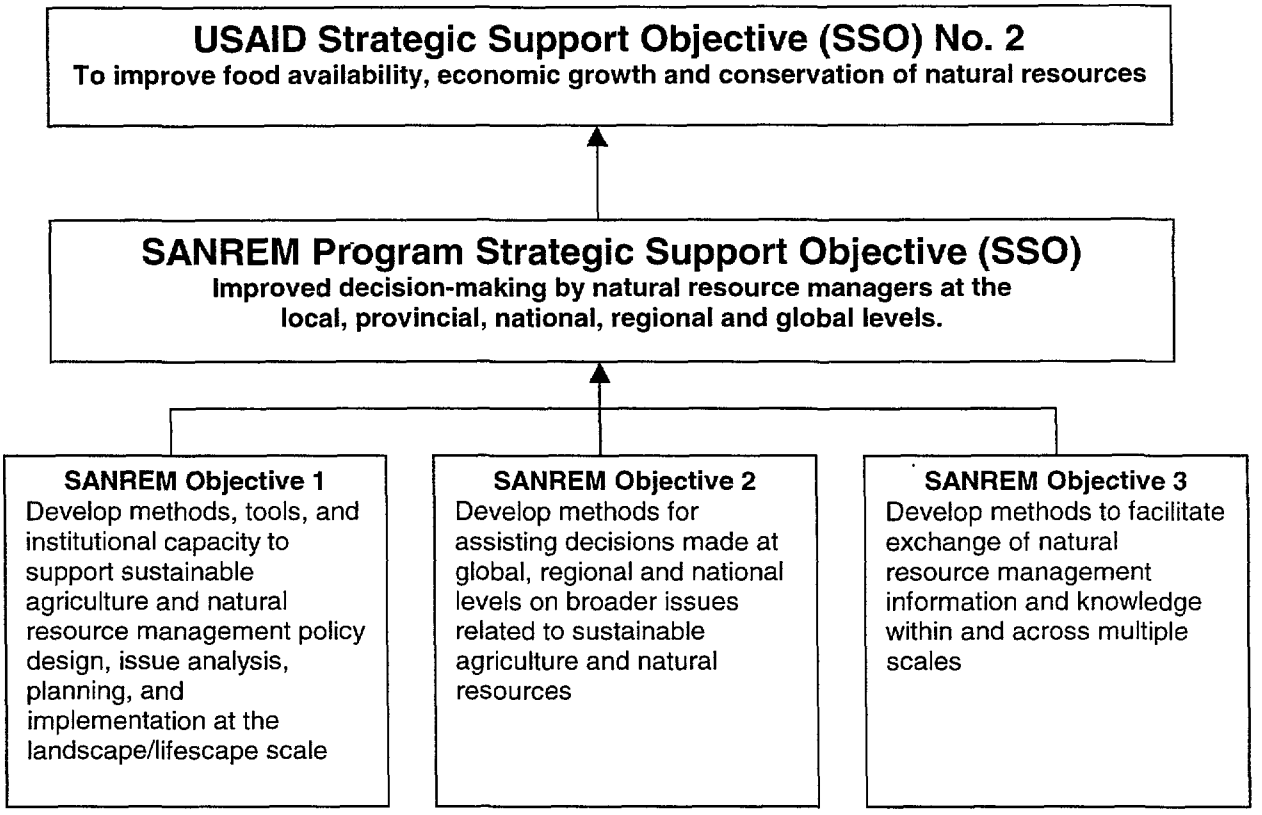
The SANREM Program objectives are:

SANREM Program Objective 1
Landscape/Lifescape Decision Support
Develop methods, tools, and institutional capacity to support sustainable agriculture & natural resource management policy design, issue analysis, planning, & implementation at the landscape/lifescape scale.

SANREM Program Objective 2
Regional Decision Support
Develop methods for assisting decisions made at global, regional and national levels on broader issues related to sustainable agriculture and natural resources

SANREM Program Objective 3
Technology Transfer
Develop methods to facilitate exchange of natural resource management information and knowledge within and across multiple scales.

Figure 1. Relationship between USAID's Strategic Support Objectives and Intermediate Results and the SANREM Program Objectives.



The development hypothesis that connects SANREM's and USAID's Objectives is based on the assumption that the adoption of alternative technologies, practices and policies (USAID IR's) requires informed decision-makers (SANREM's SSO). Agricultural and natural resource management decision-makers include people who *directly* manage resources, such as farmers, ranchers, and foresters. They also include those who *indirectly* affect the options available to local natural resource managers, for example, municipal leaders, provincial planners, national policy analysts, regional development bank managers and global research initiative coordinators.

SANREM's Objective 1 focuses on developing tools, methods and institutional capacity to support decision-makers at the landscape scale (from farmers-to-provincial-scales). Objective 2 focuses on developing methods to assist decision-makers from the global-to-national scales. Objective 3 addresses the need for methods to facilitate exchange of information and knowledge within and across scales (linking Objectives 1 and 2).

These three objectives are SANREM *program-level* objectives. The individual project and activity level objectives described later in this document all contribute to one or more of these objectives.

Program Strategy

SANREM is a global program in two ways:

- SANREM research sites represent the biophysical environment and socioeconomic characteristics of larger geographic regions and themes being addressed are global in nature. Therefore research results from these sites can potentially have global impact.

- SANREM researchers explicitly address the influence of "higher-scale" decision-makers (from local-to-global) on agriculture and natural resource management.

The SANREM Program is implemented through four integrated projects:

- The Global Project supports national-to-global scale decision-makers, assists regional projects in their assessment of decision-maker priorities and in the development of decision-support tools and methods, and facilitates exchange of information and knowledge among the regional projects;

- The Southeast Asia Regional Project implements participatory landscape/lifescape scale research in the Philippines, develops methods to extrapolate results to similar landscape/lifescapes in Southeast Asia, and develops methods to aggregate (scale-up) results to national and regional scales;

- The Andes Regional Project implements participatory landscape/lifescape scale research in Ecuador, develops methods to extrapolate results to similar landscape/lifescapes in the Andes, and develops methods to aggregate (scale-up) results to national and regional scales; and

- The West Africa Regional Project implements participatory landscape/lifescape scale research in Mali, develops methods to extrapolate results to similar landscape/lifescapes in West Africa, and develops methods to aggregate (scale-up) results to national and regional scales.

The regional projects ensure that SANREM is addressing the priorities, needs and constraints of local stakeholders. By addressing sustainable agriculture and natural resource management issues at the landscape-scale, the regional projects respond to the demands from decision-makers at multiple scales (typically from farm-to-provincial scales). They conduct research to provide information, methods, tools, and training to support difficult natural resource management decisions regarding alternative technologies, practices, and policies.

The Global Project collaborated directly with the regional projects in the development of methods to assess the priorities and needs of decision-makers. They also work together to develop methods and tools needed by decision-makers. Examples are tools that researchers can use to evaluate research priorities and methods that policy analysts can use to evaluate the consequences of different policy options. The Global Project also explicitly addresses the needs of regional and global decision-makers. A key part of the Global Project's cross-regional responsibility, the Global Project captures what is learned by the regional projects and facilitates exchange of information among the regions.

Institutional Responsibilities

The SANREM Program is implemented through subcontracts from the Management Entity (ME) to different institutions that are responsible for each Project.

1. Global Project: The ME, based at the University of Georgia through the Office of International Agriculture, is responsible for overall coordination of the global project. However, Texas A&M University is responsible for coordinating the Global Decision Support System Activities.

2. Southeast Asia Project (SEA): SEA is coordinated by the Office of International Agricultural Programs at the University of Wisconsin. It is implemented by the University of Wisconsin and subcontracted institutions in the U.S. and in Southeast Asia.

3. Andes Project (AND): AND is coordinated by the Institute of Behavioral Research and the Anthropology Department of the University of Georgia. It is implemented by the University of Georgia and subcontracted institutions in the U.S. and in the Andes region.

4. West Africa Project (WAF): WAF is coordinated by the Office of International Research and Development at Virginia Polytechnic Institute and State University. It is implemented by Virginia Tech and subcontracted institutions in the U.S. and West Africa.

Semi-Annual Report Format

For each of the four projects listed above, a progress report for this six-month period is detailed in Sections II, III, IV and V of this document. Each section begins with a project overview that describes progress toward project objectives and five-year performance indicators. Following the project overview are detailed activity reports. Each activity report begins with a brief introduction to the activity followed by a summary of progress for each activity objective, results and outcomes, impacts, publications and other issues.

Section II: Southeast Asia Regional Project

Introduction

The goal of SANREM-Southeast Asia is to enable better natural resource management decisions by upland communities. The project has no authority to make such decisions on behalf of communities. However, it can play an important role in the generation and dissemination of information, in capacity building, and in policy advocacy as a means to support communities and local governments engaged in natural resource management for sustainable development.

The geographic scope of our project extends from the municipality of Lantapan, our Philippine research site in Bukidnon province, to other municipalities and provinces in the Philippines, and similar areas elsewhere in Southeast Asia. Similarities are defined not merely by common geographical characteristics, but by the fact that countries in the region share certain experiences that are instrumental in shaping the direction of natural resource use and the logic of local natural resource management strategies. These experiences include rapid economic growth (recent recessions notwithstanding) that slows the rate of net migration to upland areas; growth of commercial opportunities for upland farmers, including intensive vegetable cultivation for urban markets; and above all, rapid or impending decentralization and devolution of powers from central to local governments.

In keeping with the principles of interdisciplinary and participatory scientific research, our work involves close collaboration among U.S. and host country researchers, and between researchers and natural resource managers at all levels, to ensure that output of the project is rigorous, relevant and accessible.

Objectives

Our primary objective in Phase II is to assist in the creation and successful implementation of decision-support tools for natural resource management and planning at both a community and a watershed scale. By decision support tools we mean materials, including research findings and simulation models that enable the formulation and answering of questions that link economic and social development goals with the long-term viability of the environmental and natural resource base.

Our other objectives complement the research that produces decision support tools. The effective use of such tools in a specific locality depends on conditions that are conducive both locally and in broader economic, political, policy and technological contexts. Our second and third objectives are, respectively, to help build analytical and decision-making capacity at local levels, and to promote structured discussion of natural resource management and sustainable development through information exchange and policy advocacy both across levels (local to national and beyond) as well as among institutions at each level. The capacity-building objective backstops our research by helping ensure that decision support tools can be used efficiently in natural resource management planning by communities, provincial and sub-provincial governments and other local institutions. The information exchange and policy advocacy objective follows through on SANREM research. Done well, it will ensure that our findings and their implications—as well as those from related research ventures— reach the right influence-makers and decision-makers, take appropriate forms

for different audiences, and ultimately contribute to broader debates on the question of sustainable development.

Progress Towards Objectives

The Southeast Asia project is on track in the attainment of its objectives. Methods and tools to support sustainable agriculture and natural resource management policy planning and implementation are currently being developed and in some cases applied beyond our research site in the Manupali Watershed. Demand for these methods and tools by local governments and non-governmental organizations continue to increase as evidenced by numerous on - and off site workshops conducted by SANREM researchers, including our community partners. Strong institution building especially at the community level greatly complements the development and dissemination of natural resource management methods and tools.

Our continued presence at the Municipality of Lantapan and working directly with the local government has given the project a practical advantage to share knowledge and information on the process of government decentralization of natural resource management. At the national level, for example, a dialogue was facilitated with the Bureau of Local Government and Development to propose amendments to the 1991 Local Government code that would enhance the local governments' capacity for environmental management. Participatory natural resource management planning processes conducted at the municipal level have served as enabling mechanisms for local governments to support the implementation of municipal comprehensive land use plans. Positive experiences gained at the local level motivated municipal governments to make natural resource management planning a part of their institutional structure.

Strategies for exchange of information and knowledge span from the community up to the regional level. We continue to support community-based meetings, regional workshops and fora as well as generate learning tools, which complement advances in information technology.

Progress Towards Five-Year Indicators

During the first half of Year 3, the project made progress toward attaining its five-year indicators. The following are selected highlights.

1. Watershed model further refined. Structural changes introduced, integrating biophysical and socioeconomic data collected from the site, to measure economic and environmental impacts of changes in economic policy variables and land use.

2. Application of environmental-economic policy model in progress. Two graduate students at the University of the Philippines currently use the model as part of their thesis work. SANREM researchers and faculty from Hue University in Vietnam explored the model's transferability to Vietnam. Model is also being tested at the provincial level.

3. Capacity building activities for local and provincial analysis of natural resource management challenges and opportunities, policy design and implementation strategies are ongoing. These include the institutionalization of natural resource management planning in municipalities surrounding the Mt. Kitanglad Range Nature Park through the creation of local project management offices. The Municipality of Lantapan's policy makers have sought technical

assistance from SANREM researchers for the creation of an environmental ordinance to introduce water tariffs to all commercial users of rivers within the municipality's jurisdiction.

4. Institution building to continue training and natural resource management activities conducted at the university level and among community-based institutions. Strengthened capacity of local institutions has led to the demand for information, training and outreach activities within and outside the province. Institution building is also underway in Vietnam in the area of natural resource management research and planning.

5. Enhanced documentation and dissemination of information strategies established. These include the production of project update and news briefs, updating of the project's website and initial production of a multimedia CD-ROM. A case study documenting the project's impacts is also being developed. Partnerships with local and national institutions were also formed to enhance dissemination of research information.

6. Local information exchange strategies strengthened through provincial-based fora such as Kapihan, the Bukidnon watershed summit and attendance to conferences and workshops.

7. Regional information exchange on a variety of topics conducted by SANREM's regional partners: natural resource management planning (SEARCA/Vietnam), water monitoring (Heifer Project International/China), and tree domestication (ICRAF/Southeast Asia). Planning of the project's first regional 2001 conference, Sustaining upland development in Southeast Asia: Issues, tools & institutions for local natural resource management, is in progress. The conference will be co-sponsored by the Philippine Institute of Development Studies (PIDS). PIDS serves as the research arm of the National Economic and Development Authority. It works with planners and policy-makers in the executive and legislative branches of the Philippine government.

SEA 00-01 Administration and Research Management for SANREM-Southeast Asia

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Rogelio C. Serrano
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Helen M. Amurao
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Introduction

As the administrative unit of the lead university for SANREM's Southeast Asia Project, the International Agricultural Programs office of the University of Wisconsin-Madison is responsible for all project administration. The IAP staff manages funds, designs and implements accounting and reporting conventions, and coordinates the project's monitoring and evaluation process. Under the terms of a memorandum of understanding signed in November 1997, the administration of on-site activities in the Philippines is the responsibility of the Philippine Council for Agriculture, Forestry and Natural Resources Research (PCARRD). Subcontracting responsibilities are divided with UW administering Auburn University, Purdue University, Central Queensland University and ICRAF while PCARRD handles administration activities for all Philippine-based partners.

In addition to project administration, the UW takes primary responsibility for research management. Starting in Year 3, we will be devoting more project resources to strategic thinking about the project structure, communication, integration of activities, production and packaging of outputs, monitoring and evaluation, and liaison with other SANREM projects and with external agencies. Increasing attention to these research management functions is consistent both with the internal logic of the project and with the recommendations of recent external evaluation reports.

Objective 1

To manage and coordinate research and related activities conducted by PIs and work plan holders of the Southeast Asia project.

Progress Toward Objective1

- Regular interaction with project principal investigators maintained.
- Site visit and meetings with project partners conducted. These meetings were designed to highlight the role of partnerships in scaling up SANREM activities outside of the Manupali

watershed.

- New partnerships with local non-government and government organizations as well as national level policy institutions explored and established. Local partnerships were established based on demand-driven opportunities to make available SANREM natural resource management methods and tools.
- Planning and initial activities of 2001 conference started. Partnership formed with the Philippines Institute of Development Studies (PIDS) to serve as co-sponsor of the conference. PIDS is the research arm of the National Economic Development Authority and is well connected at the policy level. SANREM's partnership with PIDS will hopefully facilitate the link between research and policy at the national level.

Objective 2

To provide administrative guidance for the research programs of the Southeast Asia project.

Progress Toward Objective 2

With UGA's renewal of their SANREM agreement with UW-Madison, UW completed modifications to their subcontracts with PCARRD, Auburn University, Purdue University and ICRAF. A new subcontract was established between UW and Central Queensland University to administer the expanded program of David Midmore. PCARRD, in turn, established Year 3 accounts with the work plan holders in the Philippines.

With one exception the financial flow of receipts, invoices and reimbursements through the established channels has been smooth during the first half of Year 3. It seems Dennis Garrity's group has difficulty reporting their Philippine expenditures through the ICRAF headquarters in Nairobi. We will continue to ask Dennis to push the ICRAF administrative staff to uphold their financial reporting responsibilities.

Objective 3

To coordinate documentation and communication of SANREM-SEA procedures and results.

Progress Toward Objective 3

- Web site (www.aae.wisc.edu/sanrem-sea) significantly modified and updated.
- Linkage between Applied Communication Division of PCARRD and SANREM facilitated to enhance production of research reports and learning tools such as SANREM's multimedia CD-Rom.
- System for distribution of research papers especially to in country partners including university libraries and government offices created.

Objective 4

To facilitate project monitoring and evaluation

Progress Toward Objective 4

- Field monitoring conducted to ensure on site activities and partnerships are in order
- Recommendations made to ensure proper reporting and documentation of site activities

- Case studies documenting research and outreach milestones started and expected to be completed next year

Results and Outcomes

No report

Impacts

No report

Publications

No report

SEA 00-02 Administration and Coordination of the SANREM CRSP Southeast Asian Program (PCARRD)

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Ms. Isidra Bagares, Site Coordination Office
Ms. Ma. Rowena M. Baltazar, PCARRD-based
Mr. Jefrey M. Caidic, Site Coordination Office
Mr. Diomides S. Zamora, PCARRD
Mr. Sherwin R. de los Reyes, PCARRD
Staff

Introduction

As SANREM CRSP-Southeast Asia goes full swing to implement Phase II, it needs continuous competent research management to ensure its success. It also needs to consolidate electronically all materials generated from Phase I and Phase II to ensure the preservation and availability of all useful information about Lantapan.

PCARRD is the lead host country institution contracted by the University of Wisconsin-Madison (UW) for the management of the program through the field-based Site Coordination Office (SCO). Since a Memorandum of Understanding was signed in October 1997, activities in the region have been managed through PCARRD with the Director of the Forestry and Environment Research Division (FERD-PCARRD) and UW's Dr. Ian Coxhead serving as co-principal investigators.

The primary focus of SANREM activities during Phase I was the Manupali watershed in Bukidnon, Mindanao. As an intersectoral and interdisciplinary program, which involves a number of partners consisting of scientists from the host country, NGOs, IARCS and the United States, the Site Coordination Office was established to aid field researchers and to coordinate activities with municipalities and development organizations. Dr. Vellorimo Suminguit heads the site office with the assistance of administrative and field staff. In PCARRD, Dr. Romulo Aggangan and Mr. Diomides Zamora assist Dr. Serrano.

Because of the program's need for well-defined financial management, specific accounting and financial responsibilities are handled through PARRFI, a foundation specially formed to assist PCARRD in the administration of funds. PARRFI has handled the program's finances for many years and has established a mechanism to ensure a smooth flow of funds.

During Phase II Year 3 operation of the Site Coordination Office, activities related to improving public information dissemination of research findings, improving information flow among work plan holders and collaborators, and database management will be undertaken if financial resources outside the core budget become available. These activities are in line with the recommendations in the External Evaluation Panel Report (Scherr, 1999).

Objective 1

To provide timely administrative and coordination support to regional principal investigators and work plan holders.

Progress Toward Objective 1

- Improved recording of financial transactions and regular review of liquidation of Site Coordination Office funds and the funds of the Policy Analysis Work Plan.
- Created financial database program and address book. The financial database program allows the Site Coordination Office to automatically generate a liquidation report.
- Provided logistic support to the Policy Analysis Workshop on Natural Resource Management (Rola *et al.*) and the Training Workshop on Participatory Landscape Lifescape Appraisal (Espaldon *et al.*).

Objective 2

To build linkages with other agencies and institutions that are implementing similar programs.

Progress Toward Objective 2

- Drafted Memorandum of Understanding cementing a partnership between the Site Coordination Office and Bukidnon State College. The MOU has been signed and notarized by both parties.
- Formalized membership with the Bukidnon Watershed Protection and Development Council through the Governor's signing of an Executive Order revitalizing the Council with SANREM serving as a member of the Council's Technical Advisory Committee.
- Signed an MOU with the Maridugao Watershed Cluster Council with SANREM as one of the watershed information providers.
- Presented the Technical Advisory Committee's proposed five-year implementation strategies for the management of Bukidnon watershed to the Bukidnon Watershed Protection and Development Council during its first meeting.
- Provided coordination and logistic support to the 16 November 2000 SC Meeting.
- Prepared the highlights of the First Bukidnon Watershed Summit for SP Catarata to deliver during the 16 Nov 2000 Bukidnon Watershed Management Donor's Forum.

Objective 3

To support scaling and outreach activities at the community, provincial, national and regional levels.

Progress Toward Objective 3

- Delivered welcome remarks and closing remarks in two Landcare orientation workshops.
- Served as Resource Speaker in the symposium on "Environmental Protection for Sustainable Development" held at the auditorium of Bukidnon State College on September 23, 2000.
- Served as Trainer on Natural Resource Management for 30 trainees at the International Institute for Rural Reconstruction last November 21, 2000. The trainees came from India, Vietnam, Bangladesh and Thailand

Objective 4

To support program capacity building activities, especially for community-based partners.

Progress Toward Objective 4

- Conducted field interviews with several Bukidnon municipalities and organizations concerning further improvement and enhancement of SANREM's conduct of activities for the benefit of its partners and stakeholders.
- Assisted ATSAL chairman in writing his presentation for the 5 to 6 December 2000 Workshop in LB.

Objective 5

To organize and coordinate the annual conference of SANREM CRSP-Southeast Asia partners.

Progress Toward Objective 5

Participated in meetings with prospective co-sponsors of the conference such as the PIDS and SEARCA.

Objective 6

To improve public dissemination of research outputs.

Progress Toward Objective 6

- Wrote Site Coordination Office's Year 2 Annual Report
- Published and distributed the first issue of SANREM CRSP SEA Update newsletter and three issues of the SANREM CRSP SEA Newsbrief (Aug to Sep).
- Edited and consolidated annual reports of the SANREM CRSP SEA work plans for Year 2.
- Created a multimedia CD-ROM on SANREM CRSP SEA.
- Drafted a document on SANREM CRSP SEA impact for presentation during the SANREM global meeting in January 2001.

Objective 7

To improve information flow among work plan holders, close collaborators, and highly involved institutional stakeholders.

Progress Toward Objective 7

- With direct support from PCARRD, coordinated the second Lantapan-based R&D TWG Meeting and Second Steering Committee Meeting.
- With direct support from PCARRD, convened the stakeholders for the institutionalization of AWS.

Objective 8

To facilitate access and sharing of primary data.

Progress Toward Objective 8

- Established an electronic archive containing bibliographic data for SANREM publications. The bibliographic database has more than 200 entries.
- Created a primary database. Database structure is already in place and AWS data up to May 1998 already has been entered with a complete interface. Socio-demographic data is in the process of being integrated. Data from other work plans have yet to be collected for integration.

Results and Outcomes

The convening of meetings of stakeholders for the institutionalization of the Automatic Weather Station (AWS) led to a more concrete assurance of the AWS to be continually functional even after the work plan's termination on December 31, 2000. Moreover, the turning over of the facilities and equipment to PAG-ASA ensures for continuous availability of data and smoother transitioning in terms of training of staff.

The production and distribution of newsletter and newsbriefs were well received. These publications helped the work plans and other related programs to be updated on events and undertakings among them and provided better links. The creation of the databases and Web site, on the other hand, provided for faster accessibility to information concerning SANREM and the program's research results. However, the different work plans need to continually provide information and research results to the Site Coordination Office to update their existing data previously provided.

Impacts

The memorandum of agreement entered into by the stakeholders enables the scaling up of other AWS in different municipalities. This would mean more available data and more beneficiaries from the facilities that would be set up in the future.

Development of the SANREM CRSP Southeast Asia Web site, the bibliographic and primary databases, the newsletter, and the newsbrief provided for easier access to data and information concerning SANREM CRSP SEA work plan activities, research results and related concerns. The program's different work plans would know more of developments within the program as well as in other related programs. Hence, enhanced linkages.

SANREM CRSP SEA's active participation in different councils and committees through the SCO ensures strengthening of linkages and outreach to more partners and stakeholders. Thus, further promotion of the different approaches the program employs such as the natural resources management approach and the participatory landscape-lifescape appraisal. For example, the program's outreach activities opened a future linkage with the Adventist Development and Relief Agency (ADRA), a group involved with the indigenous people called Lumads. The group is keen on the training and application of agroforestry practices and natural resources management.

Publications

SANREM CRSP SEA Update newsletter (Vol. 1, No. 1 - September issue)

SANREM CRSP SEA Newsbrief (Vol. 1, Nos. 1-3, August to October issues)

SEA 00-22 Weather Monitoring Using Automatic Weather Stations

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Co-Principal Investigator

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National Level Partner

Introduction

Weather monitoring activities at Lantapan were initiated in 1994 by SANREM CRSP in order to provide the necessary meteorological data for other work plan holders particularly in its integrated watershed modeling and water quality monitoring projects. As a tropical watershed rainfall is highly variable and the hydrologic characterization of the watershed requires the monitoring of rainfall quantities, intensities and its corresponding spatial and seasonal variations. For the purpose of natural resources management, other meteorological data such as air and soil temperature, humidity, solar radiation and wind data were required. This led to the establishment of an AWS network at Lantapan.

Since the support of SANREM SEA is expected to last only up to December 2000, efforts must be initiated to institutionalize weather data gathering. Although government agencies like PAGASA, DA, and DENR are concerned about watersheds, monitoring of weather in watersheds is way down their list of priorities. Even the PAGASA AGROMET STATION at CMU is in need of immediate rehabilitation. Therefore, the logical choice is Lantapan Local Government Unit with the assistance of Bukidnon PPDO and CMU. CMU, particularly the College of Engineering, could provide technical assistance in the maintenance and operation of the AWS and in the processing of data through our existing extension program. Training of personnel could also be included so that the Local Government Unit could sustain the operation of its own.

Objective 1 (work plan)

This work plan was primarily established to furnish meteorological information to other SANREM work plan holders and to compile data, which could be useful to researchers, development planners, farmers and other potential users.

To institutionalize weather-gathering efforts at Lantapan in order to improve the statistical reliability of accumulated data.

Progress Toward Objective 1 (work plan)

No report

Objective 2 (new)

To continue weather monitoring activities at Lantapan using Automatic Weather Station at Kulasihan, Alanib and Bulogan.

Progress Toward Objective 2 (new)

- Weekly inspection and maintenance of stations and premises
- Weekly downloading of data from the Automatic Weather Stations
- Processing of data using computer facilities at Central Mindanao University
- Compilation of monthly weather data
- Dissemination of compiled data
- Attend consultative and other meetings
- Submission of required reports

Results and Outcomes

Data for the following meteorological elements were compiled:

- air temperature
- relative humidity
- soil temperature
- solar radiation
- wind speed/direction
- rainfall

There were problems encountered in the operation of our three Automatic Weather Stations. The program in the datalogger is not functioning well. This was first noticed during the last week of May, 2000. At Kulasihan Station, intermittent negative values of different sensors were generated, while at Alanib and Bulogan unpredictable program losses occurred. For these reasons, the frequency of data downloading from monthly to weekly was immediately implemented to minimize data losses.

Since the contract of the project will terminate on December 31, 2000, the responsibility of data monitoring and all other operations will be turned over to PAGASA on January 2001, as agreed upon with Dr. Serrano and PAGASA last November 17, 2000.

Impacts

1. The demand of weather data by the government, NGO's, researchers, etc. has continued. In fact, recently a group from Taiwan requested data from the work plan for their proposed rice production project at CMU.

2. Other corporate farms are still requesting data from the work plan.

Publications

No report

Other Issues

Since this project will be turned over to PAGASA by January 2001, the staff involved may still continue to support this project as consultants. They shall also identify Lantapan as one potential area for extension activities of the College of Engineering.

Plans and Targets for CY 2000
Continue to monitor and operate the project up to December 31, 2000 and turn over the Automatic Weather Stations to PAGASA in January 2001.

Orient and train PAGASA personnel on field operations and data processing.

SEA 00-23 Policy Analysis for Environmental Management Planning

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Collaborators

Introduction

One of the significant outputs of SANREM Phase I is the development of the Lantapan, (Bukidnon, Philippines) Natural Resources Management and Development Plan (NRMDP). It is a five-year indicative plan aimed to promote ecological balance through various aspects of environmental management. The plan aims to protect the remaining natural resources of the municipality from any disturbance and to further set some guidelines on how the remaining resources be utilized and developed using a collaborative approach involving the different sectors of the community. At the national level, most municipalities have also come up with this plan. What is unique with the Lantapan model is that the process was participatory and SANREM researchers provided technical inputs.

The challenge at this time is to determine the constraints to proper implementation of the plan and the documentation of the impact of such implementation. Results of the process and the relevant lessons from Lantapan could be shared with other municipalities in the other regions of the country.

Initial steps in the implementation of the plan in Lantapan experienced some challenges. The convening of the Natural Resources Management Council (NRMC) has been delayed, although the municipal mayor has already issued an Executive Order appointing the persons and entities to comprise the NRMC. The previous Sangguniang Bayan (Municipal Council) passed a resolution appointing the Vice-Mayor as Chairman (not the Mayor) of the NRMC, which is in contravention to the spirit of the Local Government Code of 1991. As originally conceived, the Sangguniang Bayan through its Committee on Environment and Committee on Agriculture and the NRMC should advocate for the implementation of the NRMDP. As in other concerns in the country, political transition has somewhat delayed the implementation of the plan.

The overarching policy question then is how does one ensure continued implementation of NRMDP under changing political situation or realities? Would strengthening policy analysis skills of the Local Government Unit officials minimize some of the constraints? Would appreciation of the process by the key stakeholders result to a more apolitical implementation in the future?

There is a perception that in addition to the change in the political leadership, one of the problems faced by the new administration during the transition period is the lack of financial resources to implement the plan. The NRMDP does not contain strategies to source out funds for its implementation. One possible source of funding is twenty percent (20%) of the municipal mayor's

Local Development Fund. Sourcing out of resources both financial and technical and developing a system of linkages or networking with involved entities should be developed.

One complaint heard from the stakeholders about the NRMDP is that it is too technical and cannot be easily understood by the local people. Information, education, and communication of the plan in an easy to understand language, specifically the Cebuano language, which is the *lingua franca* of Visayas and Mindanao, should be prepared. The NRMDP needs to be supported and backed up by information, education and communication (IEC) campaign strategy. It should utilize simple practical and localized materials and talents and may be implemented through the NRMC.

The usefulness or effectiveness of NRMDP can only be gauged based on how the suggested courses of actions (programs and projects) are implemented. The impact of the plan can only be established if specific courses of actions or decisions can be attributed directly to the plan. These could only be accounted for if the plan implementation is effectively monitored and evaluated.

Lastly, some attributes of the plan will be a useful input to other similar environments in the Philippines; and so a distilling of lessons learned from this exercise would also benefit national policymakers and planners.

Objective 1

To develop a monitoring and evaluation system for NRMDP impacts and other national policy impacts on farm households and the community's natural resource endowments.

Progress Toward Objective 1

Framework for the formal monitoring and evaluation system of the impacts on farm households and the community's natural resource endowments. Indicators for monitoring and evaluation would be developed.

Collection of information on factors influencing farmers' decisions on land use to determine impact of the NRMDP-initiated local policies and national economic and environmental policies on farmers' resource management decisions.

Objective 2

To strengthen policy analysis and policy advocacy skills at the municipal and the provincial levels through:

a. developing a mechanism and linkages with other involved agencies that will ensure continuity of programs and policies contained in the plan even with the changing political situation;
b. developing a system of tapping technical and financial resources from local, national, international agencies both in the public and private sectors to implement the plan;
c. strengthening the capabilities of the provincial and municipal development staff through hands on training on policy analysis on specific issues to be identified by them; and
d. to make the plan more understandable to the farmers and other stakeholders, by organizing a local advocacy plan to support the NRMDP.

Progress Toward Objective 2

Environmental and development policy analysis at the local, provincial and regional levels.

Seminar-workshop on policy analysis for environmental management was conducted from August 7 to 9, 2000 at Malaybalay. Local Government Unit officials from the municipality and the province of Bukidnon participated. In addition, a Kapihan was held at Lantapan on August 9, which served as forum for discussing issues, specifically on matters pertaining to environmental management.

Objective 3

To distill lessons learned from Lantapan at the national level

Progress Toward Objective 3

To distill lessons learned from Lantapan at the national level through institutionalizing of policy analysis for sustainable local development.

Meeting with the Director of the Bureau of Local Government and Development to propose amendments to the Local Government Code that will strengthen the mandate of local governments for environmental management.

Results and Outcomes

The schedule of activities indicate that at the end of the second quarter of the project, the following should have been completed:

> Q1 (June to August) - secondary data collection at the national level; analysis of executive orders, presidential decrees, republic acts on selected topics; training on policy analysis; seminar for communication specialists.
>
> Q2 (September to November) - drafts of working papers; drafts of policy briefs; national seminar; local kapihan

ACCOMPLISHMENTS

A training-workshop on policy analysis was held last August 7 to 9 for local officials in Malaybalay and the Province of Bukidnon.

A national seminar entitled, "Research Program Planning for Natural Resource Management: A Background Analysis" was held last June 18, 2000 at the Bureau of Plant Industry-Department of Agriculture (BPI-DA) with Dr. Agnes Rola as Resource Speaker.

A local kapihan was held last August 9 at Lantapan attended by barangay and municipal officials.

See publications.

Publications

A. Documents for twelve national environmental policies that were identified for tracking have already been collected and summarized.

B. Three working papers have already been drafted. These include:

A.C. Rola and I. Coxhead. (nd). Soil Conservation Decisions and Non-Farm Economic Conditions in the Philippine Uplands of Bukidnon.

M.M. Paunlagui and V. J. Suminguit. (nd). The Peopling of Lantapan.

A.C. Rola. (nd). Impact of Natural Resource Management Research in the Philippines: Focus on Soil and Water Management

C. Two policy briefs are also in progress. These concern:

1. Amendments on the Local Government Code
    - Proposal to have a Mandatory Position for the Municipal Environmental and Natural Resource Officer
    - Proposal to Charge Local User Fees on Environmental Resources
2. Saving A River: Why Do Local Government Units (Local Government Units) Matter?

Appendix I.

Project Title: Transformation of Small Farm Holdings to Agribusiness Enterprises in Lantapan, Bukidnon: An Ex-Ante Analysis of Potential Environmental Impacts

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Date of Report: December 4, 2000

Output of the Project:

A. Two Research Briefs were submitted as of August, 2000
   1. From Subsistence Farming to Commercial Banana Farms: A Case in Lantapan, Bukidnon Celia O. Tabien and A.C. Rola SANREM Research Brief (2000-1)
   2. Local Initiatives Towards Environmental Management in Lantapan, Bukidnon, Philippines. Celia O. Tabien, A.C. Rola and E. Devibar SANREM Research Brief (2000-2)

B. Field Study Report (Finalization in progress)

C. Draft of Working Paper entitled:
   Local Government Response to the Potential Environmental Impacts of Commercial Farms on the Water Resources of Lantapan, Bukidnon

SEA 00-24 Integrated Watershed Modeling for Decision Support and Policy Planning

Gerald E. Shively, Purdue University, Group B activities
Principal Investigator

David Midmore, Central Queensland University, Group A & C
Co-Principal Investigator

Introduction

This work plan integrates socio-economic and biophysical research activities previously conducted under separate project activity titles (SEA 99-24, Shively/Purdue and SEA 99-26, Midmore/CQU). This change is intended to address recommendations expressed in the EEP report and the ME's guidelines for year 3 work plan development. Specifically, this work plan integrates continuing biophysical research (especially that dealing with soils and agroforestry) with policy modeling activities that rely on results from the biophysical research as input to the policy model.

The work plan focuses on three activities. Group A and group B activities are direct continuations of past activities. Group C activities are new undertakings directed at refining ongoing field-level experiments to fill important gaps in knowledge regarding erosion-yield interactions. These additional activities will further improve the biophysical components of the policy model.

Group A:	Measurement and analysis of farm-level biophysical data in the Manupali watershed, including crop-input and crop-technology performance and associated soil and erosion impacts
Group B:	Continued development and dissemination of a computer-based economic model to support policy research and planning for natural resources management at the watershed scale.
Group C:	Filling of important gaps in our understanding and ability to model key economy-environment linkages.

Group A activities are field-, laboratory-, and office-based efforts that focus on measurement of biophysical relationships, as follows. (1) Continuation of soil erosion and runoff studies in plots with (a) continuous vegetable production, with and without liming; (b) introduction of trees (currently 18 months old), with and without vegetable intercrops; (c) introduction of sunflower as a fallow crop and subsequent reintroduction of vegetable. (2) Analysis of survey data (planned for May 2000) and interpretation of adoption of technologies based upon farm characteristics prior to exposure to project activity.

Phase I activities provided evidence for a stemming of soil erosion through implementation of natural vegetative strips (ICRAF) and high value hedgerow crops (AVRDC-CQU) within annual cropping systems. The proposed activities will extend this experimental approach to quantify the impacts of agroforestry and objective fallow on soil erosion and soil rehabilitation, with data

generated leading to development of parameters (soil chemical, soil physical, soil biological, productivity, and economic variables) for inclusion in watershed models, for testing/validation *in situ* and for prediction elsewhere in SE Asia. In parallel, impact assessment of the participatory approach to technology development will be undertaken within the watershed.

Indeed, data collected in Year Two with or without intercropping of annual crops are already providing useful insights into the impact of trees on erosion control and the benefits of liming the land after soil degradation induced by continuous cropping of annual species.

Group B activities seek to understand potential economic and environmental policy changes and their impacts on land use patterns and economic and environmental outcomes, under a given set of crop and technology packages. Strategies and data required to transfer the model to other settings in SE Asia will be investigated. Activities will include (1) Continuation of model refinement to link economic policy changes to changes in agricultural land use at the farm level, household income, and environmental indicators; (2) Refinement of available policy instruments incorporated for natural resource management modeling; (3) Enhancements to the model's ability to measure fiscal and budgetary impacts of policy changes and implications for changes in household income distribution.

Group C activities focus on closing gaps in existing knowledge to improve the empirical foundations of the policy model, especially with respect to predictions of biophysical outcomes.

Closer integration of socioeconomic and biophysical research activities is not only desirable, but feasible. We believe that the merging of the previous Midmore and Shively work plans will lead to this outcome, but we also realize that in order to achieve the full potential of the watershed model, there is a need to fill in some gaps in our knowledge of crucial processes taking place in the watershed, that will also have relevance when the model is extended for use elsewhere. These additional areas relate to: (i) multivariate analysis to relate crop yields to soil erosion, loss of fertility, weather, and pest and disease pressure (building on and linking in with current soil experiments); (ii) literature review and field sampling to understand the relationship between bulk soil loss and associated pesticide loadings (soils are already being sampled and we anticipate gaining access to ACIAR test kits); (iii) quantification of timber yields from ongoing on-farm trials and associated economic analysis of costs and returns for timber production; (iv) investigation of the relationship between plot erosion and in-stream variation in total suspended solids; and (v) further incorporation of structural relationships and parameters from the biophysical realm into the policy model, perhaps including construction and calibration of biophysical sub-models in STELLA.

Specific activities to be undertaken include: (1) Multivariate analysis to relate crop yields to soil erosion, loss of fertility, weather and pests/diseases. Linking with soil scrape experiments to predict yield decline for given weights of soil loss; (2) Literature review and field sampling to understand relationships between bulk soil loss and associated pesticide loadings (soils are already being sampled for nutrient loadings) assuming access to low-cost ACIAR test kits; (3) Quantification of timber yields from ongoing (on-farm) trials and associated costs and returns; (4) Investigation of relationships between plot erosion and in-stream variations in total suspended solids (TSS); (5) Further incorporation of biophysical parameters to policy model.

Overall Objective

To disseminate a computer-based tool for policy research and planning at the watershed scale to serve researchers, government agencies, and NGOs for whom natural resources management is a programming priority. The work plan focuses on general objectives 1e and 2b as detailed in the SANREM request for proposals.

Group A Objectives

Objective 1

Provide evidence for or against the thesis that full and/or partial conversion of vegetable farms to agroforestry will lead to sustainable use of soil and water resources, and satisfy the income demand by upland farming families.

Progress Towards Objective 1

The survey of 48 households in Lantapan Municipality was conducted at the end of November 2000 (postponed from May 2000 due to peace and order concerns) and the digitized data are awaited for analysis in Queensland. We will then be able to verify or not the benefits of the research undertaken by AVRDC, Central Queensland University and ICRAF in terms of improving sustainability and farm-level income.

Objective 2

Provide model parameters for inclusion of such evidence into a watershed model.

Progress Towards Objective 2

This part of the research will await the date from #1 above and will be done in the second half of the financial year.

Objective 3

To monitor the changes in the practice of vegetable production, and the adoption of participatory-led research-substantiated innovations.

Progress Towards Objective 3

As for #1 above.

Objective 4

To provide a robust model for prediction of impacts due to changes in upland vegetable production practices on farm scale income generation and resource management (In year 3/4).

Progress Towards Objective 4

The model exists (Shively *et al.*) and will be modified to include recent data on the use of technologies to contain soil erosion at the watershed level.

Group B Objectives

Objective 1

To evaluate and measure the potential economic and environmental impacts of changes in economic policy variables and corresponding changes in land use in a prototype watershed economy.

Progress Towards Objective 1

A working economic policy model (the "Manupali Model") exists. Progress on refining and applying the model is being made. Recent progress includes structural changes to the model to measure nitrogen and pesticide loadings, incorporation of pest population dynamics in vegetable production, and refinement of household and zone weights based on GIS and survey data. In addition, the model was successfully linked to the widely used biophysical model SCUAF, which expands our ability to model a range of biophysical phenomena. A separate model of carbon sequestration was developed during year 2. This module is being tested and may possibly be incorporated in a subsequent release of the policy model. When data become available, year 3 research results from Midmore *et al.* (Group A 1-4, Group C 1-5) will be incorporated into the model to improve the biophysical and economic modeling of soil erosion technologies and agroforestry systems — an area that had been identified as a gap by the EEP.

Objective 2

To assess the potential transferability of the computer modeling strategy to other sites in the Philippines and elsewhere in Southeast Asia.

Progress Towards Objective 2

We are currently working with Dr. Bui Dung The, faculty of economics at Vietnam's Hue University, to assess the potential transferability of the Manupali model to a setting in Vietnam. Dr. The is a former student of Dr. Rola (UPLB) and is a visiting Fulbright scholar at Purdue this year. Dr. The's area of research expertise is land degradation in upland and hilly areas in Thua Thien Hue Province (central Vietnam).

Group C Objectives

Objective 1

Relate rate of eroded soil and decline in soil fertility to loss of yield potential in annual crops.

Progress Towards Objective 1

Once a planned experiment has been completed (a soil scrape experiment to run May to August, 2001), we will then be able to complement the data matrix that we have on erosion rates, yields, and loss of fertility parameter to derive a potential yield-loss relationship specific for the mid-upper cultivated areas in the Lantapan municipality.

Objective 2

Quantify pesticide loading on eroded soil, runoff and stream flow.

Progress Towards Objective 2

The test kits have been requested from the ACIAR cooperator, and once available, they will be used to measure the pesticide loading in eroded soil and runoff water in the Victory test site. They may be made available for the water-watch work plan too.

Objective 3

Understand harvest and associated costs of tree production, and effects of trees and sunflower on soil properties and subsequent annual crop performance.

Progress Toward Objective 3

Our visit in November 2000 has given us useful information on the relevant prices currently achievable in Bukidnon (see Trip Report for D. Midmore), but we still do not have the full tree harvesting costs (none has been done on a large scale, but one sale is underway). In March 2001, the sunflower plots in the Victory erosion site will be cleared, burnt and planted with vegetables as is the current farmer practice, and we will monitor the performance of the plots compared to those with continuous cropping of vegetables. We will also be sampling soil for physical and chemical properties, to quantify the impact of the fallow period.

Objective 4

Interpret relationships between off-plot and in-stream sediment loadings.

Progress Towards Objective 4

This analysis will be undertaken in the second half of this year, once we exchange data with the water-watch project.

Objective 5

Further incorporate biophysical parameters into the watershed model.

Progress Towards Objective 5

As for # 4 in section A

Results and Outcomes

Groups A &C

Tree growth data and vegetable yields plus erosion data have been collected from four experiments and the researcher-managed plots have been maintained. First impressions of the tree growth data suggest that they are closely in line with that predicted with simple models for biomass accumulation (Nissen *et al.*, Ag. Syst. 2001).

Some of the results from the current year follow; others are being compiled for the annual report.

Group B

In February 2000, nine individuals participated in a one-day workshop held at the School for Environmental Studies and Management (SESEAM) at the Univeristy of the Philippines Los Baños (UPLB). Participants included representatives from PCARRD, the Bukidnon PPDO, SEARCA and four academic departments at UPLB. The Manupali Model and a user's guide were disseminated to work plan partners and the research community in Los Baños. The model was installed on four

computers in the SESAM computer center, one computer in the College of Public Affairs, one computer at SEARCA, and on one computer used by the Bukidnon PPDO. At last report, the model was being used by two graduate students at the University of the Philippines, Los Baños as part of their thesis work. One student is engaged in modifying the model to account for smallholder and plantation banana production. The other student is modifying the model to account for policy impacts on carbon storage in agroforestry systems. In both cases, however, it is not yet possible to assess the extent to which these efforts are being sustained or whether they are leading to research output that can assist policymakers. In early 2000 the prototype model was installed in the office of the Provincial Planning and Development Officer of Bukidnon province. Two PPDO staff members were trained in the use of the model.

Impacts

Group A &C
No new impacts can be reported within this period.

Group B
The modeling work is having an impact on local and provincial governments in the Philippines by improving understanding of the role of economic policies in encouraging sustainable use of upland agricultural resources. Capacity for policy analysis and planning is being strengthened at local, provincial, and national levels. The ability of university researchers and staff in Los Baños to conduct policy analysis is also being strengthened. Proper and necessary groundwork is being undertaken — albeit at a cautionary rate — to translate our work to settings outside the Philippines.

Publications

Group A &C
Nissen, T.M. and Midmore, D.J. 2000. Stand basal area as an index of competitiveness in timber intercropping. *Agrofor. Syst.* (under revision).

Nissen, T.M , Midmore, D.J. and Keeler, A.G. 2000. Biophysical and economic tradeoffs of intercropping Paraserianthes falcataria with food crops in the Philippine uplands. *Agricultural Systems* (in press)

Group B
Shively, Gerald E. 2000. Poverty, Consumption Risk, and Soil Conservation. *Journal of Development Economics* (in press).

Shively, Gerald E. 2000. Agricultural Change, Rural Labor Markets, and Forest Clearing: an Illustrative Case from the Philippines. *Land Economics* (in press).

Shively, G. (ed). 2000. Conducting economic policy analysis at a landscape scale: A Stella-based approach to dynamic simulation with examples from the agricultural economy of a Philippine watershed. West Lafayette: Purdue University. Draft manuscript (70pp).

Other Issues

Group A &C
None apparent.

Group B
We continue to struggle with the issue of slow uptake of modeling activities among host-country scientists in the Philippines. Faculty members at UPLB are very over committed. As a result, we need to redouble efforts to enhance peer-to-peer interaction.

We continue to exercise caution regarding the expansion of activities to a setting in Vietnam. Many scientific and institutional issues remain to be resolved before a serious attempt at policy analysis can be undertaken.

Research collaboration with Midmore *et al.* continues. Efforts focus on strengthening biophysical features of our model and using the model to backstop economic and policy analysis in the biophysical work plan. We expect more progress in the second half of this year when data from Group A and C activities are available.

We need a formal method to disseminate results from policy modeling in a "popular" form.

Table 1. Total Eroded Soil (T/Ha) per Season According to Treatment

TREATMENT	(n)	SEASON		
		9[1]	11[a]	12[2]
Sunflower	8	0	0.3 (0.78)	0.3 (0.0)
Trees only	6	0	0.2 (0.51)	0.0 (0.0)
Vegetable/lime	6	3.3 (0.60)	12.4 (5.33)	0.7 (0.6)
Vegetable/no lime	2	5.5 (1.87)	13.4 (9.70)	1.7 (1.1)
Trees/vegetable/lime	2	5.9 (0.55)	15.0 (1.54)	0.3 (0.4)

[1] Data reported in SANREM CRSP 1999 Annual Report

[2] New data reported for Semi-Annual Report

SEA 00-25 Water Resource Management and Education Work Plan

Dr. William Deutsch
Principal Investigator, Auburn University

Mr. Jim L. Orprecio, Heifer Project International
Ms. Janeth Bago-Labis, Heifer Project International
Co-Principal Investigators

Mr. Serafin Billones, Tigbantay Wahig
Dr. Estella Cequiña, Central Mindanao University
Ms. Allison Busby, Auburn University
Collaborators

Introduction

The activity has two components: 1) to produce water quality data and 2) develop a system of community-based environmental monitoring and action that will contribute to the Natural Resources Management Plan of Lantapan and other municipalities of Mindanao. Training sessions will increase the skill level and capacity of existing community monitors and will continue to spread the program throughout Lantapan and the Province of Saranggani. A variety of water quality and quantity parameters that describe the physical, chemical and biological characteristics of the four major watersheds in Lantapan will be regularly measured by the community-based NGO partner called the Tigbantay Wahig (TW) and a faculty member of Central Mindanao University (CMU).

Ongoing water monitoring will build on the previously established, six-year database of physicochemical and biological characteristics of the major watersheds in Lantapan. These data, including stream discharges, total suspended solids, soil export estimates and concentrations of coliform bacteria (including *E. coli*) will be correlated with rainfall, land use and other pertinent data for use in both formal and informal watershed modeling. All information will be disseminated to policymakers, teachers and the general public in such a way as to contribute to the institutionalization of community-based water monitoring at the municipal, provincial and national levels. Such a model of community participation in natural resource management will be relevant for spread to other Southeast Asian countries, the SANREM-Andean project and globally.

Objective 1

To support the growth and capability of the Tigbantay Wahig as a viable and sustainable people's organization in Lantapan, and extend community-based monitoring to other parts of Mindanao (Saranggani Province).

Progress Towards Objective 1

Capacity building for the Tigbantay Wahig members and officers continued to be a priority of the work plan. Last June 15-16, 2000, a training was conducted on "Organizational development and leadership seminar." Selected members and officers attended. Mr. Ben Ramiso of the Muslim-Christian Agency for Rural Development facilitated the training, which was conducted at the HPI Field office in Alanib, Lantapan. The training included a review of roles and responsibilities of the officers as well as leadership and management skills.

Also, five Tigbantay Wahig's members attended a seminar on Goat Production and Management last June 7-9, 2000. The training equipped the members of the Tigbantay Wahig with necessary skills to manage their goat projects. This livelihood project funded by HPI and the Tankerlsey Foundation of Auburn University will help the members earn income and hopefully assist them to continue their voluntary work on data collection.

To date, the Tigbantay Wahig group continues to actively collect data in a monthly basis. New set of officers was elected and regular meetings of officers are being conducted.

The membership of the Tigbantay Wahig continues to expand. Basic Orientation Seminars for interested community members were conducted in July 23, August 27 and September 10 this year. A new batch of water monitors had undergone a two-day series of training on "Water Quality and Quantity" last October 26 and 27, backed up by the Tigbantay Wahig group. Twenty-two (22) participants attended the sessions, which were facilitated by Ms. Janeth Bago-Labis (HPI staff), Mr. Jhonie Sumampong (Project Coordinator), and Mr. Serafin Billones, the currently elected president of TW.

To keep the group in accord to developments related to Watershed Management, Mr. Jhonie Sumampong attended a training of trainers on Manupali Watershed conducted last September 9-10.

Objective 2

To collect water quality and quantity data for addition to a six-year database. This information will be useful for local water management and as model for other communities.

Progress Towards Objective 2

1. Lantapan, Bukidnon-Manupali Watershed – Tigbantay Wahig
   a. One hundred ninety-two Total Suspended Solid samples were collected from the four river sample sites of the Manupali sub-watersheds commencing June to November 2000.
   b. Twenty-four chemistry samples were collected from the four river sample sites from June to October 2000.
   c. Stream Discharge collection totaled to 24 samplings as of June to October 2000.

2. Maitum Sarangani – Maitum Munong El.
   After the March 11-17, 2000, Water Quality and Quantity training in Maitum, Sarangani, a water watch group was organized and named as "Maitum Munong El," which is a T'Boli term for Maitum Water Watch. The group started its data collection in June 2000. Dr. William Deutsch from Auburn University, and Mr. Jim L. Orprecio, Ms. Janeth Bago-Labis and Ms. Dinah Orellano of HPI-Philippines facilitated the training.
   a. A total of 72 Total Suspended Solids samples were collected from the six river sample sites of Maitum, Sarangani beginning June to September 2000.
   b. Twenty-four chemistry samples were collected from the six river sample sites starting June to September 2000.

Objective 3

To organize the water database for use in watershed model to be developed by the SANREM Southeast Asia Program.

Progress Towards Objective 3

1. The two community-based water-monitoring groups (Tigbantay Wahig and Maitum Munong El) perform regular monthly data collection and then submit data to Dr. Estella Cequiña of Central Mindanao University for laboratory work processing. From Dr. Cequiña, data are sent to HPI-Philippines and HPI-Philippines organizes and forwards the data through electronic mail to Auburn University for dnalysis and database input.

   Graphs and illustrations are also made available to serve as substantial materials and visual aids during community-based water monitoring presentations and SANREM conferences.

   A program to organize the database is currently being developed at Auburn University to collate all the data from the Philippines, Alabama and parts of Asia.

2. To conduct a feasibility study for the extension of the Lantapan model of community-based water monitoring through an NGO network in Southeast Asia

   In June 2000, Dr. Bill Deutsch and Mr. Jim L. Orprecio conducted a Water Quality Monitoring Training in Chengdu, China. The training was an offshoot of the Ecology Training sponsored by Heifer Project International in September 1999 in Malaybalay and Lantapan in Bukidnon. Country directors and representatives of Heifer Project International from 12 countries in the Asia-South Pacific Region, U.S. and Africa participated in the training.

   The China training was conducted for the HPI-China program in order to replicate the Community-based Water Quality-Quantity Monitoring Model developed in Lantapan, Bukidnon.

   Other HPI country programs such as Thailand and Indonesia will be sending staff and program partners to the Philippines for training on the community-based Water Quality-Quantity Monitoring next year.

Results and Outcomes

The data collected for more than six years now is considered a very valuable tool that can be used to develop information to educate people on the condition of the environment that they are in. In Lantapan, the data that were collected facilitated environmental awareness through presentations of data by the Tigbantay Wahig members to the municipal government office, barangay assemblies and study tour groups.

Many institutions, government offices and private groups became interested in the Water Quality-Quantity Monitoring activities in Lantapan. The members of the Tigbantay Wahig responded to a number of requests for data collection demonstrations as follows:

a. June 06, 2000 – Tigbantay Wahig members, upon the request of Ms. Sylvia Ramos of MOSCAT (Misamis Oriental State College of Agriculture and Technology), conducted a demonstration of water quality-quantity monitoring. Ms. Ramos intends to conduct a cross-visit for local farmers and students from Claveria, Misamis Oriental for them to learn about the monitoring technique that TW is doing.

b. July 19, 2000 – Upon the invitation of the Municipal office, Jhonie Sumampong attended the Municipal Forest Protection Committee meeting to discuss matters pertaining to the situation of the Lantapan environment.

c. July 25, 2000. The National Irrigation Administration (NIA) requested the Tigbantay Wahig group for information on water monitoring data for their reference.

d. August 31, 2000. Mr. Jhonie Sumampong (Tigbantay Wahig Project Coordinator) together with other TW members, conducted a water sampling demonstration for NIA personnel.

e. November 9, 2000. The Tigbantay Wahig members performed water sampling at the Maagnao river with U.S. donors of Heifer Project International as their audience. The donors were very much impressed by the commitment of the members to do voluntary work to monitor their environment.

Impacts

The Tigbantay Wahig group actively takes part in the tree-planting activity in Lantapan to help rehabilitate the Manupali Watershed. The tree-planting program is conducted by HPI-Philippines in collaboration with the Tigbantay Wahig members and other program partners in the area. About 6,500 high value fruit-tree seedlings have been planted so far.

Publications

Draft of a brochure was sent to Auburn University for editing and is expected to be back in the Philippines by 2001 for finalization and distribution.

Other Issues

The level two training that was planned to take place last October 2000 for the Maitum Water Watch in Sarangani was postponed due to the Mindanao war brought about by conflicts between Muslim rebels, Abbu Sayyaf and the government forces. The postponed training is on "Stream Discharge Measurement and Bacteria" in water and hopefully will be conducted early next year.

SEA 00-32 Adapting and Transferring Lessons Learned from Manupali Watershed to Other Critical Watersheds in Southeast Asia

Focus on Vietnam

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Introduction

This work plan originated from Phase I Year 1 and 2 activities— which generally focused on laying out a mechanism for up-scaling of lessons that we learned (and are still being learned) from Lantapan (SANREM Phase I) to other critical watersheds in the region. Selection of Vietnam for expanded collaborative research initiatives, is strategic. *One*, the U.S. Government has just normalized political relations with Vietnam.[3] Hence, broadening engagement in economic, policy and environmental activities will enhance bilateral relations between the two countries. *Two*, Vietnam is undergoing rapid transformation of both its economic as well as its biophysical landscape. Economic reforms which include de-collectivization of agriculture (decentralization of resource management), elimination of an array of administrative prices, liberalization of trade, to name a few, resulted to a rise of 7 percent of Gross Domestic Product (GDP) and Vietnam rose to become one of the largest rice exporter.[4] *Three*, with a population of 78 million, and an annual population growth rate of 2 percent, environmental pressures on land resources are expected to become a serious problem in the near future.

These conditions make Vietnam a ripe context for the up-scaling activities of SANREM CRSP-SEA. This phase focuses on successful application of decision support tools for natural resources management developed in Phase I and II (early part). These decision support tools and processes include the use of Participatory Landscape Lifescape Appraisal (PLLA), a powerful tool for a systematic, community-based and rapid assessment of key stakeholders and their issues. Process-based natural resources planning and management approaches will also be tested and validated in the light of the spread of decentralization and devolution among countries in SEA, including Vietnam. The Lantapan experience has proven to be a model in the decentralization of planning and management, and considered a concrete example of a shift from traditional top-down planning approaches to participatory, demand driven, multisectoral planning and research-based decision-making. With this in mind, we set out with the goal of scaling up the experience to SEA. But before we could do that, we need to understand the major issues confronting the target country.

During an exploratory trip conducted to identify potential areas of collaboration in August 1999, it was noted that one of the current major research challenges that confront agricultural researchers based in the university (University of Agriculture and Forestry, Ho Chi Minh City, to be specific) is

[3] Communication to USAID by U.S. ambassador to Vietnam, 1999.
[4] Ibid.

the socioeconomic, cultural and biophysical causes and consequences of coffee expansion in the uplands of South Vietnam. In fact, it was noted that coffee expansion as a result of increasing coffee exports resulted to a "terrible cost in terms of loss of the Tay Nguyen habitat (biodiversity, forest endowment, flow of water to the Mekong River)."[5]

In Vietnam, coffee now is one of the major export crops. In 1997 alone the production of green coffee beans reached 364,000 tons, the highest since 1990. The export totaled 310,000 tons in the same year (Hung 1998). It was also estimated that about 330,000 tons were exported in 1998. In terms of value, coffee is second to rice. As it is, coffee is expected to play a significant role in the modernizing period of South Vietnam.

Large coffee plantations are located in Southern Vietnam, since coffee is suitable in this area particularly the 'Robusta' cultivar. In Lam Dong Province, both 'Exelsa' and 'Robusta' coffee cultivars were grown successfully.

The main competitor for Vietnamese coffee is Brazil. So when Brazil freezes, Vietnam coffee brews. This means that when the international demand for coffee increases, and Brazil cannot deliver because of frost, there is an increase in coffee prices. This condition makes expansion of coffee production even more lucrative and hence, attractive.

This seemingly good fortune is not without some costs. The sunny side of coffee production has environmental as well as socio-cultural consequences. Farmers, encouraged by good prices for coffee, gradually clear forest areas to plant more coffee. This trend increases the vulnerability of the farmers to fluctuating markets, increases vulnerability to pests and diseases due to monoculture and poses a threat to the ecological balance. Already, water scarcity is becoming a major problem because of the demand for irrigation among coffee growers.

Discussions on influences of coffee production now center on pertinent questions: *To what extent do farmers need to limit coffee? How do markets influence farmers' behavior? How do communities deal with water conflicts among coffee growers in the uplands? What are the impacts of coffee expansion on the cultural diversity of the uplands? What is the optimal land use for the uplands? How can a community strike a balance between economics and ecology?*

This work plan proposes to address some of these questions using a study village in South Vietnam. The selection of this particular site is due to the fact that the University of Agriculture and Forestry (UAF) has on-going extension activities and a community-based resource management (CBRM) project being funded by Ford Foundation based in Hanoi, Vietnam. It is the intention of this work plan to work together with existing projects and university (UAF)-led activities. We intend that the locally based research institution will play a critical role in undertaking the collaborative research. Since Vietnam is also a priority country of SEARCA, SANREM's partner in this activity, it is projected that some of SEARCA's activity within the next two years will be in collaboration with this work plan.

[5] Ibid.

Objective 1

Determine the suitability of the SANREM Phase I tools and processes in a different socioeconomic and political context like Vietnam

Progress Towards Objective 1

The effectiveness of using tools and processes developed in the Philippines in target research areas in Vietnam is lofty because of the similar biophysical and economic conditions in the two research areas. In selected upland sites in Vietnam, there is rapid transformation of biophysical conditions due to increasing production of coffee and tea, decentralization of natural resources management, and an increasing population growth rate of about 2 percent, which resulted in increased environmental pressures. In Lantapan, Philippines, there is a parallel decentralization of planning and management of natural resources, and a shift of traditional top-down planning approaches to participatory, demand-driven, multi-sectoral planning and research-based decision-making. The two research areas have similar biophysical and economic conditions but with different cultural and political contexts.

Selected processes and tools generated in SANREM Phase1 are now being tested in Vietnam. These include the following: 1) Participatory Landscape-Lifescape Appraisal, a powerful tool for a systematic, community-based and rapid assessment of the area, key stakeholders and their issues; and 2) process-based natural resources planning and management approaches that can validate and guide the implementation of decentralization and devolution policy in the area.

Objective 2

Examine the dynamics of resources management in the uplands of South Vietnam using a case study approach.

Progress Towards Objective 2

The members of the team from University of Agriculture and Forestry (UAF) in Vietnam and SEARCA met to discuss the processes to follow in accomplishing the goals. The team members were provided with copies of the draft Participatory Landscape Lifescape Appraisal (PLLA) manual. This manual helped to explain the process of PLLA and helped the team to come up with a list of information needed, guide questions for gathering of information, and complementary tools to employ. The PLLA process and the list of information needed are in Appendix A.

After the workshop, the team completed the reconnaissance of the research site. The Principal Investigator and members of the team from UAF started gathering information through field visits, interviews with the key informants and farmers, and review of related references. The lists of government officers and farmers interviewed are in Appendix B.

Synthesis and analysis of the findings will be done as soon as sufficient information is collected. Expected completion of the draft PLLA report is January 2001 in preparation for the writing workshop and validation set in February 2001.

Objective 3

Assess the influences of market forces on farmers' behavior (work plan)

Progress Towards Objective 3

No report

Objective 4

Assess environmental and institutional factors that influence coffee expansion

Progress Towards Objective 4

No report

Objective 5

Examine the economic, cultural and biophysical consequences/impacts of widespread planting of coffee

Progress Towards Objective 5

No report

Objective 6

Determine effective mechanisms in resolving/managing conflicts arising from changes in farming systems

Progress Towards Objective 6

No report

Objective 7 (new)

Examine the interlocking influences of economic, cultural and biophysical factors as they influence upland agriculture and its environment

Progress Towards Objective 7 (new)

The team formulated research hypotheses based on the initial information collected. The following are the central hypotheses formulated:

- Increasing commercialization and changing access to and control over resources influence land management practices and decisions of farming households, community and higher policy making bodies.
- Change in environmental quality influence farmers and policymakers' land management decisions.
- Change in resource tenure induced by commercialization influence land management decisions.

Based on the hypotheses, the team formulated two abstracts. After data collection and analysis, these abstracts will be developed into full papers for possible presentation during the SANREM conference on May 2001 and/or submission to appropriate journal. Abstracts are in Appendix C.

Objective 8 (new)

Determine policy implications of the changing agricultural practices among farmers in Southern Vietnam.

Progress Towards Objective 8 (new)

A policy workshop is set for March 2001. The expected participants of this workshop are those who are involved in various levels of decision-making. Generally, the objectives of this workshop are to present and validate the results of this research to different stakeholders and to provide the different decision-makers venue for discussing the policy implications of the research results.

Results and Outcomes

During the workshop, aside from understanding the PLLA processes, the team identified the milestones, activities, expected outputs and corresponding budgetary requirements, and time frame for accomplishing target goals. The identified milestones, activities, outputs, budget requirements and duration are in Appendix D.

The letter contract to University of Agriculture and Forestry (UAF) in Vietnam was finalized. The responsibilities of the contracting institution, corresponding budgetary requirements for accomplishing target outputs and schedules of fund releases were stipulated in this contract.

Two abstracts were developed and submitted to SANREM for possible presentation at the International Conference on Sustainable Agriculture and Natural Resources Management being organized by SANREM. Development of the abstracts was based on the initial information collected through initial field visits, interviews with key informants and discussions by the team. These abstracts will be developed into full papers once the research is completed.

The research team also established contacts with local stakeholders at this stage in order to facilitate the implementation of the research activities and ensure active participation from different stakeholders.

Publication or Presentations

Espaldon, M.V.O. and A.O. Magsino. 2000. Manual on Participatory Landscape-Lifescape Appraisal for Community Resource Management (Draft). SANREM CRSP-SEA.

Other Issues

We were not able to set the PLLA on the said dates because we have to finalize the agreement/arrangement between UAF and SEARCA. Some management/administrative issues were first settled before we can proceed; e.g. financial arrangements, Memorandum of Understanding, or a contracted research mode. We finally settled on a contract mode to simplify fund releases and closing of accounts.

Appendix A. Guidelines for the conduct of Participatory Landscape-Lifescape Appraisal (PLLA) for Loc Chau Commune, Bao Loc District, Lam Dong Province.

Review of Secondary Data Available

Mr. Hung's thesis
Dr. Thanh Ha's paper on Kado and Dak Lak Province
Mr. Cai's work
Records at local offices

Local Protocols

Request permission from the local authorities and discuss the objectives of the research. Discuss also the sampling procedure.

Identification of PLLA Case Studies

Commodity/ Tenure	State Owned	Communal	Individual
Coffee			X
Tea		X	X
Mulberry			X
Mixed	X *Possible		X
Forest	X	X	

Sampling procedure is based on two major variables, major crops grown and land tenure. The work plan's focus is on the impacts of change in the policies (e.g. land tenure or use rights) and market prices of major commodities. Environmental changes will be examined in terms of soil erosion indicators (from other projects and perception interviews through PLLA) and water availability (based on perception interviews—costs of water extraction, access to water).

Farmer classification: poor, middle, rich (let's use the local indicators), include interviews of groups of men and women. If variations can be acquired from each general category, it would be positive.

List of Information Needed

Biophysical Information

Land use
Soil fertility
Rainfall
Availability of water supply
Typhoon and drought occurrence, frequency and duration
Land size of the commune
Topography, elevation and temp range
Tools that can be used:
Transect
Participatory maps and sketches
Resource maps

These tools will assist to locate the resources (e.g. water sources, and soil types), major economic activities per agro-ecological zones, tenure, problems and opportunities.

Socio-Economic Activities

History of the farmer (origin, reason for being in the area, land tenure/use right, area of farm, location, family size, labor availability-family and hired)
Crops grown
Livestock raised
Forest species grown
Cropping pattern/farming system
Management (fertilizer, pesticides and other farm inputs)
Water use and sources (irrigation, domestic, & drinking)
History of agricultural crops
Reasons for crops and livestock selected
Reasons for shifts (if any)
Livelihood activities and other sources of income
Problems and constraints
How farmers plan to address these constraints
    Tools that can be used:
    Seasonal calendars
    Resource maps
Flow patterns (product flow, decision flow, & household material flows)— please refer to manual on PLLA.
Network analysis

Market Conditions

Infrastructures (access to market & farm to market roads)
Where they sell products, prices, costs, income
Market information and sources (national, regional, & local)
Market channel (government, local collectors, & individual)

Market storage facilities
Tools that can be used:
Product flow
Community sketches

Land Tenure

Proportion of state-owned, communal and individual
How tenure changed over time
How farmers respond
Land use vis-à-vis tenure and proportion
Land tenure vis-à-vis soil conservation measures

Local Rules and Regulations

What are the existing rules and regulations?
Who formulates these rules?
How are these rules disseminated to the farmers?
Types of conflicts occurring in the area
How are conflicts resolved or managed?
What kind of rules and regulations would assist them in farming?

Credit Facilities

Formal and informal credits
Types of credit
Interest rates
Access to credit
When they need credit most? Least?

Extension Services

Types of extension services provided
By whom?
What kinds of services you have accessed and are these services timely?
What other kinds of extension services are needed?
What kind of training farmers need?

Appendix B. Name of persons met during the first trip in Bao Loc District, Lam Dong Province, Vietnam.

Name of Person, Position/Characteristics

Officers

1. Mr. Nguyen Minh Luc	Vice-head of the Economic-Planning office of Bao Loc District
2. Tran Van Cong	Chairman of Dai Lao village
3. Dinh Cong Huyen	Vicechairman of Dai Lao village
4. Mr. Bui Quoc Sy	Officer of Agriculture-Forest-Water Resource-and Land Management of Dai Lao village.
5. Mr. Ho Ngoc Hoan	Head of Statistical Office of Bao Loc district.
6. Mr. Dang Tien Vu	Specialist, Statistical Office of Bao Loc District.
7. Mr. Pham Thanh Phong	Vice Director of the State Farm Dai Lao.

NGO's

8. Mr Tran Dinh Long	Agricultural engineer. Bao Loc Rural Life Center, Dai Lao village.
9. Mr. Nilo Endoso	Agricultural specialist - Director of Bao Loc Rural Life Center, Dai Lao village.

Farmers

10. Mr. Nguyen Van Hoa	Farmer - large farm with 25 hectares.
11. Mr. Tran Dinh Ly	Farmer (oldest) (1 ha)
12. Mrs. Nguyen Thi Tinh	Medium farmer (1 ha)
13. Mr. Tran Quoc Toan	Small farmer (0.9 ha)

Appendix C. Authors and abstracts of papers to be presented during SANREM Conference in May 2001.

Impacts of Changes in Policy and Market Conditions on Land Use, Land Management and Livelihood Among Upland Farmers in Central Highlands of Vietnam

Dang Thanh Ha, Pham Hong Duc Phuoc, Hoang Huu Cai,
Pham Trinh Hung [6] and V.O.Espaldon[7]

Abstract

The paper outlines the changes in agricultural policies and market conditions in Vietnam for the last 20 years characterized with gradual decentralization and integration in the global economy. This study examines how these institutional changes influence the way farmers use and manage their farms in the uplands of Vietnam. Using a case study approach, the study assesses the impacts of these changes on the livelihood systems among members of the local community. Preliminary analysis at the local level shows that the farmers base their decisions on short term market expectations rather than on long term market information. This lends them more vulnerable to greater economic losses in the long term as shown by the behavior of mulberry and coffee production in the study area. Farmers shifted from mulberry to coffee after 1994 when the price of coffee beans increased. However, there are risks associated with coffee as a monocrop in a large area such as fluctuation in market prices and environmental degradation. The study provides empirical evidence to the complex interplay of policies and market conditions on land use, management and livelihood system of the Vietnamese upland farmers. The study raises issues that are equally important to national and local levels of policy and decision making- the need for agricultural land use planning that aims to deal with the fluctuating global market without compromising the welfare of small farmers and landholders.

[6] Faculty members, University of Agriculture and Forestry, Ho Chi Minh, Vietnam and Project Team Members, SANREM/CRSP/SEA in Vietnam

[7] Assistant Professor, School of Environmental Science and Management, University of the Philippines Los Baños and Principal Investigator, SANREM/CRSP/SEA Project based at SEARCA, College, Laguna, 4031 Philippines.

Linkage Between Natural Resources Change and Management Decisions in Lam Dong Province, Central Highlands of Vietnam

Le Quang Thong, Pham Trinh Hung, Le Van Du[8] and V.O. Espaldon[9]

Abstract

This paper addresses the questions of how the change in environmental condition influence land use decision of upland farmers and what are the linkages between environmental changes and land management decisions at different levels of authority. Although this paper provides empirical evidence to the dynamic link between decisions and natural resources change, this study focuses on the development and testing of methodology for natural resources management. Specifically, the study employs the use of Participatory Landscape Lifescape Appraisal (PLLA), an approach that considers the interlocking relationships of biophysical, economic and cultural aspects of a community at a landscape scale. In this study, the unit of analysis is a community located in Bao Loc district in Lam Dong Province. Through PLLA, the paper examines the change of land (soil) and water resources and the factors affecting the use of water and land as a resource. This paper aims to provide policymakers at the local and national levels information on the detailed dynamics of the process by which resource changes are influencing various decisions. This knowledge aids in an improved understanding of agricultural systems behavior and better policy responses.

[8] Faculty members, University of Agriculture and Forestry, Ho Chi Minh, Vietnam and SANREM/CRSP/SEA Project Team Members in Vietnam

[9] Assistant Professor, School of Environmental Science and Management, University of the Philippines Los Baños; and Principal Investigator of SANREM/CRSP/SEA Work Plan based at SEARCA, College, Laguna.

Appendix D. Milestones, Activities, Outputs and Budgetary Requirements for Vietnam, November 2000- May 2001.

Milestone	Activity	Duration	Output	Budgetary Requirements	
				%	(in US$)
1. Memorandum of Agreement (MOA) between UAF and SEARCA	Drafting of MOA	October-November 2000	Approved/Signed MOA	30	2,753.83
2. Completion of Participatory Landscape-Lifesacpe Appraisal (PLLA)	Team organization Reconnaissance visit Conduct of PLLA	October 2000 November 2000 Dec - Jan 2001	Progress report Proposed outline of the PLLA report	20	1,835.88
3. PLLA Draft report completion	Data processing and analysis Preparation of the draft	Jan-Feb 2001	Draft PLLA Report		
4. Validation of PLLA draft report	Community verification Final field work	February 2001	Community validated report	30	2,753.83
5. Completion of technical papers	Writing Workshop	February 2001	Two papers on: Impact of policy and market forces on land use and land management systems in the uplands of Central Highlands, Vietnam Linkage between natural resource change and management decisions in Lam Dong Province		
6. Conduct of policy workshop	Preparation of the list of participants Administrative arrangements Program management	March 2001	Proceedings of the workshop		
7. Completion of final report	Final report preparation	April 2001	Final report		
8. SANREM Conference		May 2001	Paper presentations	20	1,835.88
TOTAL				100	9,179.42

SEA 00-34 Replicating Models of Institutional Innovation for Devolved, Participatory Watershed Management

Dr. Dennis P. Garrity, ICRAF
Principal Investigator

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Co-Principal Investigator

Delia C. Catacutan, ICRAF-Philippines
Project Manager

Introduction

The search for better watershed management derives from global concerns and national environmental concerns, but poverty reduction and household food security are also central issues. As participatory demand-driven approaches to watershed management gain wider attention there is an urgent need for research to evaluate their performance, analyze those cases where they have been tested and identify important constraints, indicators and methods of application pointing the way to accelerated progress. The Lantapan natural resource management process and experience is a significance advance in municipality-led natural resource management planning. The model is considered a milestone in the decentralization of planning and management to the local government level. It is a shift from traditional top-down planning approaches toward participatory multi-sectoral planning and research-based decision-making. Our work with municipal government and other SANREM partners has resulted in a model of municipal-level natural resource management planning and implementation that has received national attention.

From this experience in Lantapan, we begun conducting a replication program for this model to the seven municipalities surrounding the Mt. Kitanglad Nature Park within the province of Bukidnon. This replication program will hopefully evolve a new model for community-based protected area management. We will analyze, evaluate and compare the performance of this model in these municipalities, in the context of the diversity of biophysical, socio-economic-political and institutional conditions encountered. We will test and fine-tune the processes and assess the impacts of implementation. We will package the results of this analysis and impact assessment into modules that will serve as decision-support system that assist local governments and community stakeholders to further improve the processes of natural resource management planning and implementation and communicate these to broader levels, nationally and regionally in Southeast Asia.

During the first year of the work plan, priority focus was given to analyzing the planning processes adopted by the Local Government Unit (LGU) of Lantapan in developing the plan. Surveys and self-assessment workshops were conducted. A working team at the local level was organized that served as a pool of resource persons and advocates during the replication activities in the other sites. This fulfills part of our objective to implement an LGU-to-LGU model of sharing information and experiences. New linkages were developed with the Integrated Protected Area Management and the Protected Area Management Board (PAMB). We are now replicating the natural resource management model and the experiences of SANREM through this multi-stakeholder collaborative system.

Objective 1

Develop methods for participatory monitoring and evaluation of impacts of the NRMDP in Lantapan, implement these methods with local partners in Lantapan, assess their effectiveness, and suggest refinements to overcome constraints.

Progress Towards Objective 1

This activity is being undertaken in conjunction with the current Participatory Monitoring and Evaluation logframe for our Landcare work. Please note that Landcare is a major program of the Local Government Unit through the NRMDP and is cooperatively implemented by ICRAF and the Local Government as partners. The PME logframe has been developed and circulated around the team, some parts of which however, are already implemented.

Objective 2

Continue to replicate the natural resource management model of Lantapan to three other municipalities in the Mt. Kitanglad area, leading to the development of a new approach to protected area management, in collaboration with Bukidnon's Provincial Planning and Development Office and the Protected Area Management System.

Progress Towards Objective 2

Out of the eight municipalities surrounding the MKRNP, five have already engaged in NRM planning processes and implementation at their level. Lantapan's Natural Resources Management and Development Plan (NRMDP) is already on its second and a half-year since its formulation and implementation, and is continuously following its pace of implementing key activities and action programs as embodied in the plan. Manolo Fortich and Baungon have already set-up their respective Project Management Offices (PMO) that oversee the implementation of their plans. Some of the key activities in their priority action programs have already started particularly the organization of farmers into Landcare groups as vehicle to disseminating sustainable farming technologies and practices. Libona's first draft of NRMDP is already finished. It will be presented to the NRMC members within this month of December and to other important local bodies in the municipality for consultation and verification purposes. Impasugong, on the other hand, is due for the first writeshop. The expected product of which would be the development of NRMDP's first draft. Malaybalay City will be the next stop in response to the local government's invitation for a presentation on the NRM model and replication program early next year.

Objective 3

Scale-up the natural resource management model to selected municipalities in Misamis Oriental, where ICRAF has already been working, particularly in the Claveria Watershed cluster under the Cagayan-Iligan Corridor Watershed Management Program.

Progress Towards Objective 3 (issue)

Our aim to work with the Cagayan Iligan Corridor Watershed Management Program in replicating the NRM process has been affected by the fact that the CIC Watershed Technical Working Group is still in its formative stage. Little progress was made by the TWG in pursuit of their own goals due to

some growth pains and problems related to partnership-building and collaboration among the various range of stakeholders in the CIC.

Objective 4

Strengthen collaboration with GOLD, through joint development of learning modules, case studies, and technical notes on guidelines for implementing participatory natural resource management planning and implementation, and illustrating different local practices and innovations for natural resource management and watershed management.

Progress Towards Objective 4

Collaboration with ARD-GOLD has resulted in a joint publication of a caselet that features the Lantapan experience and other promising NRM planning strategies of some municipalities facilitated by GOLD. The caselet also highlighted the ten basic steps in NRM and Watershed planning that were largely drawn from the experience in Lantapan and the GOLD-assisted municipalities (final copies forthcoming). Draft copies have been circulated to selected partners. Two NRM caselets were also produced by ICRAF featuring the pathways for streamlining NRM and specific planning process of initiating local NRM .

Objective 5

Strengthen collaboration with DENR's Forest Management Bureau for scaling-up the Lantapan methods for natural resource management and watershed management in their pilot watersheds under implementation of the National Watershed Management Strategy.

Progress Towards Objective 5 (issue)

Collaboration with DENR was initiated in several meetings with key staff of the Forest Management Bureau, Watershed Management Division at DENR Central office. Initial agreements were made for ICRAF to host a team of DENR staff on a cross visit to Lantapan and to provide assistance to call for a partners' meeting in the two first pilot watersheds of DENR. However, there was a sudden change of leadership in the FMB Watershed Division. Mr. Jess Javier who heads the team was transferred to another post—hence, the delay. So far, there is no indication that DENR will vigorously pursue the implementation of the Philippine National Watershed Management Strategy.

Objective 6

Develop and implement methods for scaling-up the natural resource management model in Vietnam in collaboration with the SEARCA work plan.

Progress Towards Objective 6 (issue)

Our initial work in meeting this objective is partly covered by our initiative on Agroforestry Capacity-building program for Vietnam (VACB) with VASI as our main partner. Mr. Chun K. Lai, our Senior Capacity-Building Specialist who is based in our ICRAF office in Los Baños is in charge of this project and has been dialoguing with Dr. Gladys Buenavista on ways to implement complimentary initiatives in Vietnam. Several meetings with our SEARCA partners have been scheduled in the past months, unfortunately however, none of those meetings took place due to inavailability of our key partners at SEARCA. Our VACB project however, is providing snapshot

information on status of the socio-political and institutional conditions of Vietnam, whereby we can assess the potential replication of the Bukidnon NRM planning model to the SANREM site in Vietnam.

Objective 7

Analyze, evaluate, assess, and compare the performance of the natural resource management model in these different municipalities, and develop this knowledge into modules that serve as decision-support guidelines to local governments in pursuing local natural resource management planning and implementation.

Progress Towards Objective 7

Self-assessment workshops were conducted in Manolo Fortich and Baungon. This provided the opportunity for the NRMC members to self-grade their performance as planning team. They also rated the Local Government Unit in terms of the support provided to the planning team. The self-assessment workshops were part of the planning process and the results were documented in the NRMDP. To further understand the dynamics of Local Government Units in relation to local natural resource management, we conducted a survey to ascertain the factors that affect local natural resource management in the municipalities of Libona, Manolo Fortich, Impasugong and Baungon. The results have been collated and the data are now being analyzed and the report will be soon available in the first quarter next year. Initial analysis however revealed, that among the eleven factors presented, four of them have significantly affected local natural resource management. These are: local financial investment, local technical capability, political culture, and national mandate.

Results and Outcomes

PREVENTIVE SYSTEMS APPROACH (PSA).

This is a model for protected area management that evolved from the scaling-up of the Lantapan experience in local natural resource management to the municipalities surrounding MKRNP, consequent to the linkage with the Integrated Protected Area Management through the Protected Area Management Board. The PSA aims to unify the efforts of different management regimes encompassing the three land belts — from the protected area to the buffer zone down to the privately held agricultural areas in an integrated ecosystem. Its management objectives extend beyond the boundaries of the natural systems to the managed ecosystem, and that enjoins larger communities and institutions' participation with the objectives of those living within. We hypothesized that when Local Government Units are effective in implementing natural resource management programs at their level, pressures in the protected area will be greatly reduced. Therefore, municipal-led natural resource management planning and implementation is a preventive approach to protected area management—hence, the PSA. The last component of the natural resource management work plan will be to conduct an assessment on the effect of PSA to protected area management. The working paper that was developed mid last year on PSA has already been developed into a paper and has been the basis in various presentations with focus on the comprehensive protected area and watershed management initiatives. Information on PSA will be packaged into a booklet for dissemination.

LOCAL GOVERNANCE AND NATURAL RESOURCE MANAGEMENT.
The Local Government of Manolo Fortich has set-up a new organizational structure that would supervise the implementation of major natural resource management programs. A particular department created is the Environmental Protection and Natural Resources Management Office where the NRM Project Management Office (PMO) will be integrated and tasked to implement the NRMDP. Manolo Fortich has integrated the natural resource management plan into its municipal Comprehensive Development Plan — hence, the establishment of their social and financial infrastructure to implement the NRMDP. Baungon has also started implementing its NRMDP upon the organization of their Project Management Office. With this underway, these Local Government Units are positioned ready for take-off next year. In fact, they have already started implementing some of the key activities in the plan such as the formation of Landcare groups in different barangays. Various training for strengthening capacity-building for Landcare facilitators have been conducted as well as training on farming technologies such as nursery establishment, contour farming and others. The Local Government Unit conducted these at large through the Municipal Agriculture Office in collaboration with ICRAF's Landcare Facilitators and other technical persons. The NRM Plans also supported the design and implementation of the municipal Land Use Plans. Land use planning almost came simultaneously with the NRM planning. Both processes were best captured by Local Government Units as dovetailing activities and generally supportive-initiatives.

THE MUNICIPAL-LEVEL NRM PLANNING AS ALTERNATE TO THE "WATERSHED CLUSTER APPROACH."
This municipal-level NRM planning approach as adopted by the northern municipalities of Bukidnon has been identified as an alternate approach of the "Cluster Approach" to watershed planning. In areas where traditional leadership and funds constrained the Local Government Unit cluster in pursuing a Watershed Cluster Approach to planning, the individual municipalities can make a good start by initiating a municipal-level planning process. We are also planning to look at the cost-efficiency of these two approaches. The Municipal Government of Libona was privileged to present the planning and implementation process reckoned from Mt. Kitanglad of the northern municipalities during the Bukidnon Watershed Management Forum last October, together with the other two watershed clusters for Mt. Kalatungan and Maridugao River Watersheds.

INFORMATION AND DISSEMINATION.
The work plan has produced two editions of NRM notes released quarterly and one NRM Caselet jointly published by ICRAF and ARD-GOLD. The NRM notes is a technical paper that comes in a newsletter format. This is made to popularize the strategies, approaches and lessons learned from our NRM work plan, and circulated to Local Government Units and other non-government organizations. The NRM caselet features the Lantapan experience and other Local Government Unit experiences around the country, particularly those assisted by ARD-GOLD.

Impacts

The devolution of natural resource management to Local Government Units prompted politicians and decision-makers to find ways for environmental management to be integrated with sustainable development. With Lantapan's exemplary experience in initiating local natural resource management as well as the other municipalities' initiatives, there is now a better understanding on the benefits of participatory processes, not just for planning but also during the implementation phase, for social

capital enhancement aimed at improving the natural capital of respective communities. The benefits of tapping local skills and indigenous knowledge available in the communities are now creating major impacts since people's involvement is now more pronounced. In areas where natural resource management is underway, local officials have been more conspicuously responding positively, innovating means and ways to successfully implement the plan.

Since NRMDPs are designed to be implemented in public-private partnerships, more and more people in the communities tend to express their ideas on how to come up with appropriate and locally sensitive initiatives in natural resource management. Hence, a new sense of project ownership builds up and a higher percentage of success may be expected unlike nationally driven programs where no participatory processes are involved.

The national park superintendent reported a significant decrease in the number of cases filed against violators in the park and he noted that this was partly due to high awareness and commitment of Local Government Unit leaders to implement natural resource management programs and enforce local environmental laws as a result of the commitment developed through the natural resource management planning process. He also noted that Local Chief Executives are now more expressive in their quest for effective environmental programs and have found that environmental projects are noble and doable.

Publications

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Catacutan, Delia, Caroline Duque, Dennis Garrity, and Felix Mirasol. 2000. Reinventing Protected Area Management: From Curing to Preventing. ICRAF. Bukidnon, Philippines.

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Catacutan, Delia. 2000. Integrated Research and Development for Natural Resources Management. Paper presented in Bogor, Indonesia, October 2000.

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SEA 00-42 Capability Building for Natural Resource Management at the Local Level:

Focus on Six Communities in Valencia and Lantapan, Bukidnon

Dr. Maria Victoria O. Espaldon
Principal Investigator

Ms. Annielyn O. Magsino
Project Management Associate

Introduction

In an effort to arrest environmental degradation in the Manupali watershed and to promote sustainable practices, activities toward human resources capability building and enhancement have been developed. The first year of the project saw the conduct of training needs analysis (TNA) in the municipalities of Valencia and Lantapan, Bukidnon. The results of the TNA underscored the need for knowledge of the concepts in and approaches to natural resource management, sustainable comprehensive land use planning at the municipal level (SLUP) and skills training particularly at the community level. Training-workshops covering natural resource management and SLUP were conducted during the second year.

This work plan is a continuation of these activities. The Year 3 Work Plan covers land use planning support to Valencia and Lantapan, training on participatory rapid appraisal (PRA), and the skills development training at the community level. This year's work plan also explores collaboration with the ICRAF work plan.

Goal

The goal of the work plan is to develop the capability for natural resources management and planning of the local institutions, community leaders, educators, local planners and professionals involved in the use and management of the Manupali watershed.

Objective 1 (new)

Develop and strengthen the skills of trainers on Participatory Landscape-Lifescape Appraisal (PLLA).

Objective 2 (new)

Develop the ability of the community for participatory planning.

Progress Toward Objectives 1 & 2

To attain set objectives, a Training of Trainers on Participatory Landscape Lifescape Appraisal (PLLA) was conducted on October 9-10, 2000 at the Central Mindanao University-Continuing Education Center (CMU-CEC). Twenty-seven (27) participants from CMU, representatives from municipalities of Lantapan and Valencia in the province of Bukidnon and Provincial Planning and

Development Office attended this training. This was conducted primarily to give participants background on PLLA, and to practice what they have learned through a field practicum. The list of participants is attached in Appendix A.

The two-day training was divided into two parts. The first part of the training was spent on learning the principles, concepts and tools in conducting the PLLA. The second part, on the other hand, was devoted to hands-on or field practicum. The first part of the training was made easier because of the inclusion of group dynamics that zeroed in on principles and requirements of the successful conduct of PLLA. The participants were divided into four teams and then group workshops were held to prepare for the field practicum.

During the field practicum in Barangay Alanib, Municipality of Lantapan, the teams were fielded to different *puroks* or zones. Using different tools such as semi-structured interviews, participatory mapping and transects, product flows, among others, information were gathered and later were synthesized and presented to the plenary.

Based on the results of this training, the participants outlined the next activities. The lined-up activities included the following: PLLA training for the members of the target communities in Lantapan and Valencia, Bukidnon with CMU as the trainers; actual conduct of the PLLA in target communities; and action planning.

Objective 3 (new)

Establish a mechanism for collaboration with other work plans/organizations in the area in the planning and implementation of activities.

Progress Toward Objective 3

There is substantial progress in setting up meetings with other SANREM work plans like ICRAF. However, a good linkage was made with Central Mindanao University-Barangay Integrated Development Approach to Nutrition Improvement (CMU-BIDANI), which has existing extension and research activities in some target communities.

Through the technical working group of Lantapan-based research and development being coordinated by PCARRD, it is expected that this will serve as the mechanism for integration and collaboration among and between research and development projects. Dr. Mardonio Lao of CMU sits in the committee and SEARCA is also a member.

Objective 4 (new)

Publish manual on Participatory Landscape-Lifescape Appraisal and on the NRM-SLUP training.

Progress Toward Objective 4

The draft copy of the PLLA manual was completed. This manual guided the conduct of Training of Trainers on PLLA held on October 9-10, 2000 at CMU-CEC. Only five copies of this manual were distributed to selected participants of the said training. Other SANREM staff members were also given copies, including the Vietnam partners, to solicit their comments and suggestions. This manual is expected to assist in other trainings for communities that CMU-BIDANI will conduct in the

future. Testing the applicability will be done through actual conduct of PLLA in six target communities in Bukidnon. Finalization of this manual will be done as soon as comments and suggestions from different sectors are solicited.

Results and Outcomes

The target set of participants on PLLA to be trained has been met. The pool of trainers for natural resource management includes CMU faculty and staff (20), members of Lantapan and Valencia barangays (5), Provincial Planning and Development Office of Bukidnon (1) and Lantapan Local Government Unit (1). CMU through BIDANI has long been involved in training of communities in integrating nutrition in barangay development planning as part of their mandate. The CMU staffs are expected to be effective trainers on how natural resource management can be integrated into nutrition plans and in barangay development planning, in general.

Another result of the training-workshop is the formulation of action plan that outlines the following activities: PLLA training for the members of the target communities in Lantapan and Valencia in the Province of Bukidnon, actual conduct of the PLLA and action plans. Action plans serve as a guide of the team in attaining objectives of the work plan. The team is presently doing the following activities: reconnaissance of other target communities, actual conduct of the PLLA in other target communities, preparation of the report of the training conducted, and preparation for the conduct of the Training of Communities on PLLA. Another output is the generation of some information from the field practicum as part of the Training of Trainers on PLLA of the target communities in Lantapan, Bukidnon.

Another significant result is the inclusion of natural resource management to CMU-BIDANI research project for possible funding by Australia Agency for International Development (AUSAID).

Publication or Presentations

See SEA 00-32

Appendix A. List of participants of the Training of Trainers on Participatory Landscape-Lifescape Appraisal held on October 9-10, 2000 at Central Mindanao University-Continuing Education Center, Musuan, Bukidnon.

NAME	POSITION/COLLEGE/ DEPARTMENT	TEL. NO. / E-MAIL
Central Mindanao University (CMU):		
Conrada P. Yeryer	Research Assistant	
Dr. Jose B. Arances	Faculty, College of Forestry	
Mr. Jupiter V. Casas	Coordinator, BIDANI	0917-905- 8633
Dr. Rebecca B. Cagmat	Associate Professor	
Ms. Helen E. Panganiban	Teaching Assistant I, BIDANI	
Ms. Chona B. Baluhan	BIDANI	
Ms. Jocelyn Salub	BIDANI	
Ms. Yolanda C. Tautho	Instructor III, College of Engineering	0917-454-0026
Ms. Lucy B. Ledres	Associate Professor, BIDANI	
Dr. James O. Lacandula	Faculty, BIDANI	0917-718-0302
Dr. Peter R. Orbase	Associate Professor, College of Veterinary Medicine	
Mr. Gideon B. Cabahug	Broadcast Program Producer Announcer II	
Dr. Luzviminda T. Simborio	Dean, College of Veterinary Medicine	0917-409-2494/ luzsimboril@usa.net
Ms. Jovita Ann Abellanosa	College of Arts and Sciences-IEC	0917-482-3378
Dr. Elsie P. Laurente	Professor, College of Education	
Mr. Reymlani P. Sullera	Training Specialist, BIDANI	0917-495-9855
Ms. Estela Y. Cequiña	Staff, BIDANI	
Mr. Oliver D. Abrenilla	Staff, BIDANI	0917-7180732/ ver_abrenilla@yahoo.com
Ms. Estrella Culang	Staff, BIDANI	
Ms. Erlinda O. Moralde	Research Assistant II, BIDANI	
Representatives from Barangays of Valencia, Bukidnon:		
Mr. Saturnino L. Campol	Barangay Councilor, Lurugan	
Ms. Vivian O. Gille	Barangay Secretary, Colonia	
Representatives from Barangays of Lantapan, Bukidnon:		
Mr. Danilo D. Longias	Barangay Councilor, Alanib	
Mr. Honorato M Bongbonga	Barangay Councilor, Kulasihan	
Mr. Jhonie B. Sumampong	Alanib	0912-3065976
Provincial Planning and Development Office of Bukidnon (PPDO)		
Mr. Limuel S. Sale	Planning Officer II	088-813-2169
Local Government Unit of Valencia, Bukidnon:		
Mr. Bernaldo L. Obuta, Sr.	Zoning Inspector II	088-222-2453

SEA 00-44 Technical and Institutional Innovations to Evolve Agroforestry Systems for Sustainable Agriculture and the Management of Protected Ecosystems in the Framework of a Watershed Model

Dr. Dennis P.Garrity
Principal Investigator, ICRAF

Dr. Samuel N. Koffa
Project Manager

Mr. Gliceto O. Dagondon
Co-Principal Investigator, Kitanglad Integrated NGO

Mr. Felix Mirasol
Co-Principal Investigator, IPAS

Introduction

Protected areas in many parts of the tropical developing world are rapidly disappearing as human needs increase with increased population. This means the loss of invaluable faunal and floral species to which these protected areas and nature reserves are the only habitat. The Kitanglad Nature Park (KNP) in Lantapan, a relatively small ecosystem of approximately 50,000 hectares, is surrounded by a human population that will continue to harvest wood and other products from the park if alternative sources for these resources are not found. The KNP is of the highest conservation value because of its high endemism of fauna and vascular flora (Amoroso *et al.* 1995, Heaney 1993).

Experience has shown that under the current situation in the watershed and the Kitanglad Nature Park, legal protection or government-imposed restrictions alone, are rarely sufficient to guarantee the continuing integrity of protected areas. New and credible systems are needed to bridge the gap between meeting the immediate needs of local people and the long-term objectives of protected areas systems (Colchester 1996, Hardley 1995). This work plan employs the principles and practices of buffer-zone agroforestry as an approach to conserving and protecting the Kitanglad Nature Park as well as sustaining the agricultural resource base of the Manupali watershed. The development of complex agroforestry systems in the buffer zones around protected areas is a technology option that may not only reduce the pressure on forest resources, but could also improve the management of protected areas (Michon 1991, Sayer 1991, van Orsdol 1987).

GUIDING HYPOTHESES

Two conditions are hypothesized as necessary for sustainable buffer zone management and biodiversity conservation of the Kitanglad Nature Park and other protected areas in the tropics:

> 1.0. **Community-endorsed, and supported enforcement of park boundaries**. This addresses institutional development issues, as well as this project's contribution to the implementation of the municipal natural resources development and management plan.

2.0. **Agricultural/agroforestry intensification within the buffer zone** to sustain and enhance sedentary farming and income growth, to be complemented by livelihood and off-farm employment generation in the local and national economy. This concerns research that induces appropriate technical change suited to the biophysical and socio-economic imperatives and realities of the buffer zone.

Objective 1

To broaden and deepen the knowledge base on the effective and cost-efficient technical innovations and farmer-driven landcare approaches for fostering, expanding and sustaining increased smallholder participation in the adoption of conservation farming technologies in upland watersheds.

Progress Towards Objective 1

Soil conservation information campaigns. Through slide shows, hundreds of farmers from Lantapan and nearby municipalities in Bukidnon, have learned of the simple but effective technologies available to them to control soil erosion. Forty-three slide shows sessions had been conducted and 2,776 farmers and other interested individuals had participated. This information effort aroused people's consciousness to the onslaught of soil erosion in the upper slopes of Manupali and other steeply-sloped lands.

Training on the establishment and management of natural vegetative strips. Central to enabling the participation of smallholders in and adoption of conservation farming practices across the landscape of the Manupali watershed is the process of capacity building. During the reporting period, 27 training sessions involving 500 farmers had been completed. Of the 500 farmer participants, 286 have established natural vegetative strips on their farms and hence are adopters of this technology.

Objective 1.1

Working with NGOs (local), the Local Government Unit and other work plans (HPI, BIDANI/CMU), expand and scale-up Landcare activities in Lantapan and other municipalities in Bukidnon

Progress Towards Objective 1.1

No report

Objective 1.2

Test the Framers' Field Schools (FFS) approach to fostering adoption of agroforestry technologies that are germane to soil erosion control and protected areas management

Progress Towards Objective 1.2

No report

Objective 1.3

Set up a data collection system to monitor the activities of new adopters of agroforestry technologies that the Landcare Approach promotes, and to examine adopters' perception of benefits and constraints to adoption

Progress Towards Objective 1.3

No report

Objective 2

To build and nurture an enabling environment for the establishment, development and management of smallholder tree-based production systems as viable enterprises and a vehicle for reforestation of deforested upper watersheds and similar landscapes.

Progress Towards Objective 2

Diversification of species on-farm. Measurement of plant performance and maintenance of the second phase of species trials continued. In this phase, eight timber tree species were added to the evaluation trials, diversify the on-farm species base. Farmers need to plant different types of trees on their farms because of market uncertainties and the vagaries of the biophysical environment in which trees are normally grown. Species diversification under farmer conditions is also critical for tree-farming success because different farmers have different needs and preferences, which can not be satisfied or somehow meant by a limited number of tree species.

Strengthening farmer-managed tree production systems. Working with farmers in nurseries established by Landcare chapters and sub-chapters, 829 farmers underwent intensive seedling production work, as well as the establishment and management of trees that are planted on their farms. These farmers have planted and are maintaining (weeding brushing, etc) 40,220 seedlings of a variety of timber and fruit tree species on their farms. The Landcare approach, as defined in past semi-annual reports, is central to our research and extension approaches and methodologies for the expansion and enhancement of adoption of agroforestry technologies to which trees are pivotal.

Strengthening grassroots institutions. Our work with the Agroforestry Tree Seed Association of Lantapan (ATSAL) continues. As an element of this work, ICRAF has invited two ATSAL members to attend the 5-6 December 2000 Tree Domestication Workshop to be held in Los Baños, Philippines. Their participation (travel, accommodation and other costs) is fully supported by ICRAF. These farmers, the only tree farmers invited to speak at this workshop, will relate their experiences in tree seed collection and management. Prominent on their agenda is the discussion of the significance of tree seed collection and marketing and the conservation and economic benefits thereof. They are also expected to touch on pertinent management constraints of tree farming and the want of support services.

Tree seed is one form of germplasm. Germplasm is undoubtedly the primordial input into agroforestry systems and component technologies. The farmers' attendance is strongly believed to broaden the horizon of their learning experience, as much as it is hoped to enable the rest of the other workshop participants to appreciate farmers needs and aspirations in the management of trees

on their farms. The other workshop participants are scientists, researchers and research managers involved in biodiversity conservation and the science of domesticating indigenous species within the context of agroforestry systems and component technologies.

Objective 2.1

Develop better collection / production and management methods and techniques for quality agroforestry tree germplasm.

Progress Towards Objective 2.1

No report

Objective 2.2

Facilitate better timber harvesting , processing and utilization to add value and broaden its use.

Progress Towards Objective 2.2

No report

Objective 2.3

Conduct a rather detailed follow-up marketing case study for trees and tree products from smallholder-managed production systems

Progress Towards Objective 2.3

No report

Objective 2.4

Develop methods and techniques for the appropriate and better propagation and husbandry of promising indigenous tree species (non-timber forest-based products) for the local beverage (tuba, etc.) (a local drink from the coconut tree), weaving (mats, hats, etc.), food (fruit , nut) and pharmaceutical establishments on the village level to generate income and employment

Progress Towards Objective 2.4

No report

Objective 2.5

Collect data on growth and site factors and to maintain (weed, fertilize) newly established species trials

Progress Towards Objective 2.5

No report

Results and Outcomes

No report

Impacts

A recognized transformation of Manupali's landscape is gradually taking shape before our eyes. For example, before this project farmers within the confines of the watershed were almost exclusively harvesting or collecting wood and other resources from the national park (a protected forest) and other tree assemblages. Now, many farmers are cultivating their own trees. Few of the farmers who were engaged in tree farming before the project knew only how to propagate and cultivate *Gmelina arborea* and *Eucalyptus robusta. Now* a diversity of both timber and fruit trees are propagated and planted on their farms. This transformation supports the ideals of biodiversity conservation and the protection of Manupali.

Publications

Koffa, S.N. 2000. Translating challenges into opportunities for an ICRAF-DAR Landcare-driven partnership. Unpublished Manuscript

Work continues on various aspects of completing the following papers for submission to refereed and related journals:

Koffa, S.N. and Garrity, D.P. 2000. Grassroots empowerment and sustainability in the management of critical natural resources: the agroforestry tree seed association of Lantapan. SANREM-CRSP, University of Georgia [Final draft is being developed]

_____. 2000. A preliminary analysis of farmer preferences and marketing channels for trees and tree products in a southern Philippines community. *Agroforestry Systems* [In Press]

_____. 2000. Growth response of six tropical tree species to fertilizer and fertilization methods on sites of varying altitudinal gradients in Lantapan [Final draft is being developed].

_____.Nguigi, M.R. 2000. Comparative growth performance of eight tropical tree species on sites of varying altitudinal gradients in Lantapan [In Progress]

References

Amoroso,V.B. Acma, F.M. and Pava, H.P. 1995. Diversity, status and ecology of Pteridophytes in three forests in Mindanao. Paper presented during the Pteridophytes Symposium at the National Botanic Gardens. Kew, UK.

Colchester, M. 1996. Beyond "participation," indigenous people, biological diversity conservation and protected area management. *Unasylva* 47:33-39.

Hardley, M. 1995. Linking conservation, development and research in protected area management in Africa. *Unasylva* 46:26-34.

Heaney, L. 1993. Survey of vertebrate diversity in Mt. Kitanglad Nature Park. Unpublished Manuscript. Philippine National Museum, Manila.

Section III: Andes Regional Project

Robert E. Rhoades, University of Georgia
Program Manager

Introduction

During the past decade, the mountain and hillside ecosystems of the world have become a primary concern of national and international agencies (both governmental and non-governmental) dealing with sustainable agriculture and natural resource management. As a result of the Earth Summit adoption of Chapter 13 in Agenda 21 (Managing Fragile Ecosystems: Sustainable Mountain Development), an increasing number of projects and initiatives are oriented towards global mountain environments. The Global Mountain Initiative of the CGIAR, the Mountain Agenda Inter-Agency initiative led by FAO, and the declaration by the United Nations that the year 2002 will be the "Year of the Mountain" are a few examples of worldwide interest.

An emphasis on mountains is not without strong justification. Mountains and uplands constitute about one-fifth of the earth's terrestrial surface and are directly or indirectly relevant for well over half of the world's population (Ives 1992).

Although it is estimated that about 10 percent of the world population live in high mountains, a much larger population, which constitutes the bulk of humanity, reside in hilly piedmont regions and adjacent lowlands. This wider population benefits from the supply of mountain food, water, wood and minerals. The mountains are the "water towers" of planet earth -- indeed without them the Amazon Basin or the Gangetic Plains would transform into deserts. Their massive watersheds are crucial for providing irrigation water, hydroelectric power, and nutrients to populations downstream. Mountains also harbor most of the wild species and landraces of our major food crops.

The uplands are valued for tourism, recreation, and provide spiritual and aesthetic value to millions of people from diverse cultures. Along with the Hindu Kush Himalayan Region of Asia, the Central Andes of South America can claim the largest, most diverse, and — by most measures — the most economically and ecologically important mountain setting in the world (Rhoades 1997). Traversing this stunning 2000-kilometer long landscape of glacial peaks, gorges, forests, and human settlements are more than one hundred life-giving, deep-gorge river watersheds that feed into the great Amazon Basin to the east and the coastal littorals and lowlands of the western pacific. No other landscape on earth is characterized by so much biotic and geomorphological diversity in such short distances as the Andean "highland-lowland" interaction system.

As in all mountain ranges, the Andes are characterized by a "three dimensionality" of latitudinality, horizontality, and altitudinality that has the effect of producing contrasting environments at different elevations. Superimposed on this altitudinal zonation are natural variations and human adaptive strategies that derive from aspect, slope, and topography of the region. Despite economic progress in some urban areas, the highest malnutrition and poverty rates in the world are found in the rural Andes. Out of 178 eco-regions in Latin America identified by the World Wildlife Fund and the World Bank, 137 are listed as "critical," "endangered" or "vulnerable."

Objective

The objective of the Andean project is to advance sustainable natural resource management in fragile mountain landscapes through the creation, testing, and dissemination of participatory multi-objective, multi-scale, and multiple stakeholder decision making methods and tools that will help highland communities make desirable, long-term environmental decisions.

Progress Toward Objective

To accomplish this principle, we carry out scientific research in key baseline mountain sites (Cotacachi and Nanegal, Ecuador and Mantaro Valley, Peru) extrapolating the principles and lessons learned to similar upland areas, and building diverse local stakeholder capacity to utilize the results to create and manage self-determined sustainable systems.

Progress Toward Five-Year Indicators

1. *Scientific and Indigenous Multimedia Decision Support Platforms.*
   - Land Use Change model, maps, and scenario analysis over 60 year period (1966-2014) completed for Nanegal;
   - Modelers' "change rules" determined for Nanegal and tested against local interpretations (15 informants); analysis shows that scientific interpretation and local inhabitants emphasize different processes;
   - Photo-simulated visions of Nanegal landscape developed with Adobe Photoshop (180 year period);
   - "Future Desired Conditions" method developed and tested in Broad River Watershed, Georgia, as input to new land use zoning plan;
   - Advocacy coalition research linked to future visioning focused specifically on water, mining and the Ecological Reserve in Cotacachi advanced; Land use change research begun in Quilcas, Peru;
   - 17 images of the landscape analyzed in Nanegal and Cotacachi;
   - In Nanegal and Cotacachi, 48 hand-drawn maps analyzed for environmental salience by class, gender, and ethnicity; 47 free-style maps were elicited, geo-referenced, and analyzed;
   - Two working papers (Comparative Images of the Landscape and Future Visioning Methodology) completed and circulated.

2. *Case Studies of Landscape Level Decision Support Tools and Experiences*
   - Memory banking protocol translated into Spanish and distributed in Ecuador.
   - Major synthesis book of all Nanegal SANREM research to date published in Spanish ("Tendiendo Puentes entre Paisajes Humanos y Ecologicos" by Abya Yala Press: Quito. 416 pages). English version to be available in January 2001 by Kendall/Hunt Publishers, Iowa;
   - Book finalized for publication on "Operationalizing Integrated Conservation and Development Strategies: Lessons Learned Linking People, Projects, and Policies in Tropical America", a joint conference proceedings with SUBIR-CARE, USAID-Ecuador, and SANREM-Andes (to be published in early 2001 by Abya Yala Press, Ecuador);
   - As a part of the Comparative Ethnoecology of the Cotacachi Cayapas Project (Phase I funding), a book edited by Joseph Henry Vogel was published ("El Cartel de la Biodiversidad: Transformación de los conocimientos tradicionales en secretos comerciales") in 2000 jointly with EcoCiencia, USAID, and CARE;

3. *Land Use Change/Hydrology Model.*
   - Three models advanced in Ecuador (Future Visioning LUC model for Nanegal, EPIC model in AND 08, and USLE model in AND 07 as a Master's thesis at Catholic Quito);
   - Multi-temporal data base (maps, images, socioeconomic data, etc.) developed at various scales for use in the models;
   - Two meteorological stations installed in Cotacachi and local personnel trained in reading and maintenance;
   - Land Use Change model for Nanegal tested against local visions of same processes (Working Paper AND 2000-1 written);
   - Community boundaries determined for relevant communities (with GPS) in Cotacachi;
   - Socioeconomic database, especially for water modeling advanced.

4. *On-site Databases Established.*
   - Combined data-visual database and training nodes at UGA, Catholic-Quito, and UNORCAC-Cotacachi full established (designated physical space in each);
   - Biophysical and Socioeconomic data integrated through GIS system and priorities set by local community. Includes GIS-based soil, topographic, political, cartographic maps linked to government data. Longitudinal information (40 year period available). Database created and pre-tested in Fox Pro that will link UNORCAC census (facilitated by SANREM) information at the community level with the digital maps;
   - Culturally relevant information related to ancestral knowledge collected in the memory banking project and stored in Cotacachi node (includes myths, legends, stories along with biodiversity knowledge from elders; 15 school children funded to gather seeds and knowledge). This ethnoecology work duplicated on a Cantonal scale by Mayor's office;
   - Soils/landuse (AND08) and water (AND 05) data collected systematically (in a first order watershed for landuse and in 43 communities for water) and entered into the UNORCAC computer as well as duplicated at Catholic-Quito and in UGA. All are linked through a database manager at UGA.

5. *Interactive Searchable Database Warehousing SANREM-Andes Data.*
   - The SANREM-Andes bilingual website at the University of Georgia has been updated and vastly improved over the past 6 months (http://julian.dac.uga.edu/~sanrem/). In addition to basic information, one can click on to the 2 primary sites and 3 secondary sites (transect diagram shown) and search all available information (reports, publications, maps, images, raw data). All of this information is backed up either on CD, diskette, or in hard copy in Georgia as well as partially in Quito and Cotacachi.

6. *Case Study on Ethno-Geomatics and Ethnoecological Methods.*
   - Working Document AND 2000-3 entitled "Comparative Images of the Landscape" (Rhoades, Jones, and Cohen) released. Contains comparative analysis of stakeholders interpretations of 17 images of the Nanegal or Cotacachi landscape. Research report (51 pp) on "Oglethorpe County: Desired Future Conditions" detailing a new methodology of understanding local people values of the future as well as an empirical study of one county in the Georgia Piedmont.

7. *NGO and Scientific Personnel Trained in Future Visioning Methodology.*
   - GIS training: six Ecuadorans trained in ArcView (40 hours); one Catholic U. professor sent to CIAT for GIS and modeling training; 1 Catholic U. professor to be trained in ArcView in Jan. 2001; 8 US PhD students trained in "future visioning" through graduate seminar;
   - Two Catholic U. student funded for thesis research (Aurelio Vicuña and Fedra Ipiales); three thesis students from Central University (Quito) in biodiversity project (Marco Tipan, Karla Vasquez, Lincoln Nolivos); three students trained from Catholic U. (Ibarra) in the "ancentral futures farm" project;
   - Three UNORCAC field personnel trained in use of computers (processing, scanning, etc.) at SANREM Jambi Mascáric SANREM office. In addition to maintaining files, they enter data from ethnoecology, water, and soils project.

8. *Community Training in Water Quality/Quantity.*
   - During July and October, 2000, basic training workshops were offered to 16 community volunteers. One UNORCAC technician and one student from the Catholic University-Ibarra trained in water techniques. They were further trained to enter into datasheets on the SANREM computer at Jambi Mascáric and monthly files sent to Auburn University.

9. *Training Manual on DSS tools for Mountains.*
   - Collaboration continues with International Center for Integrated Mountain Development (ICIMOD) to develop an ecoregional approach adapted to mountainous regions. $500,000 grant received from Dutch to this end. The Andes Program Manager will be in Katmandu during January 2001 to continue this effort.

10. *Case Study of Future Visions Scenarios Method.*
   - Case Study report "Oglethorpe County, Georgia: A Study of Desired Future Conditions" prepared and distributed to local press, county planning commission, and Board of Commissioners;
   - SANREM-Andes working document (AND 2000-1) entitled "The Sustainable Mountain Futures Methodology: An Ongoing Study of Visioning in Nanegal Parish" was completed (Rhoades, Stewart, Nazarea, and Piniero).

11. *Memory Banking Methodology.*
   - Memory banking methodology (AND 02) continued to be widely adopted in Ecuador and internationally. The method was the basis of the 1999 Praxis Award in Anthropology (V. Nazarea) and has been institutionalized through Jambi Mascáric in Cotacachi (Magdalena Fueres) and in the Canton Cotacachi (Mayor Auki Tituana). Over 50 indigenous myths and legends about the environment collected and prepared for a children's storybook collection as a method of ethnically significant environmental learning. Fifteen school children (funded partially by SANREM) to collect landrace seeds and elders's stories. Materials grown in *in situ* gardens. Memory banking approach adopted by Native Seed Search in Arizona and recently became the basis of a new International Potato Center project on peri-urban gardens.

12. *Bilingual Web site (English/Spanish)*
   - The Web site is vastly improved with all recent data online and accessible (see indicator 5 above) (http://julian.dac.uga.edu/~sanrem)

13. *UN Year of the Mountain*

- SANREM-Andes is active in planning for the 2002 UN Year of the Mountain on several fronts. R. Rhoades is the North American Board member to the Mountain Forum, which is a party to the interagency planning for the upcoming event. In addition, plans are being developed to host in the Cotacachi-Otovalo area special meetings on the Year of the Mountains for mountain communities (co-hosted by Canton Cotacachi, UNORCAC, and SANREM-Andes).

AND 00-01. Andes Coordination and Networking

Robert Rhoades, University of Georgia
Principal Investigator

Introduction

The purpose of the activity is coordination of research, communication, budgeting, and networking of the SANREM-Andean project and provisioning outreach activities to the Andean region and SANREM's global program

Objective 1

Provide timely administration and coordination support to Principal Investigators of Andean projects; link with Management Entity and other regional projects.

Progress Toward Objective 1

The Andean program has institutionalized a feedback and reporting system that regularly facilitates communication between partners in both North and South America. In the US, the Andean Principal Investigators (Rhoades, Nazarea, Duncan, J. and C. Flora, B. Miller) and team researchers meet approximately every six months to review program progress and discuss problems. These meetings are often, but not always, held in conjunction with the regularly called SANREM meetings such as Annual Meeting or the EEP evaluation. During October 26-29, 2000, in conjunction with a joint symposium (SUBIR-Care and SANREM-Andes), an Andean meeting was held at the University of Georgia with investigators from Auburn, Iowa State, and University of Georgia attending. In addition, two indigenous leaders (Cornelio Orbe and Rafael Guitarra) from Cotacachi were in attendance (see funding projects AND 09 and AND 02). In Ecuador, a "mesa de concertacion" (table of coordination) was held monthly either in the field site (Cotacachi) or in Quito (Catholic University) where all Ecuador researchers could coordinate their activities. In June 2000, Dr. Hector Ballesteros who had been field coordination for SANREM in Phase I and temporarily hired in Phase II was replaced by Eric Jones. The Institute for Behavioral Research (IBR) at the University of Georgia continues to provide timely financial accounting and to date no problems with the flow of funds have been identified. The Andean PM has responded to a number of requests from the Management Entity for materials and support.

Objective 2

Manage an organized central database and facilitate communication and information exchange among Andean SANREM researchers as well as among other partners and collaborators in the Andean region.

Progress Toward Objective 2

In addition to the communication exchange system described above, the PM oversees information and training nodes in three locations: Sustainable Human Ecosystems Laboratory at the University of Georgia; SANREM Office at Catholic University-Quito; and SANREM office and Scaling up Node in UNORCAC, Cotacachi. While the information in each of these locations varies, as much of the data as possible is duplicated and stored in each location for use by the relevant partners. All

data available for SANREM Phase I and II are stored as hard copy (in filing cabinets and map cases), as computer files (UNIX networked system at Georgia, ArcView files for GIS at UGA and Catholic) and in diskette/CD files where backups are needed. A master list is available for all materials. For example, if one wants to locate all maps for Nanegal, the master copy in the map file is to be consulted. The same for all published and gray literature materials in the filing cabinet under "Nanegal". A history of the Andean program (annual reports, trip reports, communications) is filed in individual folders and available to anyone who is interested. All ME and other communications to the Andean Program are also systematically filed.

Both the Andean Program Manager (Robert E. Rhoades) and the Site Coordinator (Eric Jones) have developed relevant email lists to keep all researchers advised of developments in the project. Connections outside of SANREM have been handled by the PM although Jan and Cornelia Flora (ISU) have played a significant role in "scaling up" the Andean activities through joint activities in Peru. A SANREM-Andes directory containing names, institutions, phone/fax/email, and mailing addresses of all SANREM researchers and affiliated parties was prepared by Mika Cohen and bound for distribution. Additional computers (laptops and desktops) have been made available to Ecuadorian partners to facilitate the research (desktop in Quito; laptops in Cotacachi).

One of the strong points of the Andean Program is that we have had personnel continuity from Phase I to Phase II so that very little raw or analyzed data have been lost or undelivered to the central processing nodes (either in Ecuador or USA). David J. Stewart, Ecolab Manager, has placed organized information so that it is available on the Andean website (http://julian.dac.uga.edu/~sanrem/). Periodically, Dr. Stewart requests that SANREM Andean participants provide their most recent research reports (including trip reports) to be integrated into the dataset. Presently, all GIS information (layers for both Nanegal and Cotacachi from national to community level) are updated as of November 1, 2000. Landuse and water data from the water and soils projects (05 and 08) have been integrated. An updated SANREM-Andean publication list is found on the website as well.

Objective 3

Link the SANREM Andean project with the global interagency initiative for Chapter 13, Agenda 21 (Sustainable Mountain Development).

Progress Toward Objective 3

The most significant product since June 1 is the election of Robert E. Rhoades (Andean Program Manager) as the North American Board Member to the Mountain Forum. As one of six international Board members, plus representatives of the founding organizations (CIP, ICIMOD, and The Mountain Institute, Rhoades will be able to input research and ideas from SANREM-Andes into the global initiatives on mountains. This includes planning for the UN International Year of the Mountain to be held in 2002. Auki Tituana, the mayor of Cotacachi Canton and one of our principal collaborators, participated in the World Mountain Forum held in France during August. At this meeting, it was proposed that Ecuador host a World Mountain Forum meeting during 2002. SANREM has plans to collaborate with the major to hold a special parallel meeting for mountain communities in Cotacachi and Otovalo during the world meetings. Dr. Rhoades has also been appointed to the Editorial Board of the journal *Mountain Research and Development.*

Results and Outcomes

This is a coordination activity, which achieves smooth operation of the SANREM-Andes project and the facilitation of communication between partners. These objectives can be declared accomplished with few problems over the past 6 months. Additionally, the mid-phase EEP evaluation was completed.

Impacts

Raised awareness of mountain issues globally through active participation in the UN Interagency links (Mountain Forum, World Mountain Forum, Global Mountain Initiative, and Year of the Mountain) on Chapter 13, Agenda 21.

Publications

Coordination project; see publications listed under AND 07 and AND 09.

AND 00-02. Ethnoecology: Stakeholder Perceptions and Use of Andean Landscape Maps and Models

Virginia Nazarea, University of Georgia
Principal Investigator

Robert E. Rhoades
Co-Principal Investigator

Catholic University
UNORCAC, Jambi Mascaric
Ulpiano dela Torre High School
Palmito Pamba Elementary School
EcoCiencia
Cooperators

Introduction

A primary SANREM-Andes Phase II objective is to ground-truth decision-support (DSS) tools that incorporate and integrate information from previous research. This project aims to complement biological, economic, and institutional research by focusing on their interrelationships with significant sociocultural variables extant in the landscape. Any DSS that purports to be relevant to stakeholder groups must take into account diverse cultural, cognitive, behavioral, and ethno-demographic aspects of human behavior. Many modelers assume decision-makers are motivated by the desire to optimize performance and therefore will readily incorporate biological research results and price information into their decision-making. It is often assumed further that failure to incorporate such rational information ("what if" exercises) is an exogenous barrier or remediable market imperfection (Rayner and Malone 1998).

Ethnoecological research in SANREM Phase I, however, has shown that information does not flow smoothly among ethnic groups, communities, government institutions, and scientific development projects. The use of information and DSS in human groups should build upon cultural meaning and identity not captured by simple application of the rational choice model since scientists' assumptions and perceptions are not the same as those of local farmers or those of government officials (Nazarea-Sandoval 1995). Therefore, a strong sociocultural component would enhance success of the project by identifying opportunities to integrate local perspectives into real-world decision processes rather than trying to make decision processes conform to any rational choice model.

Any planning approach must recognize that there are different groups of people or "actors" with different roles and functions involved in watershed resource management. It is naive to assume the prevalence of a single decision-maker faced by limited alternatives that can be informed by unambiguous quantitative criteria. Indigenous or local knowledge is extremely important and should be factored in. Learning how to understand a negotiated watershed process, and developing research and training publications to extend the experience, is the essence of this project.

This proposed project continues Phase I Philippine ethnoecological studies related to different stakeholders' (stratified by gender, ethnicity, and age) perception of and behavior toward the landscape (Nazarea *et al.* 1998, Nazarea 1998). By addressing such sustainability issues as intergenerational equity and cultural indicators of sustainability, this research addresses critical gaps in knowledge. It will seek to illuminate the connection between objective, operational factors and representations in scientific models and maps — specially the proposed watershed model — and the equally important but often neglected representations and choices of local people. While policymakers need to be informed about alternatives based on the new, scientific maps and models, it is still the local population who will make, and live with, resource management decisions and practices. Local people's models of the landscape are critical because they are also models for operating within the landscape, and as such should be central to any decision support tool. Therefore, it will be worthwhile for "scaling up" to compare various representations or landscape images by scale, cost, use, access, and understandability at two basic levels of disaggregation — the local versus the external (e.g. local maps and GIS maps) and along different dimensions of the local (e.g. by age, gender, class, and ethnicity).

Objective 1

To map local realities and stakeholder perceptions as input to "future scenarios" planning exercise.

Progress Toward Objective 1

Community-based sustainable land use planning starts from an appreciation of how different landscape users conceptualize and engage space, time and space-time relationships. Over the past six months, ethnoecological research in Ecuador continued analysis of different groups perception of their environment (disaggregated by gender, age, ethnicity, and class). The forty-eight cognitive maps of people's environments (24 each from Nanegal and Cotacachi) previously collected were systematically analyzed using SPSS in the Ethnoecology/Biodiversity Lab (UGA). Regarding relative salience, the following findings are reported:

Representation. Fifty-three percent of informants used abstract representation whereas the remainder (47 percent) used pictorial representation in their cognitive maps. This is contrary to our expectation that a greater proportion would use pictorial representation instead of the abstract representation that formally trained cartographers would use. The only significant determinant was gender. Males tended to represent in the abstract at approximately a 2 to 1 ratio while 63 percent of females preferred pictorial representation.

Focus. A minority of informants (6 percent) concentrated on their community while the rest were approximately equally divided between those who focused on the center of the parish (49 percent) and those who mapped the whole canton (45 percent). Gender appears to be significant here. Males tend to draw the whole canton (9 of 14 cases) while females tend to focus on the smaller parish scale (16 to 9 cases). The effect of occupation was not significant but it is worth noting that subsistence farmers tended to focus on the finer scale (community or parish) while non-farm business operators tend to cover the whole canton.

Perspective. Slightly more informants (29 percent) mapped from the horizon (looking out or what geographers call a "perspective view") and slightly less (26 percent) mapped from a bird's eye view (top-down, flat view) as a cartographer would. A few informants (4 percent), particularly from

Cotacachi, mapped in a hierarchical, almost mystical manner reflecting the Andean cosmovision. The rest (41 percent) did not utilize any apparent spatial perspective or mixed the different perspectives.

Gender is significant in analysis of perspective. A majority of both males and females frequently mapped using a mixed, non-spatial perspective. However, of the remaining, males tended to map with a cartographic perspective (4 of 9 cases). Females tend to map from the horizon looking out (11 of 4 cases).

Detail and Emphasis. Four percent of our informants highlighted where they reside or their own community while 20 percent stressed familiar routes (e.g., to the farm or work), 33 percent emphasized important landmarks, and the remainder (43 percent) did not emphasize any one location or direction over others.

Gender is again significant but not as strongly as with representation, focus, and perspective. Among the informants who emphasized either familiar routes or important landmarks, males tended slightly to emphasize familiar routes while females were three times more likely to emphasize important landmarks.

Dominant Features. Dominant natural or human landscape features or structures most highly represented (20 percent) were community-meeting places such as the church, the park, the basketball court, and the soccer field. Roads (18 percent) came second and this is significant because "road" was not a "lumped" category. The third most highly represented places (16 percent) with more or less equal prominence were natural resources, roads, and communities. Finally, 12 percent represented, again with more or less equal prominence, a combination of roads and communities. Based on these results, we can tentatively conclude that the degree of relative salience ranking is community meeting places>roads>natural resources. On the second tier of importance, three categories came up with equal frequency (8 percent): the park, combination of rivers and forest, and combination of channels of movement and sources of livelihood.

Ethnicity is significant here as *mestizos* emphasized community-meeting places, indigenous people paid more attention to natural resource features, roads, and community-meeting places (two-sided significance P=0.058). A noteworthy, though not significant, effect of occupation is that subsistence farmers emphasize roads whereas day laborers emphasize community-meeting places.

In conclusion, natural resource planners must be aware that local people do not see their environment through the same eyes as outsiders. They map their environment differently from the way professional cartographers represent the landscape. Instead of a top-down, flat view of their community (e.g., a cartographic map), they presented a "perspective" view as if they were looking out over the landscape. They used pictographic representation instead of abstract views and they highlighted areas meaningful to them. Roads, community-meeting places, and natural resources were highly salient. Gender, more than ethnicity, class, or age apparently shapes how the environment is perceived. This work continues in tandem with the comparative visioning effort in AND 07 (see Andean working document 2000-4 by Rhoades, Jones, and Cohen).

Objective 2

To "groundtruth" scientific models, rules, and predictions regarding land use change.

Progress Toward Objective 2

As the first attempt to develop the SANREM Andes "future visioning methodology, " land use change scenarios and "change rules" generated in AND 07 for the Nanegal area (specifically Palmitopamba) through a robust modeling exercise were tested against local perceptions during June and August 2000. Local perceptions are critical in any negotiated watershed visioning because these provide the action models for on-the-ground resource managers who ultimately make the decisions and live with them most intimately on a day-to-day basis.

The ethnoecological research involved a two-step research and data gathering process:

- Using ethnoecological methods, generate local people's envisioning by presenting the scientists' scenarios and rules in culturally acceptable ways (story or folk tale completion, photo-interpretation, informal interviews) in order to elicit the local understanding of natural. resource change. In the Palmitopamba test site, local folk tales about legendary figures were presented in terms of story completion that took the respondent 30 years into the past and encouraged him or her to envision changes in the forest, pasture, the cropland, the chaparral, and the people's priorities in land use change. The Spanish version of these stories were pre-tested on two respondents (male and female) and later given to 15 individuals (equally divided between male and female). The stories were recorded and later analyzed according to dominant themes, trends, and patterns emphasized by the local people.

- The next step is to compare scientists' vision (predictive statement, maps, and rules) with the local visions (cultural perceptions) to arrive at an understanding of differences in assumptions, values, beliefs, and time and space horizons. Although the data is still being analyzed and is quite rich in detail, we can conclude that modelers tend to concentrate on factors that are easier to quantify (such as distance from road) whereas local people tend to concentrate on factors that are important to them, e.g. community and work. The connection between people and land transformation is implicit in the scientific model but explicit in indigenous frameworks. Scientists tend to compartmentalize while local people do this less often. The story completion tests revealed that local people have their own concept and time frame for ecological succession with chaparral occupying a special nexus. Roads were prominent in the local framework, as these were the in the modeler's derived rules, but distance appeared to have more of a confounding rather than a direct role in land use conversion from the local point of view. Clearly, the focus of local people is on community progress (measured in loss of forest) whereas the scientific emphasis is on loss of forest (obviously in a negative sense) due to developments such as road building.

This research has been written up in SANREM Andes Working Document 2000-1, The Sustainable Mountain Futures Methodology: An Ongoing Study of Visioning in Nanegal Parish, Ecuador (R.Rhoades, D. Stewart, V. Nazarea, and M. Piniero).

While Palmitopamba is the initial test site for the future visioning research, it is expected that Cotacachi will be the more fully developed research site for this effort. Ethnoecological research on using local folktales to capture people's interpretation of the environment is more advanced in Cotacachi. Fifty local folk tales, myths, and legends have been taped, transcribed, and translated into Spanish and Quichua. These are available in hard copy draft and stored in the SANREM-Andes training node in Cotacachi and at the University of Georgia. In the coming months, three books will be published in Spanish and Quichua to transmit local knowledge about the environment and contribute to community efforts to strengthen cultural identity. The stories illustrate that the indigenous people of Cotacachi see their landscape as a living being with an intimate connection between people and natural features. Mountains and rivers are addressed as ancestors or deities and given human attributes.

Nazarea and Rhoades organized a major symposium on "Indigenous Self-Determination in Plant Genetic Resource Use and Conservation: Crafting New Approaches in Ecuador" at the International Congress of Ethnobiology (Athens, Ga., Oct. 23-26). In this symposium, Dr. Nazarea and Quichua colleague Mr. Rafael Guitarra presented results on Cotacachi folktale research in a paper entitled, "Traversing a Landscape of Memory." This paper will be published in the Congress proceedings. Environmental folktale research continues in Cotacachi through a systematic gathering of information in 44 communities. This work, in turn, will be a vital part of the "Farm of the Ancestral Futures" (AND 07), which will involve indigenous seed banking and ecotourism.

Objective 3

To put Decision Support Information to use by supporting local initiatives in biodiversity conservation emphasizing the role of local youth and of women.

Progress Toward Objective 3

In response to the priorities of both local people and the USAID-Ecuador office, the ethnoecological research's major thrust is to help buffer-zone communities recover and maintain their traditional varieties of food and medicinal crops. Using a method called "memory banking," the project links cultural knowledge with planting materials (especially seeds) and then looks for culturally acceptable ways to stimulate conservation of both. This past six months, 10 students (ages 9-12) in Nanegal, and 15 high school students (ages 13-15) and 15 young scholarship students or *becarios* (ages 6-10) in Cotacachi were trained to document the knowledge of their elders. Three *in situ* genebanks were established (Palmitopamba Elementary school, Ulpiano de la Torre High School, and Jamric Mascaric). Herbarium specimens were also preserved in the schools. Seed samples were collected and some were planted in school gardens while remaining portions were kept in Jambi Mascaric. A total of 32 seed specimens were collected and conserved. The Mayor of Cotacachi and his wife (a very influential woman in the Canton) have requested that the two UNORCAC facilitators working for SANREM provide training to the community at large on memory banking so that more local youth can participate. This later part is independently funded of SANREM. The International Potato Center has approached Dr. Nazarea to begin a research program of applying the award winning memory-banking approach to peri-urban gardens around the world.

Results and Outcomes

- 48 cognitive maps analyzed and results integrated into future visioning method
- Gender demonstrated to be most important shaping force in environmental perception

- Working Document completed on "future visioning methodology" (WD Andes Sanrem 2000-1)
- Landscape change rules from modeling of Nanegal landscape tested through story completion in Palmitopamba community and differences between local and scientific perspective highlighted
- International Symposium on genetic resource use and indigenous rights organized at International Congress on Ethnobiology; joint authored paper completed.
- Fifty environmentally relevant folktales revealing how Cotacachinos perceive their environment collected, analyzed, and stored for land use planning in Cotacachi
- Forty students trained in memory banking methodology; three *in situ* gardens established; memory banking method adopted by the International Potato Center (CIP) for peri-urban garden research
- Biodiversity and memory banking research integrated into "Farm of the Ancentral Futures," an ecotourism and conservation initiative by the UNORCAC communities for income enhancement, conservation, and cultural enrichment.
- PhD dissertation research on women, development, and biodiversity management completed; graduation expected in May, 2000 (Maricel Piniero, national of the Philippines)

Impacts

- Continued widespread regional and international adoption of the memory banking protocol. Mayor of Cotacachi using SANREM researchers to diffuse method in the canton; CIP using in its international program, and bilingual education collaborators in Cotacachi are promoting the folktale book products with the Ministry of Culture and Education;
- Future visioning methodology, including adaptation of the TATs method, also applied in Oglethorpe County, Broad Rivers Watershed, by a graduate seminar (see AND 07)
- Institutional strengthening of Jamric Mascaris, a subunit of UNORCAC, through collaboration with Magedelana Fueres (Vice President of UNORCAC) who is promoting a very strong gender component in her development efforts.

Publications

Nazarea, Virginia and Rafael Guitarra. 2000. Traversing a Landscape of Memory. Paper Presented in the Session on "Indigenous Self-Determination in Plant Genetic Resources and Conservation" at the 7th International Congress of Ethnobiology held in Athens, Ga. Oct. 23-26, 2000. Submitted to the Congress Proceedings.

Nazarea, V. and R. Rhoades. Co-Organizers of the Symposium on "Indigenous Self-Determination in Plant Genetic Resources and Conservation" at the 7th International Congress of Ethnobiology held in Athens, Ga. Oct. 23-26.

Piniero, Maricel. 2000. Youth-led Memory Banking: The Andean Experience. Paper presented in the Session on "Indigenous Self-Determination in Plant Genetic Resources and Conservation" at the 7th International Congress of Ethnobiology held in Athens, Ga. Oct. 23-26, 2000.

Rhoades, R., D. Stewart, V. Nazarea, and M. Piniero. 2000. The Sustainable Mountain Futures Methodology: An Ongoing Study of Visioning in Nanegal Parish, Ecuador.

AND 00-03. Integrated Institutional Management

Social Capital, Institutional Capacity, and Environmental Capital in the Andes

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Tony Bebbington, University of Colorado
Florencia Campana, Instituto de Estudios Ecuatorianos, Ecuador
Thomas Carroll, George Washington University
Edith Fernández Baca, Grupo Yanapai, Lima, Peru and Quilcas, Junín, Peru
Maria Fernández, Grupo Yanapai and National Agrarian University at La Molina, CIAT, Peru
Patricio Fuentes Pozo, Centro de Datos para la Conservación (CDC), Quito, Ecuador
Mary Garcia Bravo, Terra Nueva, Quito, Ecuador
Fernando Guerrero, Instituto de Estudios Ecuatorianos, Ecuador
Fernando Larrea, Fundación Heifer, Quito, Ecuador
Constance Neely, University of Georgia
María Schurrah, Grupo Yanapai, Peru and Quilcas, Junín, Peru
Partners

Introduction

Institutional decisions that impact sustainable agriculture and natural resource management are often at cross-purposes, leading to environmental degradation, increasing social inequality, and poverty. That situation is particularly true in indigenous areas of the Andes, including the selected sites of Cotacachi, Ecuador, and Quilcas, Peru. Decisions made by farmers and local institutions — the municipio, the indigenous community organization — are influenced by their desired future conditions for agricultural and natural resources and by decisions made by a variety of institutions — economic, governmental, and civil society — that enhance or limit local options. These institutions are not only local, but also municipal, provincial, national and international (levels). As coalitions are made across sectors and across "levels" where there are similar desired futures and similar causal models, more sustainable development will take place.

Analysis of the desired futures and mental causal models of actors in different sector at different levels — from local to international — and the evidence they use to make decisions regarding the degree to which the present situation will result in desired future states, local actors can form advocacy coalitions to influence decisions at the relevant institutional levels.

Objective 1

Identify and analyze Sustainable Natural Resource Management (SNRM) issues and decision points within local regional, national and international context.

Progress Toward Objective 1

Cotacachi, Ecuador

- Completion of five additional focus groups (two on water, two on the Ecological Reserve, and one on the mining issue)
- Conducted four additional individual institutional interviews (19 conducted previous year)
- Coded all individual interviews and most of focus group interviews using text analysis software (coding at Iowa State University)
- Initiated text analysis (at Iowa State University)
- Wrote and presented three papers for International Farming Systems Association meeting in Chile (Nov. 27 to 29, 2000)
- Completed drafts of two papers to be submitted for publication (from Phase I on Nanegal)
- In August 2000, Florencia Campana and Mary García from Ecuador presented preliminary results of the advocacy coalition work on issues around water quantity and quality in Cotacachi at a conference on the New Rurality at the Javeriana University in Bogota, Colombia

Peru

- Team consisting of NGO and of community members completed nine institutional interviews
- Interviews coded using text analysis software (coding at Iowa State University)
- María Fernández of Grupo Yanapai and National Agrarian University at La Molina visited Iowa State University for 6 weeks (end of August to early October) as a Visiting Scholar
- Submitted six proposals or pre-proposals to various funding agencies for continuation of work natural resource management work in Quilcas in highlands
- Developed four short pre-proposals for cooperation between Iowa State University in areas of sustainable agriculture, distance education, undergraduate exchanges, and farmer exchanges.
- Arranged for three Peruvians to attend SANREM External Evaluation Panel meeting in Ecuador and to exchange knowledge with Ecuadoran collaborators
- Discussed funding for National Agrarian University at La Molina -Iowa State University collaboration with Iowa State University Foundation personnel.
- Worked on four papers with Edith Fernández-Baca, Cornelia Flora and Jan Flora.
- Visit to Iowa State University of Ing. Hugo Nava, Vice-Rector for Academic Affairs, National Agrarian University at La Molina, Peru from October 30 to Nov. 1, 2000. Signed a Memorandum of Agreement with the College of Agriculture at Iowa State University, and more importantly carried on discussions of specifics of future collaboration. It was agreed to concentrate on collaboration around sustainable agriculture, since both universities are initiating graduate programs in this area next year. This could include, joint elaboration and teaching of courses that could lead to joint research projects (in the area of medicinal plants, for example) and to graduate student exchanges and perhaps later of exchanges of undergraduates and of farmers. The collaborative research could be done within the rubric of SANREM, particularly in Phase III. The next step will be exchange of curriculum vita followed in early 2001 by a visit by three or four faculty from Iowa State University to Peru.

Objective 2

Develop Decision Support tools for encouraging sustainable natural resource management (SNRM) that are appropriate for different institutional levels and different institutional actors.

Progress Toward Objective 2

The decision support tool development will be the main activities of Years 4 and 5, and is closely linked to the future scenario methodology. It will involve bringing together the various components of SANREM's Andean regional effort in order to conduct the future scenarios. In the meantime, we have progressed in developing ancillary decision support tools, to wit:

- We have refined a planning approach that incorporates analysis of diagnostic reports carried out by others. UNORCAC, the Union of Peasant Organizations of Cotacachi, was used as a pilot effort. Some half-dozen evaluation reports were synthesized with feedback offered to the organization. A publication in Spanish resulted from the effort and was distributed to UNORCAC and other organizations and agencies in the region. Informal feedback has been offered to UNORCAC leaders individually and we are waiting for an appropriate time to make a formal presentation of the results.
- A similar exercise was carried out with several Regional Rural Sustainability Partnerships, which are based on agroecological zones of Minnesota and funded by the Minnesota Legislature. It these cases, we took previous visioning efforts they had carried out, divided their proposed efforts into activities, outputs, and outcomes. We then step-by-step helped their steering committees move from outcomes (desired future states) to outputs (intermediate goals) and then to activities that needed to be undertaken to achieve, first, outputs, and ultimately, outcomes, encouraging them to modify outputs and activities that were inconsistent with the desired futures they had set for themselves.
- We have collaborated with Tom Carroll and Tony Bebbington on the measurement and analysis of social capital and organizational capacity for peasant secondary-level organizations (SLOs). Most of the analysis has been carried out on the four SLOs in Ecuador, but we have not yet written it up. Once that is done, a simplified instrument can be developed that can be used by SLOs as a self-diagnosis tool. (The initial instrument was very long and laborious; factor analysis and regression techniques should allow us to pare the variables down.)
- We have completed the bulk of the interviews for three decision nodes or issues in Ecuador — water quantity and quality, bio-reserve management, and the question of whether there will be large-scale mining in Intag (the semi-tropical part of Cotacachi canton). A protocol was devised to guide the open-ended interviews with each institutional leader defined through a snowball approach. In addition, five of the six focus groups have been completed — two for each issue. Each focus group includes representatives from organizations that are part of (or anticipated to be part of) an advocacy coalition. The protocols are tailored to the focus group and center on the interaction among the different organizations around the particular issue and on specifying more clearly the common desired futures of the group and the means to achieving those futures. These taped interviews have been "coded" using the NVIVO text analysis software program, which will allow us to bring together comments made by different interviewees on particular themes. This will allow us to validate the composition of different advocacy coalitions, but more importantly, to carry out the discourse analysis that will identify the different mental causal models (rules of evidence) used by different institutions. Documents of the organizations' public presentation of self have also been scanned and coded using NVIVO. We anticipate that a few additional interviews will need to be carried out to fill in gaps or to include a few additional actors after we have carried out the text analysis.
- In Peru, in the municipality of Quilcas, near Huancayo in the Mantaro Valley, the interview process is moving forward. Some dozen interviews have been carried out with the participation

of community members (at this point, members of the Colpar Annex or rural neighborhood, though persons from other parts of the municipality may be involved later on). Positive things have already happened as a result of implementing the advocacy coalition approach. Agreement has been reached on boundaries among neighborhoods and communities in the municipality, an important prerequisite for future collaborative efforts.

- The Andean Institutions group (in collaboration with the Centro de Datos para la Conservacíon, a SANREM institution from Phase I) has conducted analysis that links land use changes based on remote sensing data and a census of small holders to social capital and organizational capacity for the four communities near Nanegal, the site for SANREM's Phase I. Bob Rhoades is incorporating the community-level changes in land use into the pilot phase in which the future scenarios approach is being tested.
- The institutional group is examining advocacy coalitions related to water use in the highland part of Cotacachi. Control and use of water is closely linked to land use issues. We believe that the advocacy coalition approach will be very policy relevant in this area and should dovetail with Auburn's work on water monitoring and with the land use-erosion work being carried out by the University of Georgia. Year 4 is obviously the year to begin serious work on this integration among projects.

Objective 3

Disseminate SNRM Decision Support tools and publications to appropriate actors at appropriate levels throughout the Andes and beyond; train people to implement and evaluate efficiency and effectiveness of Decision Support (DS) tools.

Progress Toward Objective 3

Although to be incorporated into the Future Scenarios approach, we believe that the advocacy coalitions approach and the accompanying visioning techniques discussed in #1 and #2 above can also be a stand-alone tool. The different approaches being used in the Ecuador and Peruvian sites should be helpful in developing a flexible tool that can be adapted to different conditions of stakeholder involvement. In Ecuador, the collaborating NGOs are carrying out other development work in Cotacachi, with both the mayor's office and UNORCAC, the secondary-level indigenous peasant organization. What is learned from the advocacy coalition research will be conveyed to these and other local entities through the ties that have been developed through the other work carried out by Terranueva and the Institute for Ecuadorian Studies (IEE). In the Peruvian case, community leaders and members are playing an active role in defining which institutions to interview and in carrying out those interviews. We will be able to compare the efficacy of these two approaches.

We have not yet put much thought into how best to disseminate the advocacy coalition perspective as a decision support tool to extra-local state, civil society, and market entities. We have presented preliminary results of the Ecuador work to World Bank people in Washington (April 2000), so we believe there will be interest in the approach at the international level. We will clearly have suggestions for how the advocacy coalition approach might be used by the national state, but have not yet worked out how the approach might be formed into a tool that would be of utility and attractive for use at that level. The same may be said for the market sector at all levels.

Training in decision support analysis been has been initiated. The involvement of community people in the advocacy coalition research involves on-the-job training.

Results and Outcomes

Groups are now meeting around the three issues identified in Cotacachi, based on the analysis of the written materials and key informant interviews.

So far, the outcomes have been achieved through the research process itself. In both Peru and Ecuador, the interviews and particularly the focus groups have provided a space for reflection on issues that are contested. As a result, the different advocacy coalitions around management of the bio-reserve have asked our Ecuadorian colleagues to facilitate a focus group between the two coalitions, based on the analysis of the desired future conditions, mental causal models, and rules of evidence present in each coalition.

Our NGO colleagues are very clear about the projected outcomes at the institutional level, although still not clear about how we will contribute to the larger modeling project. Many of the institutional actors interviewed found the interview questions and the focus groups based on the advocacy coalitions identified through the focus groups increased their understanding of the importance of shared desired future conditions and mental causal models of how to get there.

We have used this methodology in work that we are doing with funding from the U.S. Environmental Protection Agency (EPA) and also with collaborations for IATP (Institute for Agriculture and Trade Policy) and the Land Stewardship Project in Minnesota in two different watersheds. It has been very helpful there for generating the basis for creating alternative future scenarios and policy analysis to help achieve the more desired future conditions.

Methodologies for issue identification and data gathering are clearly specified.
Desired future conditions of advocacy coalitions have been identified in Cotacachi, Quilcas, and the Chippewa Watershed in Minnesota.

Impacts

No report

Publications and Presentations

PRESENTATIONS

Campana, Florencia, Mary García Bravo y Edith Fernández-Baca. 2000. Capital Social y Coaliciones de persuasión: Un ejemplo de Ecuador" Seminario La nueva ruralidad en América Latina. Universidad Javeriana, Bogota, Colombia. August 23.
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Other Issues

We are now at the stage where all the projects in the Andean team are doing a lot of writing. We need to feel freer to exchange drafts. Perhaps posting them on the secured portion of the SANREM-Andes web page would be a good way of increasing that exchange. The project management techniques that we use require constant writing of papers to share results.

AND 00-05 Water Resources Management and Education in Andean Watersheds

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William Deutsch, Auburn University
Co-Principal Investigator

Sergio S. Ruiz-Córdova, Auburn University
Collaborator

Introduction

Many international research and development organizations have recently drawn attention to a global water crisis, with indications that a growing proportion of the world's population does not have ready access to ample quantities of good quality water. Water quality and quantity have emerged as key issues to local communities at virtually all SANREM sites based on Participatory Landscape Lifescape Appraisals (PLLAs).

At the SANREM research sites in Ecuador, much local concern about water relates to public health and safety of drinking water. Most public water supply systems depend upon conveyance of mountain spring water to community taps or homes, with only intermittent or no treatment available (chlorination, filtration, etc.). As a result, communities have reported the incidence of waterborne diseases, which are perceived to be increasing. As has been typical of public input from other SANREM sites, negative changes in water quality and quantity are generally perceived to have occurred in the last few decades. Such a rapid rate of change is cause for concern and sometimes alarm among many residents.

Many changes in water quality result from increasing population and the accompanying problems of waste disposal. Even the city of Quito has inadequate wastewater treatment, as the deplorable condition of the Guayllabama River attests. Beyond human and livestock waste contamination of water, other land use changes are affecting water quality. Use of pesticides on agricultural and horticultural crops, with leaching or runoff of these chemicals into public water supplies, is another concern of many local residents and researchers. Mining activities near Cotacachi threaten water quality and overall integrity of the watershed by altering natural stream flows and contaminating surface waters with metals and acid. Other industrial activities introduce toxins to the water supply.

A lack of understanding of the biophysical alterations of water in Ecuador is as much a problem as the contamination itself. Public awareness and participation in the process of environmental management is required for lasting, positive impact. Therefore, this activity strongly emphasizes the need for public education and involvement in water resource management to derive solutions to environmental problems and optimize the unique mix of livelihood activities, cultural norms and environmental quality.

Objective 1

Provide technical support to citizen monitoring groups for collection of data on water quantity and quality at Nanegal (phase out after this year) and Cotacachi sites.

Progress Towards Objective 1

This objective included the following activities: bacteriological monitoring, water chemistry monitoring, stream discharge and total suspended solids monitoring, development of a quality assurance protocol and the continuation of improving the water quality database.

Sergio S. Ruiz-Cordova made two trips to Ecuador — one in July and the other one in October — to conduct bacteriological surveys and water quality monitoring. He also conducted a Basic Training Workshop on Water Quality Monitoring for sixteen volunteers. Ongoing water quality monitoring has been conducted with volunteers coordinated by Nicolas Gomez UNORCAC's Water Commission Coordinator and Horacio Narvaez Pontificial Catholic University of Ecuador Ibarra Campus. Mr. Gomez and Mr. Narvaez are both Certified Monitors and have considerable experience with water quality testing. They have been great collaborators during Basic Training Workshops. Data has been entered into datasheets stored in SANREM computer at Jambi Mascaric. Monthly data files have been sent via e-mail to Auburn University.

Objective 2

Establish partnerships and linkages for research, outreach and training/education activities in Andean region.

Progress Towards Objective 2

A strong partnership has been developing with the Pontifical Catholic University of Ecuador-Ibarra Campus. Ms. Kaia Ambrose, field activities coordinator at the School of Agriculture and Environmental Sciences, has helped identify students interested in SANREM activities and as a result, several students have taken part in different project activities. Their participation has been successful for both parties. A reconnaissance trip to the UNORCAC communities in the Intag River area revealed interesting sites for potential monitoring activities in that region.

Objective 3

Assist Andean project leader with overall coordination of Andean project.

Progress Towards Objective 3

Sergio S. Ruiz-Cordova, an advanced Auburn graduate student assigned to this task at 0.5 FTE, has been actively participating in diverse activities during his trips to Ecuador. He has lead or helped coordinate monthly meetings (or Round Tables) with the SANREM participants present during the time of the meetings. The purpose of these meetings is to inform everybody about completed activities as well as ongoing and future activities. The round table discussions have been scheduled to occur alternatively in Quito and Cotacachi. Mr. Ruiz Cordova has also participated in several field activities for other SANREM-Andes projects in Quito and in the UNORCAC area. He is mediating different subprojects in order to have a better use of the resources and maximize the field activities for data collection.

Objective 4

Write a monograph on the topic of developing community capacity for bacteriological assessment of water, and protection and restoration of aquatic resources.

Progress Towards Objective 4

The Andean experience will be an important component of the monograph. Initial talks have been conducted among the three Auburn University participants regarding this objective. Initial work is underway and the experiences and success stories of the bacteriological surveys in the UNORCAC communities will add great value to this monograph regarding community-based activities.

Results and Outcomes

a) One hundred and five (105) chemistry samples were collected from sixty (60) sites including surface and drinking water through October 2000.
b) Eight hundred and fifty-eight (858) bacteriological samples were collected from one hundred and fifty-eight (158) sites including surface (54) and households (104) drinking water. Results have been posted on the bulletin board at Jambi Mascaric.
c) Sixteen new volunteers were certified during a Basic Training Workshop on Water Quality Monitoring.

Impacts

No report

Publications

Mr. Miguel Robalino, UNORCAC Communications Coordinator, requested that a written report about the bacteriological testing of drinking and surface water in the UNORCAC communities, to be published in the local newspaper. Sergio S. Ruiz-Córdova wrote and submitted such report.

On October 16, 2000 Mr. Enrique Moran from the Centro Wiñaypak in Atuntaqui interviewed Mr. Ruiz-Córdova about the different SANREM activities with UNORCAC in Cotacachi and specifically those concerning diverse aspects of water quality and bacteriological testing. The interview was broadcasted from Atuntaqui on Saturday October 21, 2000 at 07:00 with special comments in Quichua to reach the audience listening to this radio program.

Other Issues

Mr. Cornelio Orbes, UNORCAC president, traveled to the U.S. in October 2000 accompanied by Sergio S. Ruiz-Córdova. Mr. Orbes visited Auburn University, the Alabama Water Watch headquarters, and other sites in Alabama. He met with AWW officers and researchers at the International Center for Aquaculture and Aquatic Environments. Mr. Dick Bronson, an AWW member, took Mr. Orbes to visit a monitoring site in Lake Martin and to observe a water quality monitoring training session for high school students. Sergio S. Ruiz-Córdova hosted Mr. Orbes during most part of his journey in the U.S. including a visit to the Inter American Foundation headquarters in Arlington, Virginia where Mr. Orbes was negotiating a possible extension and funding of a two-year IAF project taking place with UNORCAC.

AND 00-07. Sustainable Mountain Futures: Linking People and Information for Effective Landscape Decision-Making in the Andes

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David J. Stewart, University of Georgia
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Larry Frolich, Catholic University, Ibarra, Ecuador.
Auki Tituana Males, Mayor of Cotacachi Canton, Cotacachi, Ecuador
Marcia Peñafiel, Catholic University, Quito
José Ignacio Sanz, CIAT
Jody Stallings, CARE/Ecuador, Proyecto Subir
Hernan Valequez, Ministry of Agriculture and Catholic University of Quito, Ecuador
Cooperators

Introduction

Since mountain ecosystems achieved Agenda 21 chapter status at the Earth Summit in 1992, there has been an explosion of interest and activity on the part of international agencies, national organizations, and NGOs in the development of multiple use, multi-stakeholder, and multi-scale (e.g., catchments, landscapes, watersheds, river basins) research, management tools, methodologies, and information processes. While it is assumed that effective decision-making for sustainability can be improved through a participatory linking of primary stakeholder groups with scientists and their products (research, information, technologies), the reality is that all too often there is a discrepancy between local stakeholder realities (needs, perceptions, experiences, time and space frames, and capabilities) vis-à-vis those of scientists and planners.

PROBLEM STATEMENT

Despite the overwhelming importance of the mountains to humankind, and of the Andes in particular, effective methodologies to address the sustainability of the natural resources and human communities of the mountains have been neglected by researchers and development specialists. Northern latitude, flatland science and natural resource modeling are not appropriate in fragile slope lands or for the people who live there. The biophysical and sociocultural nature of mountains is characterized by extreme diversity, not homogeneity. Also, the remoteness and marginality of most mountainous areas have rendered them data-impoverished and data-incompatible with conventional datasets. The interaction between vertical zones, upstream-downstream resource users and internal-external economic forces that shape agricultural/natural resource systems requires different analytical tools than the conventional two-dimensional analysis typical of flatland eco-regions.

The task, therefore, is to derive mountain-specific methodologies that can be used by diverse stakeholder groups (local to global decision-makers) to address the mountain *problematique* while at the same time providing useful action tools for sustaining agriculture and saving natural resources. The purpose of that project is to create a learning format for both local internal and external

stakeholders in two Ecuadorian test sites by ground-truthing existing decision support tools in terms of local realities.

The challenge for research in the SANREM Andes group grows from a scattered but growing literature on eco-regional approaches to sustainability. Eco-regional approaches were further stimulated by the Rio Earth Summit and have led to new initiatives (methods, tools, models) to integrate information at various levels of aggregation for the purpose of research priority setting, problem identification, and organization of R&D in contexts of multiple resource use, multiple scale, and multiple (often conflicting) stakeholders (Fresco, *et al.* 1990). The new emphasis has led to an increasing attention to the role of information technologies, GIS, expert systems and modeling at varying levels of scale (Stoorvogel, *et al.* 1997; ISNAR 1998).

Emerging from the first round of experiences with participatory natural resource management projects (including SANREM Phase I) were numerous conceptual and operational problems (Rhoades 1999). Foremost among these were problems of weak integration and research results influenced by disciplinary biases (scale, time and space assumptions, and disciplinary data requirements). This led to a great wealth of data and reports that were loosely connected and scattered. In turn, the overall output (although notable individual performances were recognized) was not seen as useful to the multiple stakeholders who ultimately make good or bad decisions about agriculture and natural resources. The purpose of SANREM-Andes II is to design a research strategy and methodologies that achieve the involvement of local populations (and related stakeholders) in the integration, testing, ground-truthing and adapting of decision support tools aimed at sustainability.

Objective 1

Integrate data from the SANREM-Andes activities (land use/biodiversity, hydrology, ethnoecology, institutions) into a "Futures Scenario" modeling process at two Ecuadorian test sites (Nanegal and Cotacachi).

Progress Toward Objective 1

A combined data-visual database has been set up in Athens, Georgia in the Sustainable Human Ecosystems Laboratory (manager: David J. Stewart), in Quito, Ecuador at the Catholic University Geography Department (overseer: Ing. Hernan Valesquez), and in Cotacachi, Ecuador, at the SANREM office in Jambi Mascáric (Magdalena Fueres:UNORCAC Vice President). This database currently includes GIS-based soil, topographic, and political boundary maps of the Cotacachi Canton -- the maps are linked to general socio-economic government data. More specific geographic information is now available in the GIS database on land use and irrigation from 1993, through aerial photo-interpretation by Hernan Valasquez (Ministry of Agriculture). He is currently in the process of interpreting 1963, 1978, and 1998 satellite Landsat images. This information will link with the multi-temporal analysis (30 year period) of landuse change (1970-present), a key process in future scenarios. Marcia Peñafiel (Centro de Datos de Conservación) is refining Hernan Valasquez's aerial photo-interpretations to develop these multi-temporal maps for the past 40 years (1963. 1978. 1993, 1998) for the focused research site which is the southern sector of rural Cotacachi. Field work by Marcia and 4 students from Catholic University add data on current plant and animal biodiversity which, in turn, can be compared to benchmark data she collected 10 years ago from the nearby Laguan de Cuicocha in the Cotacachi Cayapas Reserve.

EPIC and USLE have been chosen as two biophysical models for erosion and the effects of landuse, and are being run by members of the soils team (AND 08) and the future visioning team (AND 07). Two meteorological stations were moved to Cotacachi communities Morochos and Topo Grande and installed by a technician from INAHMI who is training local collaborators David Valasquez and Nicolas Comez (UNORCAC).

Advances have been made in the development and integration of socioeconomic data over the past 6 months. Aurelio Vicuña (PUCE-Quito) has collected data on production strategies in three specific sites in the SANREM study area in Cotacachi as a part of this thesis that involves development of the USLE model. Calibration of this model will take place during the coming months (January-May, 2000). Mika Cohen (UGA) has collected field data on land use in irrigated versus non-irrigated areas and in high versus low altitude communities. Along with agricultural production in these areas, she has also collected accompanying information on demographics (household size and migration patterns) and on local perceptions and beliefs regarding hydraulic resources in the area.

Furthermore, a database has been created and pre-tested in FoxPro that will link UNORCAC (44 communities with a population of 20,000) census information at the community level with the digital maps. The census has been technically designed by Fernando Guerrero (Instituto de Estudios Ecuatoriano) and Hernan Valesquez, and has been tested in the Cotacachi area by Luis Fichamba (UNORCAC), an ongoing process that will refine the census questionnaire.

For the Nanegal site, two major developments have occurred over the past 6 months. First, a full synthesis book, covering 18 chapters, of all SANREM work to date has been published in Spanish by Abya Yala Press of Quito. Three hundred copies will be marketed by the press in Quito and the SANREM project will have 200 copies to distribute to authors, donors, communities, libraries, reviewers and other interested persons. The volume describes one of the most complete interdisciplinary studies of a landscape ever conducted in Latin America. The chapters build on each other and give equal weight to the interaction between the human and the natural landscape through time and space. All Nanegal data are stored in computer and hard copy form in the Sustainable Human Ecosystems Laboratory at the University of Georgia. Second, an initial working paper describing the "sustainable mountain futures" methodology was completed. This report consists of a literature review, overview of the proposed methodology, scenario development for Nanegal, testing of the "modelers rules" by local people, and creation of multi-media decision support tools for use by local communities. Landuse changes over 30 years (1966, 1990, 2014) were analyzed and projected (using aerial photographs and satellite images). These changes, especially deforestation, were in turn linked with "human drivers" especially the development of roads which is the best information available at this time. The dominant trends were projected through simulation to define "plausible" scientifically described rules and scenarios of future conditions. Based on this, using Adobe Photoshop (photo-manipulation) images of the landscape for different periods were created.

Objective 2

Test and refine the participatory future scenarios modeling exercise with a hierarchy of decision-makers (internal and external) connected with the landscapes around Cotacachi and Nanegal.

Progress Toward Objective 2

The "future visioning" protocol described above has been tested in two settings over past six months: Nanegal (Palmitopamba) and the Broad River watershed, Oglethorpe County, Georgia. Based on the modeling exercise mentioned above, maps reflecting landuse in 1966, 1990, and 2104 were carried in August to Palmitopamba, one of the 4 Nanegal communities studies by SANREM. These images became part of a complex of 17 different landscape images (e.g., topographic, hillshade, aerial photo, 3-D diorama, etc.) for eliciting people's mental causal models rules for landuse change (see SANREM Andes Working Document 2000-3). Each image was examined by different stakeholders in terms of perception of scale, theme, perspective, relief, purpose, costs, geo-referenceability, understandability. During August 2000, the ethnoecology team also "tested" the modelers rules (deforestation and road building) against local perceptions and values (see AND 02 for more details).

In response to the Board of County Commissioners and the Planning Commission for Oglethorpe County, Georgia, a graduate seminar under the direction of Robert Rhoades carried out a study of "desired future conditions" for the county. As in the SANREM Ecuador effort, this study is considered pioneering and preliminary. The seminar devised a new research protocol combined the strengths of Thematic Apperception Tests (TATs) and Visual Preference Surveys (VPS). The final test asked people to pile sort, rank, and carry out a proximity test with a series of photographs representative of development in the county. This technique was shown to be useful in determining people's values about the future as well as some conflict in choices. To supplement this research, a phone survey (randomized phone number selection within census block tracts) on 266 individuals (approximately 8% of the population) was carried out. This information has been prepared in a report (Sustainable Human Ecosystems Laboratory 2000) and presented to the local newspaper, the Planning Commission, and the Board of Commissioners.

Objective 3

Extrapolate the Future Scenarios methodology to other global mountainous landscape/watershed projects as a contribution to Agenda 21, Chapter 13.

Progress Toward Objective 3

Although extrapolation of the future scenario work is not to begin until year 3 of Phase II, some activity in that direction has started. First, a $5000 contract has been developed with a Peruvian NGO (Yanapai) to carry out a duplicate landuse and future scenarios project in the community of Quilcas, Mantaro Valley, Junin, Peru. This work is just underway, although the Yanapai team participated in the EEP evaluation in Ecuador. Second, discussions have opened with the Mountain Forum and Dr. Jane Pratt, CEO of the Mountain Institute in West Virginia to share methods and ideas about this kind of methodology for mountainous communities in Asia, Africa, Latin America, and North America.

To encourage more local participation in the SANREM-Andes project in Cotacachi, the team has designed a local initiative called "Finca de los Futuros Ancestrales" (Farm of the Ancestral Futures). This grows from an expressed local demand that they wish to recover passing traditions and crops, as well as link these traditions to future survival. This project is highly inter-sectoral involving UNORCAC, Catholic U.-Ibarra, CIP, CISP-Heifer, Fundacion Interamericana, and others.

Beginning in June 2000, research began on the concept of an "Ancestral Future Farm" as an entry into communities and as a mechanism to revolutionize agriculture extension in the area. Three students from Catholic-Ibarra under Kaia Ambrose (extension specialist) are writing their undergraduate thesis on sustainable agriculture, emphasizing the lost cultivars of the region. Simultaneously, a number of controlled agronomic experiments were undertaken in three ecological zones to better understand how local varieties would do after extensive periods of high external input agriculture. The "Granja Integral" (Integrated Farm) of Catholic-Ibarra -- a conventional extension farm -- has been re-designed under this experience. Three field days were conducted involving local farmers and information was distributed regarding organic quinoa (a traditional Andean crop) growing and marketing. Five Cotacachi "leader" farmers also were taken to a CIP field day on alternative and organic methods for potato cultivation.

Results and Outcomes

- Database and knowledge base established at three nodes (UGA, Quito, and Cotacachi)
- Spatial analysis materials gathered and initial multi-temporal analysis complete (40 years)
- Biodiversity transects and analysis for Cotacachi zone advanced
- USLE model data collected and linked with EPIC modeling efforts of AND 08.
- Initial field research completed on socioeconomics of irrigation and potable water systems of Cotacachi
- Database and protocol created and pre-tested in FoxPro for participatory census of Cotacachi
- Synthesis of all Nanegal research to date published in 2000 in Spanish ("Tendiendo puentes entre paisajes humanos y ecologicos" by Abya-Yala Press: Quito). Presented to communities in December 2000.
- Final editing of publication of "Flora y Vegetacion de la Laguna de Cuicocha y sus Alrededores" by Marcia Peñafiel completed; book to appear in January 2001, also by Abya Yala Press.
- Landuse model and future scenarios developed for Nanegal (maps and photo-interpretation) along with "landscape change rules".
- 17 images of the landscape analyzed and compared by different stakeholder groups
- Future visioning protocol tested in Broad River Watershed, Georgia, and information fed into landuse planning commission of the county.
- Background research and experimental plots for a "Farm of the Ancestral Futures" conducted in conjunction with Catholic University-Ibarra
- Twelve Ecuadorian students trained and three local technicians trained

Impacts

- Capacity building for the study and management of natural resources in Ecuadorian universities, NGOs, government, and indigenous organizations
- Input into the first landuse zoning laws of Oglethorpe County, Ga.
- Publication of first interdisciplinary study of a landscape in Ecuador
- Training in research skills at university and local level in Ecuador

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AND 00-08 Effects of Land Use Change on Long-Term Soil Fertility, Crop Productivity and Water Quality in Cotacachi

William P. Miller, University of Georgia
Principal Investigator

Introduction

Cotacachi is a region in the Andean highlands, just to the north of Quito, the capital of Ecuador. The political district has an area of just under 2000-square- kilometer, and lies at an elevation of 3000 to 4000 meters above sea level. Indigenous populations have lived in this area for thousands of years and have employed farming practices well suited to the climate and topography of the region during much of that time. Spanish colonization and suppression of the old social order produced changes in the agricultural context, and with the breakup of the hacienda system new problems of soil erosion and declining soil fertility have emerged.

In Ecuador, many local indigenous organizations are accepting the responsibility for managing their own natural resources. UNORCAC, for example, is the organization through which indigenous farmers in the Cotacachi region have expressed their desire for erosion control and a clean, reliable water supply. Over the past four years SANREM-Andes has developed a good working relationship with UNORCAC. The SANREM research initiatives thus far have focused on water quality (through Auburn University) and ethno-ecology (through UGA). With this activity we now begin to explicitly address the issues of erosion and soil fertility.

Initial project activities began during Summer 2000 with a three-week visit by Dr. William Miller to Cotacachi, with Franz Zehetner (PhD student) remaining in-country for the three-month summer period to plan and initiate in-depth studies.

Objective 1

Select with local community guidance a representative first-order watershed to which the model developed in this activity will be implemented

Progress Toward Objective 1

Various first-order watersheds within the Cotacachi area were visited in June 2000. The specific topography of the study area – streams deeply carved into the landscape, and the major portion of agricultural lands on the surrounding plateaus draining parallel to the streams towards the toeslopes of the volcano – suggested the selection of the Río Yanayacu watershed, which drains the entire southern slopes of the Cotacachi volcano. It extends from the town of Cotacachi west to Lake Cuicocha, and northward up the slopes of the volcano. The watershed has an area of approximately 50 km^2 and its elevation ranges from 2,500 to 4,000 meters above sea level, covering a wide range of slope gradients, soil types, and agro-ecological zones.

Objective 2

On a field-scale, assess long-term changes in soil fertility, crop productivity, as well as nutrient export by erosion and runoff using an erosion / nutrient cycling / crop growth model (EPIC = Erosion-Productivity Impact Calculator)

Progress Toward Objective 2

General model input parameters, such as topographic information, elevations, field sizes, etc. were collected during Summer 2000.

Historical weather data from existing weather stations in Cotacachi, Otavalo, and Ibarra, were collected and two Campbell Scientific weather stations were repaired, recalibrated, and installed in the study area (in the communities of Morochos and Topo Grande). A participative weather monitoring activity was initiated in nine communities around the Cotacachi volcano, with nine rain gauges and three thermometers installed at the homes of participants, who will record rainfall as well as minimum and maximum air temperature on a daily basis throughout the next two years.

In cooperation with Dr. Larry West, major soil types within the study area were identified and example soil profiles were described.

Soils were sampled from cultivated fields, pastures, and forests in different agro-ecological zones to assess soil fertility and erodibility under different land use, land management, parent material, and climate. A rainfall simulator borrowed from the engineering faculty at the Escuela Politécnica Nacional in Quito will be used next summer to measure erosion from these soils. Erodibility factors thus determined are basic inputs for erosion models used to estimate soil and sediment loss from the watershed area under study. An in-depth study of terraced fields in two contrasting areas was initiated to examine soil differences due to the effects of terraces in retaining soil against erosion. Terraced and un-terraced fields in Iltaquí and Topo Grande were sampled and surveyed as part of this study.

In total, about 400 soil samples were taken throughout the study area. Basic parameters, such as pH, electrolytic conductivity, and saturated hydraulic conductivity, were measured in-country during the summer months. One hundred (100) soil samples are being analyzed for routine fertility parameters by a soil laboratory in Quito, and 300 soil samples were shipped back to the Department of Crop and Soil Sciences at the University of Georgia (UGA) for further analyses.

In three communities (Morochos, Chilcapamba, and Iltaquí), plot experiments were started to assess factors limiting to crop growth. The EPIC model will be validated by comparing predicted with measured crop yields in these plots.

In cooperation with Brian Campbell (PhD student of Dr. Robert Rhoades), farmer surveys were conducted to document cropping practices and rotations used in the study area.

Since September 2000, extensive analyses have been conducted in the soil laboratories at UGA. These include particle size distribution, aggregate stability, plant available water, organic carbon, organic nitrogen, organic phosphorus, labile phosphorus, cation exchange capacity, base saturation, NO_3^- content, P sorption ratio, mineralization experiments involving organic fertilizers used by

farmers in the Cotacachi area, and various other analyses aiming at understanding the mineral composition of soils in the study area.

As of now, routine analyses have been concluded for a representative subset of samples, whereas other experiments involving long-term incubations (mineralization, sorption) will be continuously monitored over the next year.

First trial model runs have been conducted using parameters thus far available. Over the next months the model runs will be continuously updated as new input parameters will become available and others will be refined.

Objective 3

Scale up the field-scale modeling outputs to the watershed level using raster GIS

Progress Toward Objective 3

Soil sampling was carried out in the Cotacachi area in order to prepare a level two soil survey with mapping units relevant to both the Soil Taxonomy system and to local soil management schemes. The soils are clearly Andisols, weakly developed sandy and silty volcanic deposits with large accumulations of organic material in the top 20-30 cm above stratified mixed ash and mud flow deposits. Complete soil descriptions were collected over the summer months, based on which existing soil maps will be refined.

Objective 4

Route sediment and runoff through the landscape and evaluate nutrient export and water quality changes

Progress Toward Objective 4

A preliminary study was started in cooperation with Aurelio Vicuña (Geography student at Pontificia Universidad Católica del Ecuador (PUCE) in Quito) using the WaTEM Model, which allows for erosion prediction employing the Revised Universal Soil Loss Equation in a raster GIS environment, as well as for sediment routing. Input coverages, including a digital elevation model, a land use map, and a soil erodibility map were generated in cooperation with other project participants during the past months and first model runs were conducted. Multi-temporal analysis will be carried out over the next months using land use maps from different years.

In Summer 2000, sediment monitoring stations were installed at five locations in the Río Yanayacu, which will be used throughout the next two years to validate the model outputs.

Objective 5

Incorporate the model into the "Future Visioning Methodology" and case study as well as show local people how to interpret and use the model results as a decision support tool.

Progress Toward Objective 5

Many contacts were made in local communities, and the planned efforts were presented and discussed with community members individually and in community meetings.

Results and Outcomes

Preliminary results include profile descriptions as well as chemical and physical characterizations of dominant soils within the study area.

Impacts

Since this activity has just been initiated, its impacts will be seen in subsequent years.

Other Issues

During Summer 2000, contacts were made and collaboration was initiated with faculty and students at Pontificia Universidad Católica del Ecuador (PUCE) in Quito, with the Engineering and Geophysics faculty at the Escuela Politécnica Nacional in Quito, as well as with researchers from the Centro Internacional de la Papa (CIP). Model calibration and validation efforts will be coordinated with Dr. Walter Bowen from CIP, who has been using crop growth models to simulate yields in the El Carchi province in northern Ecuador.

AND 00-09. Regional Node for Training and Upscaling of Community-Based Natural Resource Decision-Making

Robert Rhoades, University of Georgia
Principal Investigator

Magdalena Fuertes, UNORCAC
Co-Principal Investigator

Introduction

The long-term impacts of SANREM-Andes will be found in the use of appropriate methodologies, case studies, and sustainable land use systems and technologies in mountainous or slope land regions of the world. In preparation for the eventual end to the SANREM-Andes project, it is necessary to create mechanisms and trained personnel who can carry forth in different contexts the lessons learned from SANREM in Phase I and Phase II. While significant information can be perpetuated by individuals (farmers or other stakeholders) a more long-lasting transfer occurs when the recipient is a well-established community or organization that represents the interests of stakeholders over the long-term.

Toward this end, SANREM-Andes is proposing to establish a training node to be located within Jamric Mascaric (UNORCAC-Union of Organizations of Campesinos of Cotacachi) but with downslope linkages to other areas in the Canton Cotacachi (and adjacent Pinchincha area of Nanegal, the site of Phase I research). This node will be located strategically to the Cotacachi landscape, which includes small producers, large haciendas, agro-business, and a nature reserve, and will contain an information center, hands-on opportunity with projects in the area, and the case study information for instruction based on SANREM research. Up-scaling workshops and short courses will target trainees from other indigenous or peasant communities in the Andes, decision-makers from the NGO and state organizations, and from institutions of the North.

PROBLEM STATEMENT

The issue of scaling up or the extension of findings over a larger area (both spatially and hierarchically) needs to be addressed in a project like SANREM. How can the valuable lessons learned be transferred or extrapolated to other interested parties? In one way, SANREM-Andes is linking with the global mountain research and development community to transfer lessons learned. In addition, through the Iowa State project, case studies are being carried out in other Andean regions (e.g., Mantaro Valley of Peru). However, there is considerable advantage of bringing participants to a viable SANREM site where research has been ongoing, where information is available, the "future scenario exercise" has been carried out, and where other local stakeholders and communities can be a part of the transfer process.

Our partners at UNORCAC have expressed interest in this approach. One of the former leaders of UNORCAC, Segundo Arrango, is presently the Executive of PRODEPINE (Projecto de Dessarrollo de Los Pueblos Indigenos y Negros de Ecuador), a project representing a hundred communities in the Ecuadorian Andes as well as indigenous communities of the Amazon and NW coastal area. Within Ecuador alone there is wide scope for transfer, but when expanded to other Andean regions (e.g., Peru, Bolivian, and Colombia) a wider net can be cast. The possibility for

"Mountain-to-Mountain" exchanges will be enhanced if there is a node for training and institutional capacity building in the SANREM site.

Objective 1

Establish a training and up-scaling node within Jamric Mascaric (UNORCAC) which will serve as the center of scaling up activities for landscape level work (especially the A sustainable futures visioning methodology, memory banking, water quality and quantity, leadership training in NRM) within the Andean region and for other mountainous areas.

Progress Toward Objective 1

Through an agreement with UNORCAC, an office space was acquired in Jambi Mascáric in which SANREM would be housed. This space is used for computer training, data storage, seed and equipment storage, seminar training, and other day-to-day activities of the SANREM project in Cotacachi. It is located one block from the "Cotacachi Hilton", a communal apartment rented by the SANREM-Andes for housing researchers while in the field.

Objective 2

Establish a functional data center at Jamric Mascarci headquarters with dynamic linkages to comparable facilities at UGA (USA) and Catholic University (Quito) to house case studies and summaries of Phase I/II findings for use at Cotacachi and other sites in the Andes.

Progress Toward Objective 2

Since June, 2000, a training office has been fully established and staffed with local personnel. Linked to computer facilities at UGA (Ecolab) and Catholic-Quito, this is final of the SANREM-Andes triage of training and data storage nodes. A computer and scanner is in place. They are maintained by UNORCAC with the agreement that the equipment will become theirs after the project ends. Three indigenous research assistants, along with others, have been trained to use the computer (inputting data, word processing, scanning, and backup procedures). All data available from the Future Visioning (07), water (05), soils/landuse (08), ethnoecology (02) projects have been added to the computer databases, backed up at Catholic and in USA, and -- in relevant cases -- stored in hard copy in the UNORCAC SANREM office. This office will be the "nerve center" for the participatory census of all UNOCAC communities (44) to be conducted in the coming months. All available secondary data reports available from UNORCAC (not SANREM only) have been collected and placed in the data node (e.g., self-diagnosis, consultant reports, etc.)

Objective 3

Conduct training on site in methodologies, technologies, land use and water systems for interested individuals and organizations that have the ability to further scale-up the findings of SANREM.

Progress Toward Objective 3

Training and outreach using the office has been limited to the ongoing projects (see each work plan) in addition to a visit during the EEP meeting of our partners from Peru. The office serves as the base of operation of the research assistants of UNORCAC personnel working in the water/land use, ethnoecology, and future visions project. Each of these projects engage in training. For example, 15

"becarios" (scholarship students) from primary and secondary schools are trained through the node in biodiversity, memory banking techniques, and related skills. The training node room was visited by the EEP where they were advised by posters and other types of project information.

Results and Outcomes

- Training node facility set up and functional
- Data from projects for year 1 and 2 entered on computer
- Weather station functional
- Training of local staff advanced
- Two indigenous leaders (Cornelio Orbe and Rafael Guitarra) traveled to the US to present on our joint work and learn about activities here.

Impacts

Primary impact is the building of capacity within an indigenous development organization (UNORCAC).

Publications

WORKING PAPERS AND REPORTS

Campbell, B. 2000. Applied Historical Ecology in Cotacachi, Ecuador. Working Document 2000-4.

Rhoades, R., E. Jones, and M. Cohen. 2000. Comparative Images of the Landscape. Working Document 2000-3.

Rhoades, R., D. J. Stewart, V. Nazarea, and M. Piniero. 2000. The Sustainable Mountain Futures Methodology: An Ongoing Study of Visioning in Nanegal Parish. Working Document 2000-1. SANREM-Andes Program.

Stewart, D. J. 2000. Thirty Years of Landuse Change in the Nanegal Micro-region: Past Patterns and Future Scenarios. Working Document 2000-2. SANREM-Andes Program.

Other Issues

During October, the Jambi Mascáric office was broken into and the staff computer stolen. Fortunately, the SANREM office was not harmed and no equipment taken. However, in the coming months we will share cost of a security system and a guard with other projects.

Section IV: West Africa Regional Project

Summary of Results and Impacts Year 3 June-November 2000

Building on lessons learned from the first phase of the SANREM CRSP, the West Africa Project (SANREM-WA) began Phase II with a new mandate, regional strategy and a new site in Mali. SANREM-WA is supporting natural resource decision-makers at multiple scales with appropriate data, tools and methods for analysis and capacity building to make decisions concerning conflict and natural resource management (NRM) problems associated with the agricultural and pastoral systems of West Africa. Over the course of Phase II, SANREM-WA is addressing the issues of increasing food insecurity, continued degradation of the natural resource base and increasing potential for conflict induced by these interdependent factors. In order to do so, SANREM-WA offers an integrated package of activities designed to further our knowledge of Sahelian Landscape/Lifescape dynamics and to apply that knowledge in assisting local and national scale decision-makers to improve their management of the natural resource base.

Output/Accomplishments by Objective

Good progress is being made in all activity areas of SANREM WA. Although it is still early to assess project impact, the SANREM WA project is on track for achieving the following objectives during the expected life of project:

Objective 1

A multi-year database established for modeling the dynamic interactions between the local populations, their NRM technologies and practices at the enterprise or local government landscape/lifescape scale (Target: local, national, and regional researchers).

Progress Toward Objective 1

A second rainy season of climatic and agronomic data has been collected for 32 farmer fields across the commune of Madiama. This data is being augmented by an additional 20 field sites (two for each of Madiama's 10 villages). The crop, cropping patterns and management database contains data for each of the crop varieties monitored. Each record contains fields for planting dates, fertilization, cultural methods, labor, phenological stages (emergence, flowering, maturity, harvest) and corresponding yields. In May/June 2000 a base-map at a scale 1/40000 was produced from a Landsat 7 image taken in November 1999 and from aerial photographs (1973 and 1991). A soil map at a scale of 1/40000 has been produced as a result of the soil survey conducted in June 2000. Major land types and soil types are described and their distribution and areas determined. In addition, a land use map has been generated using geo-referenced photographs for developing a classification of vegetative cover of an October 2000 Landsat 7 image. Initial-state socio-economic databases at the household level have already been established.

Objective 2

Bio-physical and socio-economic models developed that provide cost-effective decision-maker aids for the local government assessment of potential NRM technologies and practices that may be applied at the enterprise or local government landscape/lifescape scale (Target: decision makers and researchers at all locals).

Progress Toward Objective 2

CropSyst parameter files for management, weather, the main soils identified in the commune, and crops (4 millet cultivars, two sorghum, two rice) are being developed to help with model calibration, sensitivity analysis and initial simulation runs. It is expected that preliminary models will be run in the next two months, using CropSyst. Modeling will take place both in the US and in Mali. An MS degree has been awarded to the student working on the Social Accounting Matrix (SAM) Model. The initial results of this effort have been reported and additional publications are in the process of preparation.

Objective 3

Participatory NRM model developed at the local (Commune) level in the context of West African decentralization and interacting and competing agricultural and pastoral systems (Target: local and national governments and researchers and NGOs).

Progress Toward Objective 3

An institutional development plan, organization by-laws, restructured committee member assignments, and a plan for literacy training in Bambara have been completed by the NRMAC with the assistance of CARE/Djenné. The committee has also been reinforced with four additional women representatives, raising women's membership from 14 to 33 percent.

Objective 4

Local government capacity reinforced and local officials able to effectively manage their natural resources through the development of a prototype NRM plan at the Commune level (Target: local, national governments, NGOs).

Progress Toward Objective 4

Three training workshops in Holistic Management (HM) consensus building have been completed for local leaders, the Natural Resource Management Advisory Committee (NRMAC), and technical assistance providers in the Commune of Madiama. This year they have begun monitoring their soil and pasture resources applying the Holistic Management model. Work on the development of the commune level NRM plan based on HM principals will begin next year.

Objective 5

Local capacity building through the identification and application of NRM conflict mitigation strategies (Target: local to regional GOs, NGOs, and communities).

Progress Toward Objective 5

Two training workshops in HM conflict prevention and mitigation strategies have been completed for local leaders and technical assistance providers. Committee members have achieved improved inter-village communications over sensitive resource issues.

Objective 6

Information on NRM models, conflict management methods and associated decision-making tools disseminated throughout the West African Sahel (Target: national and regional researchers and the development community).

Progress Toward Objective 6

The SANREM CRSP-West Africa Annotated Bibliography is being augmented with additional research materials on NRM and conflict management in the West African Sahel and a Web page has been established that contains a Working Papers Series (in French and English) documenting project accomplishments. A SANREM CRSP Regional Workshop was held in February 2000, the next is planned for March 2001.

Progress Toward Five-Year Indicators

For SANREM WA, the project objectives are the same as the Five-Year performance evaluation indicators, i.e. objective 1 is also performance indicator 1. The project is on track to achieve these indicators. Since June 2000, the NRMAC model for participatory NRM is still in the early phases of its organizational development (Indicator 3). It has, nevertheless, made good progress toward developing its institutional capacity to plan and manage the natural resources found in their commune (Indicator 4). Improved inter-village communication has been reported by NRMAC members (Indicator 5). Coordinating the interests of all stakeholders (both within and outside of the Commune) around the sustainable regeneration of a *bourgoutière* is on the agenda for the next few months. A *bourgoutière* is s a flooded zone where a grass commonly called "bourgou" (*Echinochloa stagnina*) grows. As river waters rise during the rainy season, this grass begins growing from the bottom of the flooded area, keeping its head just above the water line as the floods rise. It is extremely valuable as cattle feed, in the West African Sahel where it plays a role similar to sugar beet in the dietary intake of cattle.

The biophysical and socio-economic databases (Indicator 1) and models (Indicator 2) to inform natural resource management decision-making have been established and are in the process of refinement. Information on NRM models, conflict management methods and associated decision making tools are beginning to be disseminated (Indicator 6).

Publications and Other Documents

Kaboré, Daniel P., Breima Traoré, Daniel B. Taylor, Peter Wyeth, Michael K. Bertelsen, and David Holland. 2000. Modeling District-Level Socioeconomic Linkages and Growth: Towards Sustainable Natural Resource Management in Agricultural and Pastoral Systems Under Environmental Stress and Conflict in the Niger Delta Region of Mali. Presented at the American Agricultural Economics Association Annual Meeting. Tampa, Florida. August 2000.

WAF 00-01 Coordination and Management of SANREM CRSP-West Africa

Dr. S.K. De Datta, Virginia Polytechnic Institute and State University
Principal Investigator

Dr. Michael Bertelsen, Virginia Polytechnic Institute and State University
Dr. Keith Moore, Virginia Polytechnic Institute and State University
Co-Principal Investigators

Dr. Lassine Diarra, Institut d'Economie Rurale, Mali
Cooperator

Introduction

The Office of International Research and Development (OIRD) at Virginia Tech provides overall project guidance and coordination for SANREM WA work plan activities. As this second year of on-the-ground activities begin in Mali, we are pleased to look back on the progress we have made together in a very short period of time. Only one year ago, SANREM WA was engaged in the PLLA to develop the framework for project activities in the project site in Mali. Today, all of the partnerships have been formed, the strategies have been developed and implemented, and the project is well-focused and well-positioned to contribute substantially to overall goals and objectives of the SANREM CRSP. We have been able to accomplish this thanks to the hard work of our collaborating PIs and institutions. We look forward to continuing this rewarding collaboration in the future.

Successful SANREM WA regional project implementation requires effective coordination not only between the PIs and partner institutions of the project within the region, but also between the regional and global programs. OIRD/Virginia Tech will continue to provide leadership in both of these areas. In particular, we are looking forward to exploring the possibilities of a more direct and mutually rewarding collaboration with Texas A&M's regional activities in Mali. We will also lead the search for additional resources to leverage the promising beginning we have enjoyed in Madiama. Finally, we will continue to support the regionalization of the project through our collaboration with the Institut du Sahel (INSAH) and the NRM Research Pole.

Objective 1

Provide leadership for regional project development and implementation.

Progress Toward Objective 1

The SANREM CRSP-West Africa Project Manager and Co-Manager have guided the development and implementation of all project activities of SANREM CRSP-West Africa partners in the U.S. and Mali, as well as conducted three site visits to Mali during June, August and October. To reinforce project ties and strengthen project development, arrangements with implementers of the World Bank-supported West African Pastoral Pilot Project (PPPOA) in Chad that have been applying Holistic Management practices were made. A key trainer from that project was invited as an additional HM trainer at the SANREM site in Mali. We have also been collaborating directly with

the SANREM CRSP ME on development of the Carbon Sequestration Proposal for NASA. If successful, this will help leverage our core SANREM activities.

Objective 2

Coordinate program development among U.S. and international collaborators.

Progress Toward Objective 2

The SANREM CRSP-West Africa Project Manager and Co-Manager at Virginia Tech coordinated activities and planned integrated program development with IER, CARE, UGA, WSU, and CHM representatives.

Objective 3

Coordinate financial and programmatic reporting of regional activities.

Progress Toward Objective 3

Procedures for formal reports of CARE-Djenné financial and programmatic activities were established. Various financial, program, and trip reports have been submitted to the ME in a timely manner.

Results and Outcomes

The SANREM CRSP-West Africa Project Manager and Co-Manager have provided leadership and routine backstopping as well as conducted two site visits to SANREM CRSP-West Africa partners in Mali during June, August, and October. During these visits, Moore or Bertelsen met with USAID officials to apprise them of project progress. The Office of International Research and Development (OIRD) continued support for work on the *Conflict and NRM in West Africa* annotated bibliography by hiring a part-time undergraduate student to update the database and establish a Web site, http://www.oird.vt.edu/sanremcrsp/sanremcrsp.html.

Project management has coordinated with visits of Oumarou Badini of WSU to Mali in August and October. With CARE, institutional development of the Commune Committee has been initiated and the third holistic management workshop was organized and conducted. Also with IER and WSU, biophysical baseline survey work has been continued and a planning meeting with SANREM PIs and the Commune Committee set for early February 2001. Project management has continued dialog with USAID bureaus on database development and coordination in West Africa.

A new SANREM Coordinator for IER, Salmana Cissé (Sociologist), has been designated to replace Lassine Diarra (who has been appointed Director of the CRRA/Sotuba). Cissé is based at CRRA-Mopti and will be able to provide closer supervision for activities at the Madiama field sites.

Impacts

Efficient working relations to implement the SANREM CRSP-West Africa program in Madiama Commune are being established.

Publications and Presentations

Bertelsen, Michael. 2000. Holistic Management in West Africa: A New Approach to Community-Based Natural Resource Management Decision Making and Institutional Development at the Decentralized Commune Level. Paper presented at the 16th Symposium of the International Farming Systems Association in Santiago, Chile in November 2000.

Bertelsen, Michael. 2000. Holistic Management in West Africa: A New Approach to Community-Based Natural Resource Management Decision Making and Institutional Development at the Decentralized Commune Level. Pp. 29-38. *In*: Cason, Kathleen (ed). Cultivating Community Capital for Sustainable Natural Resource Management: Experiences from the SANREM CRSP.

Bertelsen, Michael. 2000. Holistic Management in West Africa: A New Approach to Community-Based Natural Resource Management Decision Making and Institutional Development at the Decentralized Commune Level. SANREM-WA Working Paper (01-01).

Moore, Keith M. 2000. SANREM CRSP-WA Trip Report for 22 June - 1 July 2000. OIRD-Virginia Tech.

Moore, Keith M. 2000. SANREM CRSP-West Africa Trip Report for 18 October - 3 November 2000. OIRD-Virginia Tech with Sam Bingham, Center for Holistic Management and Ahmed Nadif, Pastoral Pilot Project-Chad.

Touré, Abdoulaye. 2000. CARE-Djenné Rapport d'Activités (Mai-October 2000).

Other Issues

Encouraging and inciting participation in community activities that do not have precedent models is time consuming. The patterns of behavior of different partners must be modified and new adaptations allowed to coalesce into a coherent program for collaborative participation to occur. Each aspect of the participatory process requires negotiation among all participants and structural impediments must be removed. One of those impediments has been differing perspectives of researchers and holistic management practitioners, which leads to disjunction in messages presented to the community. More importantly, however, delays in implementation of planned activities leads to frustration within the community, and difficulty in achieving goals dependent on prior accomplishments.

WAF 00-05 Workshop on Conflict and NRM: Emerging Lessons and Directions from West Africa

Dr. Michael Bertelsen, Virginia Polytechnic Institute and State University
Dr. Lassine Diarra, Institut d'Economie Rurale, Mali
Dr. Keith Moore, Virginia Polytechnic Institute and State University Principal Investigator
Co-Principal Investigators

Introduction

A workshop to bring together SANREM stakeholders and other interested parties from around the region and the world to review and discuss emerging strategies to manage conflict and natural resources. This recurrent (annual) workshop will provide a forum for researchers, development practitioners, and the donor community interested in conflict and NRM in agro-pastoral systems to present and discuss results, strategies, program directions, and impacts of collaborative research in these overlapping domains. The objective of each workshop will be to review the cumulative progress within the region, seek to identify innovative new strategies, and reach consensus among participants on priority future directions. Workshop organizers will invite participants including regional SANREM partners (e.g., IER, the NRM Research Pole, INSAH, and participating NGOs), others working on conflict and NRM in the region, and global stakeholders including SANREM stakeholders from other regions. Participants will make formal presentations on research and related development activities to serve as the basis for discussions and panel discussions. Breakout sessions will allow more detailed discussions on specific topics and the development of recommendations to guide the SANREM program and others working in these areas. The evolving SANREM West Africa program and other regional programs will benefit directly from this ongoing dialogue of internal and external experience. The workshops will be scheduled during the first quarter of each year.

Objective 1

Review the present (annual) state and progress of strategies to deal with conflict and NRM in agro-pastoral systems in order to coordinate research with other related ongoing activities in the region.

Progress Toward Objective 1

An initial SANREM workshop was held in conjunction with the NRM Pole Coordinating Committee meeting in Bamako in January 2000 and was reported in the Annual Report. The next SANREM Regional Workshop is scheduled to be held in Bamako early next year in conjunction with a CIRAD-INSAH-supported regional workshop on Agro-silvo-pastoral NRM strategies. The NRM Research Pole Coordinating Committee, SANREM PIs, NGOs, and IARCs are expected to present, discuss, and coordinate their various activities.

Results

No report.

Impacts

No report.

Publications and Presentations

No report.

Other Issues

No report.

WAF 00-06 Creation and Support of a Commune-Level NRM Advisory Committee

Salmana Cissé, Institut d'Economie Rurale, Mali
Abdoulaye Touré, CARE/Djenné, Mali
Keith M. Moore, Virginia Polytechnic Institute and State University
Co-Principal Investigators

Oumarou Badini, Washington State University
Mike Bertelsen, Virginia Polytechnic Institute and State University
Sam Bingham, Center for Holistic Management
Lassine Diarra, Institut d'Economie Rurale, Mali
Jeff Goebel, CARE/Mali
Amadou Kodio, Institut d'Economie Rurale, Mali
Mohamed Sisi M. Touré, Institut d'Economie Rurale, Mali
Peter Wyeth, Washington State University
Cooperators

Introduction

The PLLA conducted in February 1999 with Madiama community members by researchers at IER, Virginia Tech, Washington State, and the University of Georgia led to the establishment during the first year of a commune-level natural resource management advisory committee to help the SANREM CRSP-West Africa better target and transfer research results. A major objective for the formation of such a committee was to investigate the extent to which the NRMAC could assist commune-level decision-makers better manage natural resources at this recently decentralized local government level. Researchers at the CRRA/Mopti, in collaboration with local officials and development agents, assisted with the formation of village NRM user groups that met in the village of Madiama on 15 October 1999 to form the Natural Resource Management Advisory Committee - NRMAC (Kodio *et al.* 1999). Representatives from major commune-level NRM associations and from the villages elected a committee of fourteen members. In November, an initial training activity in Holistic Management and Conflict Management was conducted with committee leaders and local development agents (trip reports of Bertelsen and Bingham, 1999, and working paper of Goebel, forthcoming).

The Holistic Management Model evaluates all decisions in relation to an explicit "Holistic Goal", agreed to by consensus, which describes a desired quality of life, the forms of production necessary to support it, and a resource base capable of sustaining the whole. While the full committee has yet to complete the formal goal-setting process, discussion in the initial training session and subsequent community meetings indicates a strong desire to produce a landscape characterized by:

- High successional grazing land dominated by perennial grasses.
- Current areas of denuded hardpan revegetated by high successional perennial species.
- A soil nutrient cycle that builds fertility and tilth, especially in cropping areas.
- Ponds and wetlands (*bourgou* areas) capable of producing high quantities of both fish and dry season forage.

- A water cycle that raises the water table to historic levels and produces clean and moderated recharge of ponds and wetlands.
- Trees

In preparation for the annual research planning meeting in Madiama in February 2000, the NRMAC of Madiama not only prepared village level lists of priority research concerns, they also specified a list of priority areas to improve the organization and functioning of the NRMAC itself. Committee priorities included:

- the development of by-laws for committee functioning;
- training of committee members in literacy and numeracy;
- training in management of a NRMAC operational budget; and
- assistance in assuring commune-level food security.

The SANREM CRSP-West Africa proposes to address these committee institutional priorities through a series of training and support activities coordinated by CARE/Mali and supplemented by the Holistic Management Trainers from the Center for Holistic Management and Goebel and Associates.

Objective 1

Reinforcement of the institutional capacity of the NRMAC through training in functional literacy and numeracy, financial management and strategic planning.

Progress Toward Objective 1

The Natural Resource Management Advisory Committee (NRMAC) has been routinely meeting (despite difficulties of reuniting during the growing season). Its first achievement has been to conduct a diagnostic of its institutional strengths and weaknesses. As a consequence of this diagnostic, it drafted a plan for institutional development and a set of organizational by-laws. The internal organization of the committee has been revised and four additional women members added, raising women's representation from 14 to 33 percent. Literacy training has been planned to begin in December focusing on notions of democratic governance. Forty-five percent of the NRMAC are illiterate.

Objective 2

Increasing the understanding and application of the principals of Holistic Management. The Committee, with assistance from SANREM researchers, will develop and implement a monitoring and evaluation program for their management plans. This program has the following characteristics as prescribed in the Holistic Management Model: it will be designed to provide timely feedback to the decision-makers immediately responsible for changing management plans as new knowledge and unforeseen circumstances require; and the monitoring and evaluation plan will function on two levels: informal (allowing herders and farmers to immediately draw useful conclusions in a low tech, changing environment) and scientific, seeking to draw together and use data and results from the other activities.

Progress Toward Objective 2

The underlying foundations to achieve this objective are being established. The third training workshop in Holistic Resource Management focused on use of common pasture resources, both wetland and dryland. Two specific themes were discussed: organizing a system of rotational grazing on communal pastureland; and an action plan for sustainable regeneration of a *bourgoutière*. HM tools were also used to examine soil fertility enhancement through rock phosphate application, and millet and cowpea rotations (WAF 00-08) in several farmers fields, as well as a set of exclosures to demonstrate pasture regeneration (WAF 00-09) in two villages.

Objective 3

Increasing member's capacities to manage conflict situations involving natural resources.

Progress Toward Objective 3

Committee members report having applied their newly learned conflict management skills to improving inter-village communication over sensitive resource issues.

Results

The primary result of this activity during the first six months of this year has been the growing awareness on the part of NRMAC members concerning their roles and obligations with respect to the management of natural resources within the commune of Madiama. The re-organization of the committee to include more women representatives indicates this broadened perspective. The committee has also adopted the principal of maintaining written records of their meetings and those of the general assembly. Drafts of organizational by-laws and plan for institutional development have been completed and are under review.

Impacts

It is still early for the NRMAC to have achieved any substantial impacts on NRM in the Commune of Madiama. However, the committee members were highly satisfied with the consensus building and conflict resolution training they received during the previous workshops and are applying these skills to improve inter-village cooperation. Lessons from Holistic Management have been applied to develop a plan of their own for rotational grazing system in the commune.

Publications and Presentations

Keith M. Moore, Michael Bertelsen, Lassine Diarra, Amadou Kodio, Salmana Cisse, and Peter Wyeth. 2000. Natural Resource Management Institution Building in the Decentralized Context of West Africa: the SANREM CRSP Approach Working Paper No. 01-02.

Other Issues

Developing a sustainable institution is a challenging and time-consuming process. The patterns of behavior of different partners must be modified and new adaptations allowed to coalesce into a coherent program for collaborative participation to occur. Each aspect of the participatory process requires negotiation among all participants and structural impediments must be removed.

WAF 00-07 Development of Methods and Tools for Evaluation and Decision Making

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Mohamed S. M. Touré, Institut d'Economie Rurale, Mali
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Introduction

The purpose of this activity is to develop methods and tools for sustainable agriculture and natural resource management decision-making that provide technically sound advice and are socially feasible at the new Commune level within a multi-ethnic society. The tools proposed here are an essential complement to the experimental work being undertaken in activities WAF 08 and 09, the soil fertility and pasture improvement tests. Two sets of tools are involved: biosystems and economic/socio-institutional. The biosystems tools are specifically designed to extrapolate, through simulation, the results of these tests over time and space to farmers' fields under different rainfall, soil type or socioeconomic conditions. The economic/socio-institutional tools are designed to adapt findings to the decision-making context at the Commune-level.

Many crop models have been developed over the past two decades (Stockle, 1989). Examples of these models are the CERES models (wheat, corn, sorghum), developed by Joe Ritchie (Michigan State University) and coworkers (e.d., Jones and Kiniry, 1986); SoyGro (Jones *et al.*, 1989); PutGro (Boote *et al.*, 1989), and BeanGro (Hoogenboom *et al.*, 1991); SUCROS and other models developed by researchers from Wageningen in the Netherlands (for references see Kropff and van Laar, 1993); EPIC (Sharpley and Williams, 1990) developed by Jim Williams, USDA/ARS at Temple, Texas; and CropSyst (Stockle *et al.*, 1993) developed by our team at Washington State University.

We will not need to develop new models, but rather will adapt and apply those most appropriate through calibration of parameters and validation.

The biosystems model best suited to the analysis of alternative cropping systems in Madiama is CropSyst (Cropping Systems Simulation Model). CropSyst is a multi-year, multi-crop, daily time step, generic crop growth simulator. The model has a friendly user interface (Windows 95 & 98) and is linked to GIS software (ARC INFO) and a weather generator (CLIMGEN) (Stockle, 1996). It was developed to simulate crop growth in response to soil, weather, and management, and has the

capability to estimate water erosion, residue decomposition, tillage effects and other effects. Crop growth description is more detailed than in the EPIC model used by Texas A&M, though necessarily less detailed than some of the single crop models. Nevertheless, many data requirements are similar among models and hence promote the data sharing and swapping that we propose to do between the SANREM Global and West Africa projects.

CropSyst has the capacity to reflect site specificity not only from the biophysical, but also from the socioeconomic perspective incorporating socioeconomic considerations such as evaluation of risk and economic feasibility of dryland agriculture systems. The model is being adapted without difficulty to West African conditions through calibration and validation, using data from the field experiments proposed in WAF 08 and 09 and the socioeconomic data to be collected under this activity. Employing the models to determine how much of the year-to-year variation in yield is attributable to changes in weather, soil conditions or management practices, is an iterative and interactive process in which both field tests and simulation are essential.

Biophysical data including soils, crops, cropping patterns and weather have been collected during the past growing season for all representative soil types and cropping systems. Also, the presence of scattered trees within fields, a predominant characteristic of the parkland agriculture practiced throughout the Sahel, with its potential yield effect is being documented. This coming year, the monitoring will continue and will include more soils, crops, cropping systems, socioeconomic data in other NRM systems and weather zones as we extend our efforts to cover the whole Madiama Commune. Because of the year-to-year differences in the weather, input costs, and product prices, two to three years' results may be needed for a reliable evaluation of tests results.

Preliminary work on soil characterization allowed us to understand the general geomorphology of the commune. Next steps will include the cartography of soil types, land uses and the production of digital maps in a geographic information system.

The first objective of the economic analysis is to assess the economic viability of current and alternative crop and range practices. This will ensure that recommendations for improved practices make sense from the economic as well as the agronomic point or range management of view. A second objective, building on past Social Analysis Matrix (SAM) work, is to assess distributive impact in order to determine whether specific types of interventions are likely to exacerbate or diminish conflicts between the various groups in the commune.

In addition to the economic analyses, an additional objective will be a socio-institutional study to determine how to adapt the tools being developed to the socio-institutional context of the Commune. Decentralized, Commune-level decision-making is a new and crucial area of inquiry in West Africa. Traditionally, local decision-making has been the domain of village heads, captured in the French concept of "terroir". Intra-ethnic institutions and inter-ethnic relations have existed at multi-village, regional levels, but are becoming increasingly anachronistic as decentralization occurs and the resources on which they were based continue to degrade. What elements of the biosystems and economic models, training in conflict resolution, and the Holistic Management Model and associated tests are best adapted (or could be adapted) to addressing decision-making parameters at the Commune level? The study is exploratory in that it focuses on learning (1) the language and priorities that shape Commune decision-makers perspectives on changing NRM practices, and (2)

the institutional mechanisms which are most likely to effectively communicate and effectuate community priorities. This study presages the subsequent step — after developing technological (i.e., bio-physical) alternatives and tools for their application — how to integrate them into the decision-making process, at this new administrative level.

Objective 1

Evaluate socio-institutional performance in natural resource management practices.

Progress Toward Objective 1

This objective is met through Activity WAF 00-06.

Objective 2

Develop community-based methods for monitoring and evaluating field tests or innovations designed to improve soil fertility or improve pastures.

Progress Toward Objective 2

This objective is met through Activity WAF 00-06 and 08.

Objective 3

Adapt and apply biophysical modeling techniques to monitor and evaluate the biophysical performance of existing and alternative natural resource management technologies and practices.

Progress Toward Objective 3

CropSyst parameter files for management, weather, the main soils identified in the commune, and crops (four millet cultivars, two sorghum, two rice) are being developed to help with model calibration, sensitivity analysis and initial simulation runs. It is expected that preliminary models will be run in the next two months, using CropSyst. Modeling will take place both in the US and in Mali.

Objective 4

Establish a multi-year database for crops, soils, weather and management technologies for modeling and evaluating the impacts of NRM practices on productivity and the environmental sustainability.

Progress Toward Objective 4

The multi-year database is being established by IER and WSU. Biophysical data on weather, main soil types, main crop varieties and existing cropping management practices from last year for a sample of 32 farmers' fields have been assembled, coded and entered into Access and Excel database files.

Data for the current year for the same 32 fields from last year plus data from 20 more (two from each village of the 10 villages of the commune) are being collected for entry into the database once harvesting is completed in December 2000.

The crops concerned are four millet local cultivars (Gaouri, Sagnori, Sanio, Toroniou), two sorghum (Kénégué and M'bayéri) and two rice cultivars (Riz Blanc and DM16). For each of these crops and for cowpeas (niébé) in the test fields this year, the different phenological stages from planting to maturity have been characterized. Heat units were calculated as well as the component biomass (roots, stems, leaves, fruits) and total yield.

The database for the main soil types determined in Madiama is being integrated using last year's data and this year commune-wide soil survey data. Preplanting soil tests on organic matter, P, N, pH from last year were used to determine baseline soil chemical characteristics and fertility levels. Soil water content was also monitored in each field through soil samples taken every two weeks from planting to maturity. These data, together with the data from the crops, will also help in the calibration and corroboration of the biophysical models and will serve as values against which to measure the impact of SANREM actions on the environment.

Historic daily weather data (solar radiation, rainfall, minimum and maximum temperature) from 1953 to 1999 for Mopti, Djenné and Sofara were obtained and compiled for use in the long-term simulation modeling and analysis. From the automatic weather station installed last year, data were collected without major disruption for the entire growing season. A network of 10 rain gauges was installed in each of the 10 villages of the commune. These data will be inputs to the modeling.

Objective 5

Monitor and evaluate the social and economic viability of current and alternative soil and pasture management practices.

Progress Toward Objective 5

Economic data on crop production were collected last year as part of the activity to construct a social accounting matrix for the Commune. Once output from the CropSyst models is available, the economic data can be applied to assess economic viability of the practices modeled. The economic data already collected may be supplemented by additional information on economic variables that IER is planning to collect this year.

Objective 6

Create cartographic and geographic information systems (GIS) for the commune of Madiama from remotely sensed data for more refined planning and a geographic representation of natural resources.

Progress Toward Objective 6

A soil map at a scale of 1/40,000 has been produced from a soil survey conducted in June 2000. Major land units and soil types are described and their distribution and areas determined. Further processing is taking place for refinement of the map and for creation of GIS layers for linkage to the modeling scheme of CropSyst.

Objective 7

Transfer evaluation tools including models, methods and skills to IER and other regional partners.

Progress Toward This Objective

Evaluation methodologies and tools are being developed with Malian partners and their transfer to Malian partners through training and hands-on applications would be an ultimate outcome of our collaborative work in Mali.

Results and Outcomes

IER and WSU researchers are working together on establishing the database. It is available at CRRA-Mopti and at WSU and is being up-dated with data collected this year. The technical understanding of biophysical conditions in Madiama commune has been much improved. Productive collaboration has been established. This has led to an exchange of methods and skills in field monitoring and database development for biophysical and socio-economic variables parameters used in describing systems and in simulation analyses.

The soil database constitutes a soil "library" comprising the initial chemical test results (pH, organic matter, total N and phosphorus), the soil water balance from the 32 fields and the samples from 190 sites from the soil survey. Baseline values have been derived that show very low values for total nitrogen (less than 0.1 percent in all soils), very low values for organic carbon content (0.08 to 0.5 percent) and deficient phosphorus content (2.5 to 8 ppm). The soils range from strongly acid (pH 4.2) in the clayey rice fields to slightly acid (pH 6.2) in the loamy millet fields. Soil bulk density and soil texture are included in the database. These initial values will be compared with subsequent monitoring results to keep track of fertility and yields. In general, information on soils will be used for explaining current cropping practices and identifying limitations and assessing the potential for new crops and cropping patterns.

The crop, cropping patterns and management database contains data for each of the crop varieties monitored. For example, average days from planting to maturity for rice DM16 were 116 with an average yield of 1,988 kg/ha, and for rice 'Riz Blanc,' 127 days with a yield of 1,813 kg/ha. Millet days to maturity and yields ranged from 74 days and 680 kg/ha for Gaouri to 107 days and 748 kg/ha for Sanio. Sagnori millet had the highest yield with 878 kg/ha (87 days to maturity). The sorghum M'bayeri had a growing period of 113 days with a yield of 820 kg/ha and Kénégué 104 days with an average yield of 1,016 kg/ha.

The weather database contains historic data (1953 to 1999) for nearby sites. We are also building a current weather file for each of the 10 villages of the commune using a weather station and rain gauges. Total rainfall in 2000 from the 10 villages of the commune was highly variable from place to place and ranged from 359 mm for 23 rainy days at Tatia to 629 mm for 41 rainy days at Torokoro. The characterization of the weather will help in the selection of cropping systems and varieties suited to the climate.

No biosystems or economic models have been run at the time of writing. It is expected that preliminary biosystems models will be run within two months.

LandSat and soil maps for the commune have been developed (see Publications and Reports, below.). The commune, with a total land area of 16,433 hectares, has extensive areas of seven land types that are identified and described according to landform, pedogenesis, hydrology and land use. They range from flooded hydromorphic plains to ironstone plateau. The flood plains with gleyey

and pseudogley hydromorphic soils (USDA *Aqualfs*) occupy the basin of the Bani River and represent 6.4 percent of the commune. Hydromorphic plains of silty and loamy material prevail in 6.82 percent of the commune. The soils are *Psammaquents* (or French "Sols minéraux bruts d'apport alluvial"). The third type is represented by slightly hydromorphic plains of silty and loamy material (20.71%). The commune is dominated by the plains of sandy to loamy materials (36.42%). The soils are tropical ferruginous soils (or USDA *Ultic Haplustalfs*). The old alluvial plains and terraces represent 19.7 percent of the commune. The soil type is *Plinthic Haplustalfs* (or French "Sols Hydromorphes à tendance vertique avec nodule calcaire"). The two last types are land underlain by laterite (5.99%) with *Aridic Cuirastals* soil type and ironstone plateau with *Cambic Cuirorthids* soils over 3.91 percent of the commune.

Impacts

As yet there is no impact in terms of improvements in natural resource management practices.

Publications and Reports

Trip reports and photographs are available.

Technical reports or maps in progress or complete:
In May/June 2000 a *base-map* at a scale 1/40000 was produced from Landsat 7 image taken in November 1999 and from aerial photographs (1973 and 1991). A *soil map* at a scale of 1/40000 has been produced as a result of the soil survey conducted in June 2000. Major land types and soil types are described and their distribution and areas determined.

Further processing is taking place for refinement of the map and for creation of GIS layers for linkage to the modeling scheme of CropSyst. The CropSyst-GIS integration will help the spatial and temporal analysis of NRM and production of thematic maps on yields, production and agroclimatic risks.

A technical report on the morphopedology of the commune as well as the agricultural potentials and constraints of each land unit and corresponding soil type is being prepared and will be available for the evaluation/planning workshop.

A technical report on agroclimatic characteristics of the commune is being prepared and should be ready by February 2001.

Other Issues

Collaborative experience with partners in Mali has been successfully built up through participation in meetings and training sessions that are part of other West Africa Project activities as well as through one-on-one cooperation between researchers. It was originally intended to hold group-training sessions for both IER researchers and villagers on the database and biosystems modeling activity. As the 2000-01 work plan was being developed a decision was made not to include these sessions in order to bring total expenditure within budget limits. An attempt will be made again next year to make the training a part the work plan.

WAF 00-08 Farmers' Decision Making Aides for Improved Soil Fertility Management

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Introduction

The Participatory Landscape Lifescape Appraisal (PLLA, February 1999) conducted in the villages of Madiama, Nérékoro and Tombonkan of Madiama Commune identified severe degradation in soil fertility and forest resources. In November 1999, community leaders and key Natural Management Advisory Committee (NRMAC) members were introduced to the Holistic Resource Management methodology and have begun to diagnose the soil fertility problems in their fields. They have targeted the nutrient cycle as the key pillar of the ecosystem to address. Sahelian soils are characterized in large part by their poverty in nitrogen and phosphorus as a consequence of continuous cropping and reduced applications of manure that have not allowed for adequate replacement of soil nutrients (Pichot and Roche, 1979). Crop residues are increasingly being collected for domestic use and animal feed. Cereal yields have decreased steadily and more fields have been opened up to cropping, further reducing the practice of fallowing (De Fahran *et al.*, 1989).

In preparation for the communal research-planning meeting in February, the NRMAC of Madiama prepared village level lists of priority research concerns. Among the priorities in every village, degraded soils were cited as one of the major natural resource constraints (NRMAC, February 2000). Given this continued support of the NRMAC and the local population for reversing land and soil degradation, research on the characterization of existing cropping systems and soil quality improvement practices will continue.

A research activity to introduce soybean in rotation with millet and sorghum was conducted last year. This activity was designed as a "pump-priming" experiment to demonstrate to the populations of Madiama one type of SANREM intervention. It was justified on the basis of strong interest among Madiama households to find an alternative to the disappearing 'nere' fruit used in making soumbala, a popular food condiment. Also, promising test results of soybean had occurred in similar areas of Mali. Unfortunately these results were not borne out in the Madiama test. Although the plants grew and the pods formed, the beans did not develop and there was no crop. This is attributed to the late onset and short duration of the rainy season in 1999. Although this rainfall pattern is unusual and researchers expect soybeans to be normally successful in this region, it was

decided not to continue with this test.

Other lessons will be learned as the ongoing biophysical characterization of agricultural ecosystems provides information on local soil management practices and farmers' participation in the design, testing and evaluation of other soil management technologies proceeds. Long term improvement of soil quality and a positive nutrient cycling path in farmers' fields of Madiama Commune will require changes in NRM technologies brought about through direct community involvement in the choice, implementation and evaluation of soil management tests. A fundamental lesson learned is that farmers are much more likely to adopt new NRM practices when they are directly involved in the selection and use of the practices. In addition to their involvement in testing the practices, adoption is enhanced when:

- A variety of technologies and practices to confront the problem is proposed. This allows farmers with different needs and circumstances to choose best-fit alternatives.
- Options are proposed that yield benefits in the short run (within a year or two), such as intercropping cereal crops with leguminous crops or woody plants.
- Alternatives whose payoffs are longer run (accrue after two years or more) may be adopted providing the benefits are clearly perceptible and the payoff periods are known in advance (An example is the planting of *Faidherbia or Acacia albida* in fields of cereal crops).

This activity will use a participatory and collaborative research process built around the emerging understanding and use of the Holistic Management model to identify and test soil fertility and water management improvement technologies with the aim of increasing the decision-making alternatives available to farmers in Madiama Commune. Collaboration will be structured through the active participation of the NRMAC and related village committees. The field trials will include socioeconomic evaluation, biophysical monitoring and modeling (see WAF 00-07). The biophysical and economic benchmark characterization began last year, and future modeling efforts will seek to demonstrate impact on holistic goals of slowing and reversing the degradation of soil resources.

The NRM technologies and practices whose potentials are to be assessed include agroforestry interventions and organo-mineral fertilizations. Community soil management technologies that combine organic and mineral fertilizers with cultural practices associating legumes and cereals will be tested in farmers' fields and their impact evaluated using physical performance indicators such as mineral and water balance as well as crop yield outputs. The mineral fertilizers referred to here are not manufactured chemical fertilizers, which farmers cannot normally be expected to afford, but rather rock phosphate, which is locally available in Mali.

Results for the cropping season are not in yet and with only a single season of trials it is difficult to make conclusions. However, some preliminary observations have been made during field visits.

Objective 1

Evaluate the impact of existing cultural practices.

Progress Toward Objective 1

Continuous cropping of cereals (millet and sorghum) on fields has led to soil degradation and increasing infestation of Striga. Activity WAF 00-07 provides an overall perspective on these conditions.

Objective 2

Test and evaluate the effect of alternative mineral and organic fertilization techniques (e.g., rock phosphate and manure) on soil mineral and water balance.

Progress Toward Objective 2

The field trials involved only rock phosphate (PNT) as a fertilization additive, manure was not included this year. Some farmers found that the plots with the PNT responded better than those without it. Nevertheless, it is unlikely much response to PNT will be measured this year since (due to late arrival of funds and identification of farmer cooperators) it was not applied until late August, well after the onset of the rainy season.

Objective 3

Test and evaluate the effects of new cultural associations and rotations of cereals (millet, sorghum) and legumes (cow peas) on soil fertility and crop yield improvement.

Progress Toward Objective 3

Results for the cropping season are not in yet and with only a single season of trials it is difficult to make conclusions. However, some farmers have made some preliminary observations during field visits. This is the first season for trials involving cowpeas in association or rotation with cereals. The new striga-resistant cowpea variety was attacked by an unidentified pest in some farmers' fields. This has caused concern, but has not yet deflated farmer enthusiasm for this combination. In fact, one farmer mentioned he would plant a more extensive field of cowpeas in the coming year.

Objective 4

Build local capacity for using the Holistic Model to understand and manage NRM problems and issues.

Progress Toward Objective 4

Collaborating farmers are beginning to describe their experience with the cereal and cowpea association or rotation using the HM conceptual approach. More interesting, however, is that in conducting these experiments on barren (degraded) land that had been abandoned for some time, farmers have come to see that rest, even on barren land, does make a difference, as they had not expected much crop growth at all. Some farmers are considering plowing and planting other barren parcels that have been left abandoned. A new understanding of degraded land may be emerging.

Results and Outcomes

These trials were established on two farmer fields in each of ten villages in conjunction with each village user group (Village NRM Committee). This has allowed for a potentially higher than expected

level of participation by community members. However, not all plots had been successfully managed by the farmer collaborators. Committee members will need to consider the quality of farmer participation in the next season of trials. Nevertheless, these trials have provided a focus for addressing issues of increasing soil fertility within the Commune.

Impacts

It is still too early to discuss impacts of these field tests.

Publications and Presentations

None as yet.

Other Issues

The late commencement of the farmer trials was in part due to a lack of funds at the CRRA-Mopti to initiate activities for the growing season that begins in June. Decisions, preparations, and investments for each growing season are normally made in April and May. However, the SANREM fiscal year begins in June with funds only released to the University of Georgia after June 1. This has meant that Virginia Tech only received funds in mid-July and IER (CRRA-Mopti) by mid-August. Virginia Tech did provide an advance through a travel loan to assure initiation of activities, but this was not sufficient to resolve the problem. While improved financial management will be instituted to ameliorate this situation, the SANREM fiscal calendar poses a severe constraint for proper implementation of planned and budgeted activities.

WAF 00-09 Community Decision Making Aides for Improved Pasture Lands

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Introduction

Madiama community members and researchers at IER, Virginia Tech and Washington State have conducted participatory diagnostics of the pastureland resources in the Commune of Madiama (PLLA, February 1999, and the Holistic Management Training Sessions, November 1999). In preparation for the communal research planning in February, the Natural Resource Management Advisory Committee (NRMAC) of Madiama prepared village level lists of priority research concerns. Among the priorities in every village, the poor quality of pastureland was cited as one of the major natural resource constraints (NRMAC, February 2000).

According to Ba *et al.* (1995), desertification and drought have reduced usable land in the Sahel at a rate of 80,000 hectares a year. In the Mopti Region (including Madiama Commune), the lack of pasture and forage resources has been a growing problem. Demographic growth, extension of field cropping, increasing herd size, high levels of exploitation of ligneuse resources, and climatic fluctuations have all contributed to serious losses of biodiversity within the zone. In addition, access to pastureland resources has become a major flashpoint for conflict among stakeholders.

Using the Holistic Management diagnostic process, the NRMAC and collaborating researchers have identified management practices that are the probable cause of a generalized regression of plant communities to the level of annual grasses and other species of low forage quality that severely limits the potential for the community to achieve the quality of life it desires. The bourgoutières in the region are poorly managed and, though accessible during the dry season, are flooded during the rainy season and require that livestock seek out pastures in communally controlled dryland areas. The forage resources of these pastures have become nearly non-existent and only a few perennial grasses can be found in Madiama. Transhumant practices are also increasingly limited, particularly in traditionally utilized areas in the communes of Timissa and Tominian.

The present low level of succession represents a severe botanical shift. The first priority is to concentrate on changing management practices so that natural succession can revegetate/restore these resources. Setting realistic expectations for this process and evaluating progress toward their fulfillment requires understanding of the native vegetations (legumes/grasses) that existed previously. Researchable questions include:

a. Is the soil in its current status able to support the growth of perennial grasses that used to grow on these soils (pre-disturbance)? If not, how can the status of the soil be improved? If the soil fertility can't be improved to support the growth of perennial grasses, then which alternatives (e.g., managing the existing annual grasses and shrubs) are most promising?
b. What latent seed sources still exist in degraded areas.
c. What areas can be reclaimed most quickly and give the most immediate benefit to the community on the basis of soil type, moisture, existing vegetation and use patterns.
d. What intermediate stages of succession can be anticipated when management changes, including toxic or otherwise noxious plants, insects, and other organisms?
e. What beneficial organisms (birds, insects, amphibians, small mammals, microorganisms, etc.) can be promoted through special habitat enhancements (shelter sites for bats, nesting boxes, water points, mulching bare ground to draw termites, etc.)
f. What trace minerals that might accelerate succession are deficient in soils that could be introduced through livestock supplements?
g. What management practices will promote different expressions of natural succession, as the commune is not only worried about the loss of perennial grasses but also certain woody plants and trees and many medicinal herbs?
h. Long-term improvement in the potential for the succession to more diverse and productive plant communities in pastoral areas will require that additional issues be researched including:
    - the current management practices of herd owners within the commune as well as their transhumant practices,
    - the potentials for community organization of pasture access and use,
    - the quality of pasture and forage resources, and
    - how pasture practices and resources can be modified to increase productivity, improve pasture management, and help prevent conflicts involving those resources.

This work will require surveys of pasture and forage resources as well as the herding practices of Commune residents within and outside the commune. Community involvement in this research will also be focused through Holistic Management and Conflict Resolution training, and subsequent community-based experimentation with pasture management tools as suggested by the NRMAC and researchers.

Objective 1

Determine the quantity and quality of forage resources in the Commune of Madiama.

Progress Toward Objective 1

Data collection to evaluate potential biomass production and floristic composition of primary pasturelands in the Commune has been conducted. In addition, geo-referenced photographs have been obtained for the classification of pastoral resources indicated on the November 1999 and October 2000 LandSat images.

Objective 2

Describe the socio-economic characteristics of livestock management and the cycles of resource use in the commune including ties to the region.

Progress Toward Objective 2

Work has not been initiated on this objective.

Objective 3

Work with the NRMAC to propose and organize actions leading to the resource conditions described in the Holistic Goal. These may range from small-scale demonstrations and experiments to changes in land use conventions that affect the whole commune and even the wider area of transhumant livestock production in which Madiama is embedded. This activity will also seek to identify and disseminate with the NRMAC techniques for improved production of forage in both dryland and flooded zones (bourgoutière) within the region.

Progress Toward Objective 3

Four exclosures (10 x 10 meters) were established, two in the village of Sidagourou and two in the village of Nérékoro. One exclosure in each village was sited on barren pastureland and the other in a depression. Vegetative response in these exclosures was noted and appreciated by the villagers. Actual differences with land outside the exclosure appear to be minimal. Nevertheless, NRMAC were interested in expanding the exclosure to a much larger area. A formal report is forthcoming.

Holistic Management training in October focused on the evaluation of exclosure demonstration sites and on how to sustainably expand the area of pastureland allowed to rest through a rotational grazing program. A key issue addressed was the identification of all stakeholders and the necessity for their involvement in a formal convention governing pasture use.

Work in the bourgoutière begins this month as the floodwaters recede. The NRMAC has agreed to conduct discussions with all bourgou stakeholders in order to develop a management plan for the regenerated bourgoutière.

Results

Limited results have been achieved up to this time. Efforts of IER researchers and NRMAC members have been focused on bourgoutière regeneration which begins this month.

Impacts

There are no impacts to report at this time.

Publications and Presentations

None.

Other Issues

There is a certain reticence on the part of the NRMAC to advance discussions very far with all stakeholders concerning *bourgou* regeneration until they are certain that IER will provide the needed sprouts and technical assistance in a timely manner.

Section V: The Global Project

Introduction

The Global Project serves several important purposes within the overall SANREM program. These include research, information exchange and decision support. These are each designed to integrate, augment and serve the regional projects and the program as a whole.

The Global Project of Phase II SANREM was originally designed to promote and ensure a focus on global issues and scaling up from SANREM Phase I. Through experiences in the first two years of Phase II at both the regional and global levels and to respond to external reviews of the Program, the role of the Global Project has evolved to better serve each of the projects.

GLOBAL PROJECT STRATEGY

The Global Project strategy involves research, information exchange, and decision support for decision-makers through:

- *The identification of difficult agriculture and natural resource management decisions and issues through an assessment of decision-maker priorities*

This research activity aims at better understanding the needs and priorities of natural resource decision-makers at multiple scales and in various sectors (government, private sector, NGOs). It is designed to ensure that decision support activities that seek to inform natural resource management decisions directly respond to the decision-makers' most pressing needs and priorities, especially in settings where devolution of or shifts in power are in progress.

- *Facilitation of communications and information exchange among regional and global projects, decision- makers, and agencies and institutions involved in similar work*

This activity involves both communications and information exchange in order to ensure that information generated with the SANREM projects is captured and shared within the SANREM community. It is also designed for information exchange among a broader network of institutions that may use the program outputs. These include research and policy briefs, case studies, newsletters, and a Web ring. Additionally, this activity serves to support institutionalization efforts in the program.

- *Production of information, tools, and training that help decision-makers identify alternative technologies, practices, and policies that contribute to more sustainable use of natural resources and to the sustainable production of food.*

A suite of geo-referenced economic, environmental and biophysical models is being developed and linked to holistically assess the impact of changes in technology or policy on food, agriculture and use of natural resources in developing countries. The resulting Global Decision Support System (GDSS) also will include critical foundation data for spatially explicit analyses as well as access through global networking to other models and sources of relevant information. GDSS is being developed and adapted for use at levels of scale from farm to global. Methods are developed and refined in collaboration with decision-makers and use relevant real-world assessments as development-demonstration platforms.

This approach produces methods tailored to the needs of specific users who participate in their development. The case studies also produce early useful products from the analysis. GDSS development is being linked to regional and other global SANREM activities by parallel development of methods and databases useful to regional projects and by mutually beneficial collaboration on specific assessment tasks within regional projects. The products of GDSS will be incorporated into the SANREM global information system.

Within the Global Project, these activities are termed:

- Assessment of decision-makers' priorities and decision-support opportunities
- Communications and information exchange
- Global decision support system

The first two sets of activities are managed through the Management Entity of the SANREM CRSP and the third is managed by SANREM-Global Decision Support System (GDSS) team at Texas A&M University.

Objective 1

Identify priority needs of local, national, regional and global decision-makers

Progress Toward Objective 1

GLOBAL-UNIVERSITY OF GEORGIA

As a result of ADMP, participants are conducting assessments with members of the State Technical Committee of the United States Department of Agriculture Natural Resource Conservation Service (USDA-NRCS). Dr. Jean Steiner, Director of the USDA J. Phil Campbell Sr. Natural Resource Conservation Center, has shared the results with Mr. Earl Cosby, State Conservationist, USDA-NRCS, to determine further interest in and application of the ADMP in North Georgia. This will likely lead to the development of an Initiative for Future Agriculture and Food Systems (IFAFS) proposal in 2001 that will focus on domestic ADMP activities.

GLOBAL DECISION SUPPORT SYSTEM

After the inaugural workshop on the Mali Pilot FIVIMS Study in December 1999 and follow-up meetings in February 2000, second and third planning workshops were held in July and September 2000. The purpose of those planning workshops was to consider the priority needs of regional and national decision-makers in Mali in the selection of five case studies to be conducted on technology and policy options affecting food security. These studies link with the evolution and implementation of the National Action Plan for Environment and the National Plans for Improving Food Security.

A planning workshop for the Kenya Pilot FIVIMS Study was held in September 2000. Participants included representatives from the Office of the President, several relevant ministries, the Kenya Agricultural Research Institute, the International Livestock Research Institute, FAO and representatives from the Governments of Tanzania and Uganda. Four case studies of high priority to decision-makers in Kenya and the region were identified and planned.

Representatives of SANREM-GDSS participated in the "Bamako Summit," which was the triennial meeting of the Heads of State, Ministers of Agriculture and Rural Development and other representatives of the CILSS countries. A poster for the meeting with a related paper for distribution was provided. The thrust of our engagement was toward identifying regional needs for impact assessment and methods to extend the products of the Mali Pilot Study to other areas. During the summit, a regional workshop on results was planned to take place in July 2001.

Objective 2

Facilitate communications and exchange of information among SANREM regional projects and between SANREM and other institutions, organizations, and agencies.

Progress Toward Objective 2

GLOBAL-UNIVERSITY OF GEORGIA

Information exchange was facilitated through participation in the following: the International Farming Systems Association (IFSA) meeting in Chile, the Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation workshop sponsored by the International Fund for Agricultural Development (IFAD) and the Food and Agriculture Organization of the United Nations (FAO), an electronic conference on Integrating Food Security in Research Agenda of the NARS, publication of reports and proceedings of the IFSA meetings, listservs, and the Impact Assessment workshop in Washington, DC.

GLOBAL DECISION SUPPORT SYSTEM

The GDSS effort toward this objective is to develop and encourage national to regional linkages and development of the global network of models and databases with FAO. Also, GDSS facilitates capacity building on use of impact assessment at varying levels.

In collaboration with FAO-WAICENT, phase one of software development for the "common modeling environment" was completed. This package will provide a seamless interface of, and access to, impact assessment models that are being networked for use by developed and developing countries.

Linkages between the GDSS and the Food Insecurity and Vulnerability Mapping System (WFS) in FAO continue as the development of methods and case studies focus on food security issues. The intent is to provide improved assessment tools to evaluate technology and policy options that improve food security and meet the goals of the WFS.

Discussions continue with the International Consortium for Agricultural Systems Applications (ICASA) toward the establishment of a network of impact assessment models and databases that will have FAO as their focal point. FAO-WAICENT is developing a broad initiative in this area that includes a partnership with SANREM to develop a series of distance learning modules for developing countries that will facilitate use of GDSS and other information.

Through an interface between the University of Florida and Texas A&M, preliminary plans have been established for a collaboration between the Soils CRSP and SANREM-GDSS in West Africa.

USAID sponsored a major workshop on impact assessment methods in Washington in July 2000. The workshop featured the models being developed under the GDSS. The CRSP Council and other potential users of the GDSS were made aware of the current status and potential utility of the GDSS for their individual assessments.

An East African workshop on impact assessment of smallholder dairy technology was held in Nairobi in September 2000. Final results of this study were reported and the impact assessment methodology was demonstrated to participants from Kenya, Uganda, and Tanzania.

Ongoing liaison with the West Africa Project was maintained relative to the planned collaboration with the GDSS activity set.

Global Project Objective 3

Improve the capability to make informed decisions and to assess the impact of decisions related to consequences of adopting specific agricultural and natural resources management technology, practices, and policy at landscape, provincial, national, regional and global levels.

Progress Toward Objective 3

GLOBAL-UNIVERSITY OF GEORGIA

An electronic conference on *Integrating Sustainable Food Security Dimensions into the Research Agenda of the National Agricultural Research Systems* was led by the Food and Agriculture Organization (FAO) of the United Nations in cooperation with the NARS Secretariat of the Global Forum on Agricultural Research (GFAR) and the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP) of the University of Georgia, USA. The e-conference lasted from June 5 to July 14 and had 400 participants from 50 countries. Constance Neely of SANREM led the E-conference team and served as conference moderator. Additionally, SANREM provided pre-conference support, prepared a flyer advertising the conference, and provided a Web page fro capturing interventions. The forthcoming output of the Conference will be a set of Guidelines entitled "Broadening the Research Horizon: Integrating Food Security Dimensions into the NARS Agenda. Several SANREM Colleagues provided interventions to the conference as well as case examples for the guidelines.

Constance Neely and Kathleen Cason attended an Impact Assessment Workshop held in Washington, D.C. from July 19 to 21. Various researchers from the CRSPs, CGIAR and World Bank plus all of the CRSP directors attended the workshop. The purpose of the workshop was to review and discuss ways to assess actual and potential impacts of agricultural research. Specifically, impact assessment models that are being developed with USAID support at Texas A&M University, the International Food Policy Research Institute (IFPRI) and by other partners in cooperation with the International Consortium for Agricultural Systems Applications (ICASA) were presented. The SANREM CRSP will prepare a summary document for this workshop.

GLOBAL DECISION SUPPORT SYSTEM

In this period, major emphasis has been placed on extending the software and analysis capability of the GDSS and to initiating new field studies in Kenya and Mali. Methods to simplify the analytic procedures in individual components of the suite of models have been advanced. The use of GIS methods was extended to improve the linkages between economic and biophysical models and to

streamline the research protocols for field studies. Research to refine and update the agricultural sector models at sub-national, national, and regional levels was initiated. Major improvements have been made in PHYGROW, NUTBAL and EPIC models. Almanac Characterization Tools were completed and delivered for use in Mali and Kenya. In country workshops on their use were completed. The Mali ACT was also prepared in French. New assessment tools and improved national and global databases have been added to the ACT. The Global Agricultural Sector Model is being used in U.S. assessment activities related to the COP-6 negotiations as it regards the agricultural response. Methods to improve the use of the normalized difference vegetation index (NDVI) by comparing it to forage models of ground-based information were continued with early encouraging results.

Planning workshops in Kenya and Mali involving decision-makers and research collaborators were conducted to develop specific protocols and commitments for involvement on substantial field studies to be initiated in December 2000 in both Mali and Kenya. In collaboration with Malian partners, representative farms in the Sikasso region of Mali have been selected for in-depth interviews to provide data needed to update the farm level and ASM models in Mali. Collection of biophysical and economic data from the region is underway. Field studies are to be completed in March and analysis of results done in time for a regional workshop in June or July 2001.

Numerous individual publications are noted in the activity reports for the GDSS. A major report on the development and use of the methods for impact assessment was completed in September 2000. This report is available at the Web site for the Center for Natural Resource Information Technology:

> *Impact Methods to Predict and Assess Contributions of Technology (IMPACT)*
> *http://cnrit.tamu.edu/IMPACT*

Progress Toward Five-Year Indicators

Progress made by the SANREM Global Project since June 1, 2000 is reported in this section. The indicators for the Global Project, as defined in the Global Project Work plan for 2000-2001 are stated and the progress is indicated below each statement. Please refer also to the section on Impacts for the Global Decision Support System (p. x), which provides additional closely related information on outputs.

OUTPUTS SUPPORTING LOCAL-TO-PROVINCIAL (LANDSCAPE) LEVEL DECISION-MAKERS

1. Methods developed to assess the priorities and needs of local-to-provincial (landscape) level agricultural and natural resource decision-makers and at least three documented cases of their application.

   GLOBAL-UNIVERSITY OF GEORGIA
   SANREM published a book entitled *Cultivating Community Capital for Sustainable Natural Resource Management: Experiences from the SANREM CRSP* that includes papers presented as part of a special session of the International Farming Systems Association in Chile during November 2000. This book documents six cases of SANREM experiences dealing with the needs of local-to-provincial level agricultural and natural resource decision-makers.

GLOBAL DECISION SUPPORT SYSTEM
Farm/household level surveys to improve farm level models were initiated and results will be used to provide input to sub-regional, regional and national impact assessment models in the GDSS.

2. Methods and tools designed to conduct *ex ante* assessments of alternative technologies, practices, and policies in the context of common goals, weighted trade-offs, etc. at the landscape/lifescape scale and at least three documented cases of their application.

   GLOBAL DECISION SUPPORT SYSTEM
   Research was initiated in the Sikasso region of Mali and in the Rift Valley of Kenya to develop and evaluate models that assess the impact of alternative technologies, practices and policies at the household and regional/provincial levels. Through a participatory approach involving decision-makers within government and research institutions, a set of case studies was defined for *ex ante* studies of the impact of these changes.

OUTPUTS SUPPORTING NATIONAL-TO-GLOBAL LEVEL DECISION-MAKERS

3. Methods created to assess the priorities and needs of national-to-global level agricultural and natural resources decision-makers and at least three documented case studies of their application.

   GLOBAL-UNIVERSITY OF GEORGIA
   Preliminary steps have been taken to synthesize results from the Assessments of Decision Maker Priorities surveys (ADMP) conducted in Mali, the Philippines, Ecuador and the Southern Piedmont Region of the United States. Planning has begun for the second expert consultation on the ADMP methodology.

   GLOBAL DECISION SUPPORT SYSTEM
   Research continued to develop methods to link national and regional priorities and needs in Mali and West Africa through collaboration with the Institut du Sahel and the Malian Institute of Economic Research. New emphasis is being placed on engagement of relevant NGOs and other regional organizations in defining needs and approaches. Linkages with the organizations monitoring progress towards the goals of the World Food Summit and the Convention to Combat Desertification within FAO were continued as part of the pilot studies supporting these international conventions continues.

4. Methods investigated and produced to assist in the evaluation of priorities *(ex ante)* and impact (*ex post*) of research and development investments for use by research managers and at least three documented case studies of their application.

   GLOBAL DECISION SUPPORT SYSTEM
   The next round of field studies, model development, and case studies conducted in Kenya will develop aim at specific applications by the Kenya Agricultural Research Institute for planning and prioritization of their research portfolio. Research in the Sikasso region aims to

evaluate the impact of emerging technology and thereby to focus the applied research and extension agenda of IER. Several *ex ante* studies are planned.

5. Methods developed to help evaluate the consequence of policy options aimed at enhancing food security, reducing poverty and improving environmentally sound use of natural resources for policy analysts and documented case studies of their application.

   GLOBAL DECISION SUPPORT SYSTEM
   This is a major thrust of the GDSS and research to develop these methods was ongoing during this period. Decision-makers participated in the definition of most relevant case studies to be undertaken in both Mali and Kenya and these studies will be initiated early in 2001 when models have been updated.

6. Improved institutional capacity created to use models and methods to make improved national, regional and global management decisions and case studies from at least two regional and two global institutions.

   GLOBAL DECISION SUPPORT SYSTEM
   Two workshops in Kenya and two in Mali have been conducted since June 1, 2000. These involved both planning and capacity building as seminars and informal discussions were done to better inform our collaborators and the users of the products of the GDSS. A joint proposal was prepared by FAO and the SANREM GDSS for external funding to increase the level of effort on packaging the GDSS models for increased usability and for training of regional users in East and West Africa.

OUTPUTS SUPPORTING INFORMATION EXCHANGE

7. Access to knowledge and tools generated by the SANREM program provided to a broad range of decision-makers through development of online resources including an electronic library, technical and non-technical presentations of information, and databases (searchable database for publications, documents, and human resource expertise).

   GLOBAL-UNIVERSITY OF GEORGIA
   An Access database was established that contains citations of all SANREM publications from Phase I and Phase II based on annual reports, semi-annual reports, the Phase I Impact Document and Web sites (old SANREM Andes, and Southeast Asia). Approximately 474 items have been identified including the following: 21 refereed journal articles, 9 books, 46 chapters, 8 manuals, 76 presentations, 80 reports, 2 videos, 3 annotated bibliographies, 15 theses or dissertations, 1 speech, 5 brochures, 1 database, 12 working papers, 1 monograph, 27 proceedings, and 167 unknown or other types of documents. Requests have been made for publications for which there are no copies at the Management Entity. Some have been received.

   Publications that are housed at the Management Entity have been recorded in a Pro-Cite database, which is published online via our Web site as a searchable bibliography. Abstracts

have been included when there are no copyright restrictions. There are currently about 150 holdings, 27 with abstracts.

GLOBAL DECISION SUPPORT SYSTEM
The SANREM GDSS involvement is mainly through its partnership with the Worldwide Agricultural Information Center of FAO for the development of a focal point within WAICENT to network impact assessment models and databases on a global basis for use by developing and developed countries. While FAO has a broad development effort in this area, the partnership with the SANREM GDSS focuses on using the Mali and Kenya pilot studies as platforms for developing and demonstrating the methods for packaging and linking models from various sources. Progress continued on this effort with the development and delivery of software from the GDSS to facilitate seamless linakge between models in the WAICENT network.

8. Methods generated to translate relevant statistical data defined by political boundaries to watershed/landscape boundaries for sub-national decision-makers and three documented case studies of their application.

GLOBAL DECISION SUPPORT SYSTEM
First generation methods for linking polygons defined by their geographic characteristics with politically defined areas within developing countries was completed last year. In this period, these methods have been refined and streamlined to make them more user-friendly and efficient. These methods are being applied to the current field studies in Sikasso and the Rift Valley.

9. Methods produced to assess impact of technology and policy options related to food security and sustainable development at the level of major world watersheds and two documented case studies of their application.

GLOBAL DECISION SUPPORT SYSTEM
On advice of the External Evaluation Panel with agreement of the Technical Committee, Management Entity, and USAID, this activity was deferred for future consideration. Development of methods for watershed level analysis of a more localized scope has been undertaken in the Sondu River Basin of Kenya. The External Review Panel, in its recent evaluation of the GDSS encouraged further studies on the Sondu River to further develop and evaluate the methods.

10. Methods developed to extrapolate the impact of research policy change to geographically equivalent areas across multiple political boundaries and three documented case studies of their application.

GLOBAL DECISION SUPPORT SYSTEM
Previous research on this output demonstrated proof of concept of extrapolating research results from Mali to Senegal and Burkina Faso (Sorghum Production System) and from Kenya to Uganda and Tanzania (smallholder dairy). Current research is aimed at refining

these methods and moving past pilot studies in individual countries to regional approaches that includes refinement of extrapolation methods.

11. Methods or processes advanced to transfer information, tools, etc. from one landscape in one geographic region to another regional and at least one case study describing transfer among two SANREM regional projects.

    GLOBAL DECISION SUPPORT SYSTEM
    The GDSS effort described under item 10 above also pertains to this output.

12. Methods to aggregate information collected at one scale to knowledge that can be applied at higher or lower scale demonstrated in at least one case study where higher scale information is synthesized to a lower scale and one case study where lower scale information is synthesized at a higher scale.

    GLOBAL DECISION SUPPORT SYSTEM
    In this period, the methods for aggregating and disaggregating biophysical information were substantially extended through GIS methods linked to models and current databases. The ability to model the performance of crops, forage, and livestock at varying levels of scale is coming into focus. Progress was made on linking ground based and satellite information and models (NDVI vs. PHYGROW). Farm level surveys are providing valuable information used to generate the budgets that drive the economic models at regional and national levels. This remains an area of research with considerable technical challenge.

ME-PRO 00-61 SANREM Year 2000 Conference in Chile

Constance Neely, University of Georgia
Principal Investigator

Dr. Mike Bertelsen, Virginia Polytechnic and State University, West Africa Project
Dr. Ian Coxhead, University of Wisconsin, Southeast Asia Project
Dr. Robert Rhoades, University of Georgia, Andes Project
Dr. Julio Berdegue and Dr. Edwin Price, Organizers IFSA Conference
Partners

Introduction

In the 1998-2003 Implementation Plan for Phase II, SANREM identified a Year 2000 Conference for global information exchange. In the December 1999 SANREM joint meeting, the Board of Directors and Technical Committee agreed that the 2000 conference could be held in conjunction with the 16th Symposium of the International Farming Systems Association (IFSA). This meeting took place from November 27 to 29, 2000 in Santiago, Chile. SANREM sponsored a special symposium within the Theme on *Institutional Development and Natural Resource Management.* This meeting brought together PIs from the SANREM CRSP research regions as well as non-SANREM researchers for a half-day symposium. The SANREM symposium was dedicated to the late Dr. Robert D. Hart in honor of his work in SANREM and with IFSA.

Objective

To enhance exchange between SANREM and non-SANREM researchers on the topic of Institutional Development.

Progress Toward Objective

The Management Entity worked with the regional project managers and the IFSA conference organizers to finalize a symposium entitled: *Cultivating Community Capital for Sustainable Natural Resource Management: Experiences from the SANREM CRSP.*

Two 1.5 hour-long sessions were held on November 28. Both sessions were moderated by SANREM Deputy Director Constance Neely and SANREM Director Carlos Perez.

In the morning session, three papers were presented by SANREM investigators from the regional projects in West Africa and Southeast Asia:

William Deutsch (Auburn University) discussed water quality monitoring efforts in the Philippines
Agustin Mercado (ICRAF) discussed the Landcare approach in the Philippines
Michael Bertelsen (Virginia Polytechnic and State University) discussed holistic management in West Africa

In the afternoon session, SANREM investigators from the Andes Regional Project:
presented two papers:

- Cornelia Flora (Iowa State University) discussed the advocacy coalition framework that is being used to study policy change in Ecuador
- Jan Flora (Iowa State University) discussed social capital and advocacy coalitions in Ecuador.
- A third paper was published but not presented due to illness. That paper was about future visioning work in Ecuador. Robert Rhoades was the author.

All papers presented were published in book-form and approximately 100 copies were distributed at the meeting. In addition, the book is being distributed at the Convention to Combat Desertification in Bonn, Germany in December 2000. Of the 500 books printed, approximately 250 have been distributed based on requests.

Results and Outcomes

SANREM research results were shared with a much broader audience during the conference and SANREM's network of individuals and institutions doing similar work will be expanded.

This meeting provided an opportunity for SANREM partners to share their findings on community based natural resource management with each other as well as to solicit feedback from key scientists from around the world.

This was an excellent opportunity for SANREM partners to participate in a major international symposium.

There was an association-wide tribute to Dr. Bob Hart.

SANREM was well received at the conference and Drs. Constance Neely and Cornelia Flora were asked to serve as co-presidents for the 17th Symposium of the International Farming Systems Association (IFSA) to be held in Florida in 2002.

Impacts

A most important impact of this work was the synergistic effect of SANREM's story being told to a wide audience of researchers and development professionals and the resulting networks formed.

Publications

Cason, Kathleen (ed). 2000. Cultivating Community Capital for Natural Resource Management: Experiences from the SANREM CRSP. Athens, Ga.: SANREM CRSP. 62 pp.

GLO 00-31 Assessment of Decision-Maker and Decision Support Opportunities

Dr. Constance Neely, University of Georgia
Principal Investigator

Dr. Gladys Buenavista, University of Wisconsin
Ms. Julia Earl, University of Georgia
Ms. Edith Fernández-Baca, Iowa State University
Dr. Cornelia Flora, Iowa State University
Dr. Jan Flora, Iowa State University
Dr. Keith Moore, Virginia Polytechnic and State University
Dr. Carla Roncoli, University of Georgia
Dr. Jean Steiner, USDA/Agricultural Research Service Georgia
Cooperators

Introduction

The five-year strategy is based on collaboration with SANREM's regional projects and other global projects. Having devoted the previous year to developing a methodology and conducting participatory appraisals of decision-makers' needs and priorities in the Philippines, Ecuador and Mali, this year's emphasis will be on validating, compiling, and disseminating the results. A participatory methodology has been developed and is being fine-tuned with input by an expert panel. Preliminary participatory appraisals have been undertaken in each of the SANREM sites and in one additional region in the U.S. to identify critical decisions related to natural resource management, relevant issues, major constraints that shape those decisions, and desired outcomes as perceived by decision-makers. From the local to regional level, the project has identified decision support priorities, including some initial insights as to tools, information, and capacity building needs.

During Year 3, this activity will focus on finalizing the process in ways that ensure tangible outputs and institutional impacts by fine-tuning the methodology, validating the findings, synthesizing lessons learned, and disseminating the results across the regions and globally. These outputs will also be used by the Decision Support System activities in regional and global projects. They will be integrated into a monitoring and evaluation framework to assess the progress of SANREM global and site-specific decision support activities.

Objective 1

To fine-tune the methodology for identification and understanding of natural resource decision-making priorities and constraints.

Progress Toward Objective 1

Progress has been made in meeting the objective of developing a methodology to understand decision-maker needs at multiple scales by addressing methods identified in the Assessment of Decision Maker Priorities (ADMP) work plan. Notable areas of progress include the following. Discussions have been held between SANREM and the United Nations Food and Agriculture

Organization (FAO) regarding preparations for the upcoming electronic conference on decision-making demands. Preliminary steps have been taken to synthesize results from the assessments conducted in Mali, the Philippines, Ecuador and the Southern Piedmont Region of the United States. Planning has begun for the second expert consultation on the ADMP methodology.

Objective 2

To synthesize and prioritize decision-maker concerns to help focus decision support research activities of SANREM, its collaborating partners, and other interested parties.

Progress Toward Objective 2

No report.

Objective 3

To compare and validate the demand for tools, information, and capacity building support to improve natural resource management decisions in the regions and globally.

Progress Toward Objective 3

No report.

Objective 4

To integrate findings into a participatory monitoring and evaluation framework to assess how research activities are progressing towards addressing decision-maker priorities

Progress Toward Objective 4

Research regarding participatory monitoring and evaluation frameworks was undertaken during this reporting period. The result of the research was the compilation of a paper, "Creating a Continuous Learning System: Participation and Evaluation in Agriculture Development Projects" that was subsequently presented at an international conference on Evaluation of International Cooperation Projects: Centering on Development of Human Resources in the Field of Agriculture in Nagoya, Japan. Full-fledged development of the monitoring and evaluation framework is foreseen to take place during the final year of the project (i.e. 2002).

Results and Outcomes

As a result of ADMP participants conducting assessments with members of the State Technical Committee of the United States Department of Agriculture Natural Resource Conservation Service (USDA-NRCS), Dr. Jean Steiner, Director of the USDA J. Phil Campbell Sr. Natural Resource Conservation Center has shared the results with Mr. Earl Cosby, State Conservationist, USDA-NRCS, to determine further interest in and application of the ADMP in North Georgia. This will likely lead to the development of an Initiative for Future Agriculture and Food Systems (IFAFS) proposal in 2001 that will focus on domestic ADMP activities.

Impacts

To date, there aren't any significant impacts to report for this activity. Project investigators are working toward measurable impacts in the final year of the project.

Publications

UNDER REVIEW

Moseley, W.G., J.A. Earl and L. Diarra. (nd). L'Échelle des Moyens d'Existence et la Gestion Communautaire des Ressources Naturelles: La Décentralisation et les Conflits Agro-Pastoraux dans le Delta Intérieur du Niger au Mali. Under review for inclusion in *Les Actes du Séminaire International sur La Gestion des Ressources Naturelles en Zones Inondables Tropicales, Bamako, 20-23 Juin.* Institut de Recherche pour le Développement. Paris, France. (Submitted 9/30/00)

Moseley, W.G., J.A. Earl and L. Diarra. (nd). Livelihood System Scale and Local Natural Resource Management: Decentralization and Farmer-Herder Conflicts in Mali's Inner Niger Delta.Under review at *Natural Resources Forum.* (Submitted 11/6/00)

CONFERENCE PRESENTATIONS

Moseley, W.G., J.A. Earl and L. Diarra. 2000. L'Échelle des Moyens d'Existence et la Gestion Communautaire des Ressources Naturelles: La Décentralisation et les Conflits Agro-Pastoraux dans le Delta Intérieur du Niger au Mali.Paper presented at the International Seminar on Integrated Natural Resources Management in Tropical Wetlands. June. Bamako, Mali.

Flora, Cornelia Butler, Jan L. Flora, Florencia Campana and Edith Fernández-Baca. 2000. The Advocacy Coalition Framework: A Theoretical Frame for SANREM to Address Policy Change and Learning. Paper presented at a Special Session of the 16th Symposium of the International Farming Systems Association and the 4th Latin American Farming Systems Research and Extension Symposium. November. Santiago, Chile.

Neely, C.L., E.T. Kanemasu and J. Earl. 2000. Creating a Continuous Learning System: Participation and Evaluation in Agriculture Development Projects. Paper presented at the 2nd International Cooperation Center for Agricultural Education (ICCAE) Open Forum: Evaluation of International Cooperation Projects: Centering on Development of Human Resources in the Field of Agriculture. December. Nagoya, Japan.

Other Issues

Dr. Constance Neely, the Principal Investigator for the ADMP activity, has served as SANREM's Acting Director from June 1999 to November 2000. As such, progress on the ADMP has not met projected expectations. However, with the arrival of SANREM's new Program Director (November 2000) we expect to accelerate progress toward activity objectives during the second half of year three (i.e. January – June 2001).

GLO 00-11 Communications and Information Exchange

Kathleen Cason, University of Georgia
Principal Investigator

Constance Neely, University of Georgia
Robert Phares, University of Georgia
Julia Earl, University of Georgia
Collaborators

Introduction

While publication of journal articles is an essential component of any research program, access to research results in that venue is limited to a narrow, scientific audience. Recasting research results for the broad audiences that can benefit from SANREM activities can expand their impact. SANREM Phase II now is at a point where a sufficient body of information is available and ready to be broadcast, in coordination with the regional projects.

The activities proposed here would strengthen ongoing communications efforts, would make SANREM research results accessible to a variety of audiences, and would generate awareness of the SANREM program in general. The Management Entity will take the lead role for these activities by coordinating communications with external audiences about SANREM projects, by disseminating general and technical information to those interested in sustainable agriculture and natural resource management, and by providing leadership for internal communications (e.g. reporting) within the SANREM CRSP.

These activities incorporate and build on current communications activities and support the five-year goals of SANREM by making knowledge accessible to decision-makers and researchers. Year 2 activities that were described in GLO 41 Knowledge Base are incorporated into this work plan. The focus of Year 3 activities will be on further development of an information system and on communication of research results to a variety of audiences.

Objective 1

Collect and facilitate access to knowledge generated by SANREM regional and global projects.

Progress Toward Objective 1

REVISE AND UPDATE SANREM HOME PAGE

Drafts of a redesign for the SANREM Web site were prepared and a design has been selected. The structure of the new Web site has been established. The new design will allow us to post relevant technical findings, papers, conference proceedings, and abstracts easily. The new site will be operational within the next six months.

New features have been added to the current Web site including a protected area where authorized users can upload files, obtain addresses and other information for those associated with SANREM, information about the countries where SANREM operates, and a place to add suggested links for our site.

Another improvement is that a T-1 line has been installed. High-speed T-1 lines offer more reliable, high capacity Internet connections than the 56.6 kbps modem connection that we relied on previously.

INVESTIGATE ESTABLISHMENT OF A WEB RING
A Sustainable Development Web ring already exists. Currently, we do not meet the criteria for joining the Web ring but once the new Web site is operational, we will be eligible to join.

PHYSICAL AND DIGITAL ARCHIVE OF SANREM CRSP RESEARCH
This year we requested that electronic and hard copies of all 1999 publications be submitted with annual reports. This was fairly successful way of obtaining materials as most Program Managers and Principal Investigators honored the request.

An Access database was established that contains citations of all SANREM publications from Phase I and Phase II based on annual reports, semi-annual reports, the Phase I Impact Document and Web sites (old SANREM Andes, and Southeast Asia). Approximately 474 items have been identified including the following: 21 refereed journal articles, 9 books, 46 chapters, 8 manuals, 76 presentations, 80 reports, 2 videos, 3 annotated bibliographies, 15 theses or dissertations, 1 speech, 5 brochures, 1 database, 12 working papers, 1 monograph, 27 proceedings, and 167 unknown or other types of documents. Requests have been made for publications for which there are no copies at the Management Entity. Some have been received.

Publications that are housed at the Management Entity have been recorded in a Pro-Cite database, which is published online via our Web site as a searchable bibliography. Abstracts have been included when there are no copyright restrictions. There are currently about 150 holdings, 27 with abstracts.

PHYSICAL LIBRARIES OF SANREM-SUPPORTED RESEARCH FINDINGS AT REGIONAL SITES
This effort will not begin until the Management Entity's holdings are more substantial.

Objective 2

Generate awareness of SANREM research and activities and promote understanding of sustainable agriculture and natural resources management issues, in particular as undertaken by SANREM.

Progress Toward Objective 2

To generate awareness of SANREM research, participants for GLO-11 engage in a number of activities that garner SANREM national and international exposure:

FAO AND ELECTRONIC CONFERENCES
An electronic conference on *Integrating Sustainable Food Security Dimensions into the Research Agenda of the National Agricultural Research Systems* was led by the Food and Agriculture Organization (FAO) of the United Nations in cooperation with the NARS Secretariat of the Global Forum on Agricultural Research (GFAR) and the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP) of the University of Georgia, USA. The e-conference lasted from June 5 to July 14 and had 400 participants from 50 countries. Constance Neely of

SANREM led the E-conference team and served as conference moderator. Additionally, SANREM provided pre-conference support, prepared a flyer advertising the conference, and provided a Web page fro capturing interventions. The forthcoming output of the Conference will be a set of Guidelines entitled "Broadening the Research Horizon: Integrating Food Security Dimensions into the NARS Agenda. Several SANREM Colleagues provided interventions to the conference as well as case examples for the guidelines.

DRAFTING GUIDELINES FOR FAO

Representatives from FAO/Rome and the SANREM CRSP are developing guidelines to help National Agricultural Research Systems in developing countries broaden their research agendas to include food security. The guidelines are based on a SANREM/FAO sponsored electronic conference and are due out at the end of the January. SANREM will have several case studies included in these guidelines.

IMPACT ASSESSMENT WORKSHOP

Constance Neely and Kathleen Cason attended an Impact Assessment Workshop held in Washington, D.C. from July 19 to 21. Various researchers from the CRSPs, CGIAR and World Bank plus all of the CRSP directors attended the workshop. The purpose of the workshop was to review and discuss ways to assess actual and potential impacts of agricultural research. Specifically, impact assessment models that are being developed with USAID support at Texas A&M University, the International Food Policy Research Institute (IFPRI) and by other partners in cooperation with the International Consortium for Agricultural Systems Applications (ICASA) were presented. The SANREM CRSP will prepare a summary document for this workshop.

CARBON SEQUESTRATION

Carbon sequestration — as it relates to agriculture and land use — was the subject of an international workshop held in Geneva, Switzerland from August 30 to September 1, 2000. More than 60 scientists and development practitioners joined in Geneva to examine these issues and look to the way forward. Representing the SANREM CRSP at this workshop were the following: Ed Kanemasu (University of Georgia), Thomas Price (SANREM/FAO), Mike Bertelsen (SANREM/West Africa at Virginia Polytechnic) and Dennis Ojima (SANREM Technical Committee and Colorado State University).

EARTH SUMMIT II

This past November, the SANREM began discussions with the Agriculture Department at the U.N.'s Food and Agriculture Organization regarding collaborative efforts in preparation for Earth Summit II in 2002.

SPECIAL SYMPOSIUM IN CHILE

The SANREM CRSP sponsored a special symposium at the International Farming Systems Association meeting held in Santiago, Chile from November 27 to 29. Details of this symposium are reported in activity ME PRO 61. Communications provided support to this effort by producing fliers and posters to advertise the session and a poster describing the SANREM CRSP.

SANREM RESEARCHERS ARE NEW CO-PRESIDENTS OF IFSA
Constance Neely, deputy director of the SANREM CRSP, and Cornelia Flora, Andes Regional Project, were selected as co-president of the International Farming Systems Association during the biennial meeting in Chile. The next IFSA meeting will be held in the U.S. in 2002.

Objective 3

Facilitate exchange of information and data generated by SANREM research among and between SANREM partners and others interested in sustainable agriculture and natural resource management.

Progress Toward Objective 3

- Coordinated, edited, designed, wrote portions and distributed the 1999 Annual Report
- Coordinated, edited, wrote portions and distributed the 2000-2001 Semi-Annual Report
- Coordinated, edited, designed and distributed a book containing papers presented at the Special Session of the IFSA meeting in Chile
- Coordinated and wrote response to the Year 3 Work Plan for USAID
- Pitched news release about SANREM participation in CSD-8 to various media outlets. Two articles were published in local newspapers. The University of Georgia's College of Business magazine wrote a spin off article about a student that SANREM helped get appointed to be part of the CSD-8 delegation for the U.S.
- Since June, seven electronic news messages were distributed to SANREM partners, CRSP directors, and others providing information on upcoming events, opportunities for funding, deadlines, and SANREM news. For more efficiency and to increase the number of recipients we can reach, a listserve has been established to distribute e-news. E-mail addresses for PIs have been collected to expand the number of people that can be reached.
- Briefing books for External Evaluation Panel for TAMU, Andes, and Management Review were produced
- The contact list that includes SANREM partners, organizations with similar interests, and media contacts have been set up in an Access database that is available on the protected area of the Web site
- Quarterly search for additional funding opportunities; search results distributed to program managers and principal investigators
- Provided editorial support to Southeast Asia project (edited chapter for SEA monograph; designed html flier for upcoming SEA Annual meeting)
- A database of important SANREM facts and online trip reporting have been set up and implemented in a test environment
- Listservs were established to facilitate communication for the CRSP Council and collaborators in a grant proposal on Carbon Sequestration (Soils CRSP and others).

Results and Outcomes

Awareness of SANREM activities was broadened by participating in activities with organizations such as FAO, IFSA, and the CRSP Council. As a result of the Impact Assessment Workshop, SANREM activities were described for representatives of the CRSP Council, World Bank and CGIAR. The supporting documents that SANREM prepares as a result of these interactions furthers awareness of SANREM as well.

Impacts

No report.

Publications

Cason, Kathleen (ed.). 2000. Choosing a Sustainable Future: SANREM CRSP 1999 Annual Report. Athens, Ga.: SANREM CRSP. 121 pp.

SANREM CRSP. 2000. Semi-Annual Report for June to November 2000. Athens, Ga.: SANREM CRSP.

Neely, Constance. 2000. Participatory Monitoring and Evaluation of Capacity Building Efforts. Panelist at Impact Assessment Workshop, Washington, D.C. July 19 to 20.

Other Issues

A quarterly newsletter was originally planned for this activity. Contributions to the newsletter have been sporadic so we are considering the creation of a news page on our new Web site instead. This would allow us to distribute a story as soon as a contribution is received instead of waiting until there is enough material for a newsletter. This may be a better — certainly a cheaper — approach. However, if contributions increase, we would revisit this.

Global Decision Support System

Neville P. Clarke, Texas A & M
Activity Set Coordinator

Introduction

Several related activities of the Global Project are aggregated under an activity set called the Global Decision Support System (GDSS). This term was chosen at the outset of SANREM II to show the coherence of several activities documented under the Global Project. In recent external reviews of the GDSS, we have recommended to the review team that this subset be documented as a project to avoid confusion. This report deals with the GDSS as an activity set and follows the format for project level reporting. There are seven activities in the set. Four reflect the subsets of modeling that are involved in the overall system. Two deal with applications and capacity building. All of the activities are actively pursued in two broad locations – East and West Africa. Pilot studies are being conducted in one country in order to develop and evaluate models to be used by multiple countries in the regions and at the global level.

Progress Toward Five-Year Indicators

Progress made by the SANREM Global Project since June 1, 2000 is reported in this section. The indicators for the Global Project, as defined in the Global Project Work plan for 2000-2001 are stated and the progress is indicated below each statement. Please refer also to the section on Impacts for the Global Decision Support System (p. x), which provides additional closely related information on outputs.

OUTPUTS SUPPORTING LOCAL-TO-PROVINCIAL (LANDSCAPE) LEVEL DECISION-MAKERS

1. Methods developed to assess the priorities and needs of local-to-provincial (landscape) level agricultural and natural resource decision-makers and at least three documented cases of their application.

   Farm/household level surveys to improve farm level models were initiated and results will be used to provide input to sub-regional, regional and national impact assessment models in the GDSS.

2. Methods and tools designed to conduct *ex ante* assessments of alternative technologies, practices, and policies in the context of common goals, weighted trade-offs, etc. at the landscape/lifescape scale and at least three documented cases of their application.

   Research was initiated in the Sikasso region of Mali and in the Rift Valley of Kenya to develop and evaluate models that assess the impact of alternative technologies, practices and policies at the household and regional/provincial levels. Through a participatory approach involving decision-makers within government and research institutions, a set of case studies was defined for *ex ante* studies of the impact of these changes.

3. Methods created to assess the priorities and needs of national-to-global level agricultural and natural resources decision-makers and at least three documented case studies of their application.

   Research continued to develop methods to link national and regional priorities and needs in Mali and West Africa through collaboration with the Institut du Sahel and the Malian Institute of Economic Research. New emphasis is being placed on engagement of relevant NGOs and other regional organizations in defining needs and approaches. Linkages with the organizations monitoring progress towards the goals of the World Food Summit and the Convention to Combat Desertification within FAO were continued as part of the pilot studies supporting these international conventions continues.

4. Methods investigated and produced to assist in the evaluation of priorities (*ex ante)* and impact (*ex post*) of research and development investments for use by research managers and at least three documented case studies of their application.

   The next round of field studies, model development, and case studies conducted in Kenya will develop aim at specific applications by the Kenya Agricultural Research Institute for planning and prioritization of their research portfolio. Research in the Sikasso region aims to evaluate the impact of emerging technology and thereby to focus the applied research and extension agenda of IER. Several *ex ante* studies are planned.

5. Methods developed to help evaluate the consequence of policy options aimed at enhancing food security, reducing poverty and improving environmentally sound use of natural resources for policy analysts and documented case studies of their application.

   This is a major thrust of the GDSS and research to develop these methods was ongoing during this period. Decision-makers participated in the definition of most relevant case studies to be undertaken in both Mali and Kenya and these studies will be initiated early in 2001 when models have been updated.

6. Improved institutional capacity created to use models and methods to make improved national, regional and global management decisions and case studies from at least two regional and two global institutions.

   Two workshops in Kenya and two in Mali have been conducted since June 1, 2000. These involved both planning and capacity building as seminars and informal discussions were done to better inform our collaborators and the users of the products of the GDSS. A joint proposal was prepared by FAO and the SANREM GDSS for external funding to increase the level of effort on packaging the GDSS models for increased usability and for training of regional users in East and West Africa.

OUTPUTS SUPPORTING INFORMATION EXCHANGE

7. Access to knowledge and tools generated by the SANREM program provided to a broad range of decision-makers through development of online resources including an electronic library, technical and non-technical presentations of information, and databases (searchable database for publications, documents, and human resource expertise).

   This output is targeted mainly to GLO 00-11, Communication and Information Exchange. The SANREM GDSS involvement is mainly through its partnership with the Worldwide Agricultural Information Center of FAO for the development of a focal point within WAICENT to network impact assessment models and databases on a global basis for use by developing and developed countries. While FAO has a broad development effort in this area, the partnership with the SANREM GDSS focuses on using the Mali and Kenya pilot studies as platforms for developing and demonstrating the methods for packaging and linking models from various sources. Progress continued on this effort with the development and delivery of software from the GDSS to facilitate seamless linakge between models in the WAICENT network.

8. Methods generated to translate relevant statistical data defined by political boundaries to watershed/landscape boundaries for sub-national decision-makers and three documented case studies of their application.

   First generation methods for linking polygons defined by their geographic characteristics with politically defined areas within developing countries was completed last year. In this period, these methods have been refined and streamlined to make them more user-friendly and efficient. These methods are being applied to the current field studies in Sikasso and the Rift Valley.

9. Methods produced to assess impact of technology and policy options related to food security and sustainable development at the level of major world watersheds and two documented case studies of their application.

   On advice of the External Evaluation Panel with agreement of the Technical Committee, Management Entity, and USAID, this activity was deferred for future consideration. Development of methods for watershed level analysis of a more localized scope has been undertaken in the Sondu River Basin of Kenya. The External Review Panel, in its recent evaluation of the GDSS encouraged further studies on the Sondu River to further develop and evaluate the methods.

10. Methods developed to extrapolate the impact of research policy change to geographically equivalent areas across multiple political boundaries and three documented case studies of their application.

    Previous research on this output demonstrated proof of concept of extrapolating research results from Mali to Senegal and Burkina Faso (Sorghum Production System) and from Kenya to Uganda and Tanzania (smallholder dairy). Current research is aimed at refining these methods and moving past pilot studies in individual countries to regional approaches that includes refinement of extrapolation methods.

11. Methods or processes advanced to transfer information, tools, etc. from one landscape in one geographic region to another regional and at least one case study describing transfer among two SANREM regional projects.

    The GDSS effort described under item 10 above also pertains to this output.

12. Methods to aggregate information collected at one scale to knowledge that can be applied at higher or lower scale demonstrated in at least one case study where higher scale information is synthesized to a lower scale and one case study where lower scale information is synthesized at a higher scale.

    In this period, the methods for aggregating and disaggregating biophysical information were substantially extended through GIS methods linked to models and current databases. The ability to model the performance of crops, forage, and livestock at varying levels of scale is coming into focus. Progress was made on linking ground based and satellite information and models (NDVI vs. PHYGROW). Farm level surveys are providing valuable information used to generate the budgets that drive the economic models at regional and national levels. This remains an area of research with considerable technical challenge.

Impacts of the Activity Set

The expected impacts of the GDSS were presented collectively in the 2000-2001 work plan because of the integrated nature of the activities. This report takes the same approach.

The GDSS will enhance the capacity of decision-makers in developing countries at multiple levels of scale as they consider impacts and trade-offs for policy options and the planning and use of technology to enhance the sustainable production of food. Their success will be measured by the ability to increase the quantity of food (availability) and generate new economic activity from agriculture (reduce poverty and create access to food). For enhanced production of food to be sustainable, those considering new policies and technologies must deal with the combination of food production and the sustainable use of natural resources. The GDSS, as an integrated suite of economic, biophysical, and environmental models, is intended to provide decision-makers with the capability to make rational and balanced decisions.

The SANREM definition of impact requires that the research not only produce useful results, but that users put results into practice. Results must be both useful and usable. Thus, it implies that technology transfer will be successfully accomplished. It is well known that this is often a daunting goal in the developing world as the factors which affect adoption of new knowledge and technology often lie outside the reach of the research effort which generates them. Because the research under this activity set is still only at the halfway mark in the five-year study, it is not surprising that the expected impacts, under this definition, have not yet been fully achieved.

In the case of the GDSS effort, the approach is to involve the ultimate user in the definition, execution, and evaluation of the methods being developed for impact assessment. Those who participate in the research and evaluation of results are most likely to be adopters and users of the product. However, it is recognized that, at the end of the day, the utility of the product will be paced

by factors not controlled by the researchers. Impact of this research will involve decision-makers at varying levels of scale and with an array of responsibilities.

The following section contains the statement of expected impact followed with a statement *in italics* of impact achieved through the period of this report.

Donor representatives of developed countries, either individually or as groups in various coalitions will use the GDSS to set priorities for their investments and to evaluate the results. The collaboration with FAO's WAICENT will contribute to the global accessibility of information and models used in these decisions.

Workshops for the Global Bureau of USAID and the CGIAR Standing Committee on Impact Assessment have been held and users in both these groups are considering the GDSS suite as part of the impact assessment portfolio.

High-level decision-makers in developing countries concerned about food security and the environment will make more informed and balanced decisions about policy options, allocation of natural resources, and investments in research and extension through the use of the GDSS by analysts in their organizations. The GDSS will enhance the ability to measure progress toward achieving goals. The early and continuing involvement of senior people in the governments of developing countries will help ensure that the product is used. The FIVIMS-GTOS pilot studies and related participation and capacity building will provide the framework of engagement by policymakers and analysts to ensure adoption of the GDSS.

The relevant decision-makers in the countries where pilot studies are underway are directly involved in setting the needs, planning the development and evaluating the results of the development of the GDSS and the case studies done to illustrate its utility. This will contribute to the likelihood of the methods being adopted. The same engagement will be required in other countries where the models are used. The partnership with FAO to package the models for ease of use, build capacity, and provide a network of models and data bases that can be accessed by developing country users also increases the probability of their being put to practice.

Regional organizations of developing countries that have the mandate for planning and cooperating on matters related to food security, use of natural resources, and environmental concerns will use the GDSS at the regional level to consider factors that have multinational implications such as the use of water and the development of regional markets. Involvements with the CILSS institutes in West Africa and ASARECA in East Africa are examples of engagements that will help ensure use of the GDSS at this level.

Regional research and economic organizations in Sub-Saharan Africa are developing the capacity to provide leadership and coherence across the African states they represent. Linkages with the CILSS and ASARECA groups are providing an early awareness of the leadership in their constituent nations of the capabilities of the GDSS. National scientists participating in the pilot countries will become the trainers of their counterparts in other countries of their region. The use of the GDSS at the regional level per se is also an application that is being encouraged.

Individual national research and extension organizations in developing countries will use the GDSS to plan and evaluate their portfolios and to develop more effective advocacy for the resources needed from them to meet their objectives.

The involvement of these groups in the development and evaluation of the GDSS will increase the probability of their adopting and using the products. Demonstration of the successful use of the models for relevant case studies in pilot countries will enhance the likelihood of their being used in adjacent countries of the regions.

Extension workers and NGOs will use the GDSS to provide farmers and farmer organizations quantitative estimates of the benefits as well as the risks of new technology and practices - both in terms of income and natural resource consequences.

New emphasis is being placed on the engagement of NGOs as participants in the development of the models and as important customers. As noted by the recent review of the GDSS by the External Evaluation Panel, these groups are becoming one of the few effective mechanisms for transfer of new knowledge and capacity.

Models at the landscape and watershed level will often assist in decision-making on a multinational scale. Regional associations of developing countries, with increasing support from donor organizations, will provide a framework for communication that will enhance adoption of the GDSS and related capacities of SANREM.

There is little doubt of the need for models that evaluate the options for multinational negotiations on water rights and use. At this point in the project, we have only begun to develop watershed models at a modest scale. Our earlier plans to work on watersheds of the world were put on hold because resources were not available to pursue them.

Subnational decision-makers from province to village levels will use the GDSS to assist in decision-making on the allocation and use of natural resources in the quest for sustainable ways of increasing income and food production. Collaboration with national programs and with regional SANREM projects will help to ensure a participatory approach leading to adoption of the models at these levels of scale.

We are ready to engage the West Africa Project in our planned collaboration when their activity reaches the appropriate level. Our studies in the Sikasso region of Mali and in the Rift Valley of Kenya, linking farm to regional models, are providing engagement with local representatives of NGOs, research, and extension workers and experience that will help ensure the utility of our product at more local levels of scale.

Farmers - *the ultimate integrators* - will benefit from the GDSS through more rational and balanced decisions made by governments and institutions affecting them and they will use elements of the GDSS to make more informed decisions about sustainable production of food and fiber at the farm level. The GDSS has the potential of making farmers more effective advocates of their needs with governments and institutions affecting them through more informed analysis.

This ultimate goal must be kept in mind as we continue to engage decision-makers at the several levels of scale stated in our plan.

Global level analysis will be used to provide an estimate of the effect of multinational markets and related demand and trade issues and their influence the performance of food production systems in individual developing nations. It will be used at the global level to contribute to the projections of future food security by FAO.

Our early contacts with global forecasters in FAO elicited a substantial interest in these models. We have agreed that we need to demonstrate their utility at national and regional levels and then look toward their global application in collaboration with FAO.

Economic, biological, and environmental models, used either singly or in concert will provide decision-makers at varying levels of scale with quantitative methods of assessing the impact of decisions regarding the development and adoption of agricultural technology and the natural resource and environmental consequences of these decisions. The GDSS will offer a means of seeking "optimal" solutions to very difficult trade-offs.

We have demonstrated the proof of concept for this capability and are well along toward the next level of development and evaluation.

The biological and environmental models developed under the GDSS will help policymakers and natural resources managers make better decisions using new methods of monitoring and effecting improvements in the status of marginal lands and limited water in semi-arid regions. The models will contribute to the ability to assess the impact of intensification of production using fewer limited resources. The use of new satellite imagery, coupled with GDSS models will provide decision-makers with a relatively low cost method of broad area assessment and monitoring of the status of fragile lands and contribute to the reduction of desertification.

Our research in this area is still at a very early stage. We have engaged some very knowledgeable collaborators and it appears that the technology and analysis capabilities are rapidly emerging. It will be important for the GDSS effort to find its niche in a very large area of science to ensure that our input will be meaningful.

GLO 00-20 Activity Set Management

Dr. Neville Clarke, Texas A&M
Principal Investigator

Dr. Bobby Eddleman, Texas A&M
Dr. Jerry Stuth, Texas A&M
Cooperators

Introduction

GDSS development is conducted by the Impact Assessment Group in the Texas Agricultural Experiment Station (TAES); a part of the Texas A&M University System. Funds for salaries are distributed to appropriate units of the TAES. Remaining funds are managed centrally by consensus. In most cases, the Management Entity invites the participation of the principal investigator to Project Manager meetings. Collaborations with CRSPs, IARCs and national/regional programs are used to gain in-country presence and knowledge of social background affecting impact assessment. Individual scientists from NARS are supported for collaboration in specific data gathering and modeling activities, directly linked to US-based methodological development.

The Impact Assessment Group has an ongoing planning and evaluation effort that defines the activities at the interface of the several models in the suite and the products of the integrated effort. Five of the activities deal with method development. The Activity Set description shows interrelationships between individual activities and how they serve multiple decision-makers and multiple levels of scale.

Objective 1

Provide a central focal point for scientific and administrative functions of the activity set

Progress Toward This Objective

STRATEGIC PLANNING

As year three of the GDSS activity began, our group used the experience of the first two years as a basis for in-depth assessment of the progress and issues remaining to achieve the overall goals of the activity set. We developed plans for the further integration of the suite of models and for taking the pilot studies from national to regional and global levels. We developed plans for engagement of additional partners such as FAO and ICASA as we move towards participating in development of a global network of models and datasets that will be made available to developing and developed country users.

LEVERAGED RESOURCES

Two proposals were submitted to the National Science Foundation for research directly related to the proposal for a new start on Ecosystem Assessment. This relates to a proposal for a new activity under the GDSS that was encouraged but not funded by USAID. A joint FAO-SANREM proposal for capacity building and networking on impact assessment methods and datasets was made to FAO co-sponsors and is pending.

EXTERNAL EVALUATION OF GDSS

The External Evaluation Panel conducted a review of this activity set during the period October 3-4, 2000. The report from the panel to the members of the GDSS was very positive about the accomplishments of this group. We were encouraged to push ahead on linkages with regional projects where possible. We have initiated another round of discussions with the West Africa Project leader toward this end.

EXTERNAL MANAGEMENT REVIEW OF SANREM

The review team visited Texas A&M November 6-7, 2000 as part of the overall review of SANREM. While emphasis was on management issues, there was also opportunity for a briefing to the team on the GDSS program. There was in-depth discussion about the overall management of SANREM with opportunities to make recommendations on ways to enhance its efficiency and effectiveness.

Results and Outcomes

The management function in the GDSS is achieving its stated goals. The recent External Evaluation Panel Report gives this activity high marks.

GLO 00-21. Global Level Analysis

Dr. Bruce McCarl, Texas A&M
Principal Investigator

Mr. Tanvier Butt, Texas A&M
Cooperator

Introduction

USAID, FAO and other donor development agencies have ongoing and emerging programs that assess the global status of hunger, trends in food insecurity and vulnerability, and the capacity to produce food, fiber, and forest products in a sustainable manner. Information to support these programs comes from sources that range from local through national to global (e.g., satellite imagery). USAID also needs methods that can be used by their collaborators to assess the impact of research investments in both *ex ante* and *ex post* analyses.

The GDSS collaborates with three FAO global programs to develop methods to extend the breadth and depth of analysis at the global level. Methods are being developed to assess the current status and trends of food security, the factors that determine this status, and the impact of alternative strategies, policies, or use of new technology to improve the availability of and access to food using sustainable production methods. We will work with those entities having the mandate for global assessments to develop or extend the assessment at national and regional as well as global levels.

Objective 1

Expand and apply Global Agricultural Sector Model (GASM) to development of national and regional impact assessment methods linking economic and natural resource management goals.

Progress Toward Objective 1

Major forces such as trade, population growth, productivity, climate change and greenhouse gas mitigation are likely to have implications for world conditions shifting locus of food demand, production and comparative advantage. This project component develops information on the implications of such phenomena by using GASM and other economic modeling techniques. GASM has been expanded so it covers detailed U.S. and world trade in eight commodities with Rice added most recently. The detailed trade commodity scope covers Rice, Corn, Soybeans, Sorghum, Hard Red winter wheat, Soft White Wheat, Hard Red Spring Wheat, and Durham wheat. In addition 35 other commodities are covered in an aggregate fashion.

GASM has been used in this and associated projects to project the impact of change principally in terms of climate, El Nino Southern Oscillation events and climate change mitigation on food availability and cost in the U.S. and other parts of the world. GASM has been used to examine the impacts of climate and climate change mitigation induced changes in agricultural productivity in developing countries on U.S. agriculture. Specifically GASM played a big role in developing the USGCRP US national assessment, the development of agricultural and forestry sink information as fed into the ongoing state sink related department response to the COP-6 round of the Kyoto negotiations and in illuminating total agricultural response B involving sink sequestration, biofuels,

ruminants, manure, and fertilization responses. It also played a role in analyzing ENSO proactive decision-making alternatives. Some non-GASM efforts were also pursued in the climate change arena examining sustainability issues with respect to climate change and pests, variability and environmental protection.

Objective 2

Use GDSS methods to expand the ability to interpret satellite imagery for decision-making at national, regional and global levels.

Progress Toward Objective 2

Predicting Forage Availability Using Satellite Imagery: The normalized difference vegetation index (NDVI), which is derived from satellite imagery, and rainfall estimates were used to determine the extent to which satellite derived information could be used to project PHYGROW simulated forage production during specific intervals of varying rainfall. A statistical method called co-kriging was used for this analysis. It involves using the weighted linear average of the sampled points along with the spatially rich satellite data to estimate forage production in unsampled areas. For this to work efficiently, the satellite data has to be correlated with the forage at the sample points.

The PHYGROW simulation model was used to derive the total forage available for cattle at each of 30 simulation points in Southern Kenya. Rainfall data used in the simulations was extracted from the NOAA daily rainfall estimate archive fttp://ftp.ncep.noaa.gov/pub/cpc/fews/archive_daily_est/ for each simulation point. The NOAA rainfall estimates are derived daily for a large portion of Africa using an algorithm that combines METEOSAT 7 cold cloud duration data, weather station data, relative humidity and wind data (Herman *et al.* 1998). The total forage available output was then co-kriged with NDVI data to generate an interpolated surface map of forage production. The resulting interpolated surface did a good job of predicting total forage available for the simulation points. The cross-validation regression showed a very reasonable correspondence between estimated total forage available and the simulated total forage available for the household points (r2=0.87, SE prediction=249 kg/ha). Co-kriging using NDVI shows promise in creating mapped surfaces of available forage for regions where limited numbers of points can be simulated due to economic and computing constraints. A time series of these maps clearly shows areas that may be susceptible to low forage conditions due to drought and spatially defines states of nature relative to grazing land capacity. For the Southern Zone of Kenya, the drought of 2000 entered the zone in May 2000 and progressed from the northwest, pushing southward and eastward through the zone. There was little evidence of pockets of drought other than in the extreme western portion of the zone. These maps tracked what was observed in the region.

Linkages with EROS Data Center: Communications have continued with EROS on using land use and land cover data to help develop virtual landscape modeling environments based on NDVI and LANDSAT 7 data. To date, our principle efforts have been on linking point-based models of forage production and diet quality from fecal samples to extrapolate responses across regions. We have also make linkages with key personnel at the NOAA Climate Prediction Center to create our FEWS NET weather data server.

Ghana NDVI and NIRS Fecal Profiling: For the past 11 months, a Ph.D. student has been collecting geo-referenced fecal samples form a stratified set of pastoral and agro-pastoral households

through out the rangeland regions of the northern two-thirds of Ghana in a zone similar to the Sikasso region in Mali. He will be completing the yearlong data gathering process in December 2000 and returning with 2000 fecal samples to explore the use of NDVI data to extrapolate diet quality across broad regions to allow nutritional profiling to occur across virtual landscapes. If this is endeavor is successful, we will have devised a method to provide nutritional profiles for animal production models to serve the economic component of the GDSS.

Acquisition of Global Database on Climate Surfaces: The ACT team, in collaboration with CIMMYT (International Maize and Wheat Improvement Center), recently acquired a global database of monthly climate surfaces. These surfaces, produced by the Climate Research Unit of Norwich University (UK) under contract from IWMI (International Water Management Institute), offer a low-resolution look at the entire globe. The climate surface models can be exercised over the whole of these global databases providing the IAG a first look at global extrapolation zones. Two global soils databases have also been recently acquired. These databases will provide a representative soil pedon for all terrestrial areas on the planet. These foundation databases will be available and useful for all subsequent model development efforts.

Objective 3

Expand and apply impact assessment methods for improving the capability of international organizations to monitor the status and progress toward achieving the goals of conventions and treaties dealing with food, agriculture, and natural resources.

Progress Toward Objective 3

FAO-WAICENT Collaboration on the Common Modeling Environment: The WAICENT information system provides access to a wide array of data and documents resident on servers at the FAO headquarters in Rome. The information system also provides links to other data sources and in some cases analytical applications. Recent developments in WAICENT have focused on delivery of mapping tools to view data in a spatial manner. The ability to retrieve data, access documents and view spatial arrangements of data provides a robust yet incomplete view of information. The missing component deals with analysis. The Impact Assessment Group (IAG) at Texas A&M University under the auspices of the Center for Natural Resource Information Technology (CNRIT) has been addressing methods of linking distributed data and models to provide information users access to tools to conduct analyses without having to learn how to use the underlying models. The approach is based on the Common Modeling Environment (CME), which allows model developers to define user access to their models using a simple scripting language referred to as "middleware". These models are served over the web from multiple locations with the *middleware* displaying those variables made available by the model developer but modifiable by the user. The net result is a user exploring implications of changes in input variables without having to learn the use of the model.

UNCCD: The climate change investigations reported on under the first objective above are relevant to efforts under the United Nations Framework Convention on Climate Change.

Namely GASM has been used in this and associated projects to project the impact of climate change, EL Nino Southern Oscillation events and climate change mitigation on food availability and cost in the U.S. and other parts of the world. Other efforts were also pursued in the climate change arena examining sustainability issues with respect to climate change and pests, variability and

environmental protection and in analyzing economic consequences of climate change mitigation strategies

FIVIMS: Elsewhere in this report, we will describe the development and demonstration of the GDSS with application to impact assessment methods to enhance food security in the context of the World Food Summit. The Food Insecurity and Vulnerability Mapping System (FIVIMS) is an FAO based system to monitor and facilitate the development of national food security assessment systems. The GDSS will support such national systems and also have food security uses at regional and global levels.

Results and Outcomes

The GASM has been further developed as planned and is being used to assess the role of global markets on food security in developing countries. It is also being used to assess the impact of climate change on agriculture in both the developed and developing worlds. In a joint effort with FAO, new software called "common modeling environment" is being developed to provide a seamless interface between models in a planned network of impact assessment tools that will be provided by the Worldwide Agricultural Information Center in FAO.

Impact

See activity set

Publications

(See also GLO 00-23)

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GLO 00-22 Development of Economic Models

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Introduction

The Agricultural Sector Model (ASM), providing interaction among commodities and otherwise reflecting the total agricultural sector in a given country, is a necessary component of the suite of models being developed by Texas A&M. Methods to streamline the development of these models to facilitate multinational impact assessment will be developed. Economic models, in addition to the agricultural sector models, include rural household and farm models derived from the Farm Level Income and Policy Simulation Model (FLIPSIM), that simulate the economic performance of individual farms in response to changes in policy or technology. The model predicts changes in probability of economic survival, changes in debt, and capital liquidity in response to introduction of new technology or policy. Other household level models used in previous studies provide outputs, including an index of vulnerability, net food surplus, index of mobility, equilibrium values for resource allocation, and household production to maximize profit and minimize cost. In year-three of SANREM, increased emphasis will be placed on linking economic and natural resource management models aimed at seeking optimal estimates of the takeoffs between meeting short-term food needs and long-term sustainable production. The Global ASM provides inputs to national and provincial ASMs on markets and prices. The national and provincial ASMs provide input on prices and quantities of commodities to household or enterprise level models. Natural resource constraints limit the adoption of new technology or policy at the several levels of scale.

Objective 1

Adapt, extend, or create economic models to be linked with biophysical and environmental models in the DSS to provide quantitative estimates of the impact of alternative policy options or technology introductions in the agriculture of developing countries.

Progress Toward Objective 1

National ASM economic models have been developed for Mali and Kenya that include regional delineations for the major (provincial or regional) political administrative regions of each country. Major food crops, cash crops and livestock commodities are included in each country's ASM. In this period, work was initiated to provide more detail for some of the economic sub-sectors with the national ASMs and to update model parameters to 1999 for baseline analyses. Research to add regional specificity in the Sikasso Region of Mali and the southern portion of the Rift Valley Region in Kenya was planned and initiated to link the outcome from the regional components of the ASMs

to natural resource and environmental impacts within the regions stemming from alternative technology or policy options.

Objective 2

Develop linkages between economic models at varying levels of scale to improve the ability to forecast impact of technology introductions in the agriculture of developing countries.

Progress Toward Objective 2

Economic models, in addition to the ASMs, include rural household and farm level models derived from the Farm Level Income and Policy Simulation Model (FLIPSIM). This model predicts changes in net present value, probability of economic survival, changes in debt, and capital liquidity in response to introduction of new technology or policy. Changes in crop and livestock output and mixes, yields and equilibrium commodity prices from ASM provide input to FLIPSIM along with variability of commodity prices and yields to predict 10-year simulations of these economic variables for representative or sample farms.

In this period, plans were developed and studies initiated for a major field study of households in the Sikasso region to provide a current baseline model of economic and environmental factors that affect the enterprise and the factors that affect the adoption of new technology. The results of these studies will provide budgets and other inputs for the agricultural sector model that is also being updated at the sub-regional, regional, and national level. Further progress was made in developing methods of linking biophysical models of crops and livestock yields within biologically defined simulation zones with economic models that require data that is collected by administrative district.

Objective 3

Continue to add the risk dimension to economic models at varying levels of scale to assist decision-makers in the evaluation of policy and technology options.

Progress Toward Objective 3

A farm level rapid appraisal survey questionnaire was developed for use in surveying 80+ farms in the Sikasso Region during December 2000. The rapid appraisal survey is used to classify farms by size, type, resource endowments, and scale of commercialization and mechanization. A sample of farms taken from the rapid appraisal information will be used to identify large and medium size commercial farms and small size traditional farms for a more intensive survey in January to February 2001. The intensive survey of sample farms will be used to characterize their economic and biophysical attributes and the production risk situation confronting each sample farm. The information will be used to exercise the FLIPSIM and other farm level household models for the risk analysis, as well as to exercise the updated, regional specific ASM. A similar set of surveys and analyses at both the farm level and the regional/national sector levels for the southern RIFT Valley Region in Kenya is being carried out during the December, 2000 B February, 2001 time frame.

Objective 4

Evaluate trade-offs between sophistication and quality of output versus simplicity and ease of use of economic models in the developing world.

Progress Toward Objective 4

Previously, in studies in Senegal and Mali, a comparison was made between a highly simplified spreadsheet approach and the agricultural sector model for assessing national level impact of the introduction of new technology. The simpler method met some but not all needs for impact assessment. This research continues in the next round of field studies and analysis, using models that were developed by a scientist who recently joined the GDSS team from Purdue University.

Objective 5

Use economic models as part of the GDSS suite in implementing the Mali and Kenya Pilot FIVIMS - GTOS Studies by evaluating scenarios deemed relevant by national decision-makers.

Progress Toward Objective 5

The Food Insecurity and Vulnerability Mapping Information System (FIVIMS), a product of the World Food Summit (WFS), is intended to monitor progress towards reducing hunger by 50 percent in the year 2015. Through a memorandum of understanding with FAO, GDSS is being developed to provide analytic capacity to assess options to achieve WFS goals. Both the Mali ASM and the Kenya ASM were used to examine generic technology and policy interventions to attain food affordability and food availability in 2015 under the FIVIMS Pilot Study in each country. Projections were made of food quantities, prices, and costs associated with projected 2015 populations and various interventions. Interventions included policies to achieve full adoption of new sorghum and millet production technologies, intensification of current land use, introduction of other new technologies to increase crop and livestock productivity, extensification of land use through bringing additional marginal croplands into production, and import/export policies for food commodities and industrial inputs. Model outputs included prices and quantities of food commodities produced and consumed domestically, imports of food commodities, and productivity increases needed to maintain near current real prices of food in Mali and Kenya. The results provided the basis for discussion in a major workshop held in Bamako in July 2000 and in Nairobi in September, 2000 with key decision-makers in the governments of each country to plan more detailed studies now underway in the Sikasso Region of Mali and the lower Rift Valley Region of Kenya on food security options.

Results and Outcomes

Overall progress towards achieving the goals of this activity is excellent. There is growing interest on the part of regional and national users in developing countries and with the agencies monitoring progress on international conventions such as the World Food Summit and the Convention to Combat Desertification. Improved linkages between farm, sub-national, national, and regional impact assessment methods are being provided by ongoing research. FAO and SANREM plan to establish a distributed network of models for impact assessment with a capacity building capability and mechanism for access them housed in FAO's WAICENT.

Impact

See Activity Set

Publications

See GLO 00-22

GLO 00-23 Development of Biophysical and Environmental Models

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Introduction

Biophysical models are used to predict the performance of crops or livestock based on historical data, surveys, and expert opinions. When such models reasonably replicate historical data, they may be used to estimate the biological impact of the introduction of new technology or policy options in advance of detailed experimental or practical experience and to establish areas of similar geographic potential through geographic analysis. These models generate the performance data that is needed as input to both farm level and agricultural sector models. Biophysical models form a key bridge between economic models at varying levels of scale and environmental models that estimate the impact on natural resources of the introduction of new technology or policy options. Environmental models that adequately describe the biological impact of these changes are being developed, drawing on an increasing body of new knowledge and methods to define ecosystem health (including land and water degradation) in biologically as well as economically significant terms. An overall goal of the GDSS is the development of the capability to provide iterative interaction of economic models which predict cost and quantity of food produced with environmental models which reflect the natural resources consequences of adopting new technology or policy options. The overarching goals is to provide a means of selecting optimal solutions that lead to sustainable methods to meet food demands of the new century.

Objective 1

Develop and demonstrate the utility of biophysical models to estimate performance of crop and livestock species under developing country conditions.

Progress Toward This Objective

Data for Sikasso and Rift Valley Studies: A new field study was initiated in the Sikasso region of Mali. Final plans for a similar study in the Rift Valley of Kenya were made in a September 2000 workshop in Nairobi. GDSS models require relatively intensive biophysical and economic data inputs. Some of these are gathered from national or global databases. Other information must be acquired locally within the regions of study. National research scientists are engaged in acquiring this

data with our collaboration. The following kinds of information are being either evaluated, if supplied by us, or acquired by our national partners if not available elsewhere:

- Soils characteristics
- Crop growth parameters and tillage practices
- Modal plant communities/plant species lists
- Plant preferences by livestock species
- Stocking rules
- Livestock breed attributes
- Feedstuff characteristics
- Nutritional profiles by rangeland type for each species of livestock

Improved PHYGROW Functions for Use on Grazing Lands: The PHYGROW model is designed to simulate forage yield and stocking adjustments of complex, multi-species plant communities for multiple grazers and associated hydrology of the site. During the period of reporting, PHYGROW underwent several improvements to better accommodate plant growth functions, accommodate deep-rooted tree species and improve hydrology and increase the ease of handling large batch files of hundreds of simulations. These enhancements include:

- Improved day length function
- Mechanism to handle large batch files
- Resurging growth function added
- Bottom type added

Delivery of PHYGROW and NUTBAL PRO to AGHRYMET: The metric version of PHYGROW and NUTBAL PRO were delivered to Djaby Bakary at AGHRYMET. Mr. Bakary is a member of the advisory group working with SANREM GDSS in Mali with our IER collaborators. We are making arrangements for his short-term training at TAMU in use of these models.

NUTBAL PRO Metric Ready for Delivery to Collaborators: A metric version of NUTBAL PRO was finalized which accommodates African livestock rearing conditions and has the framework for multiple languages. Validation of the program in East African has indicated that the program tracks observed weight gain/loss in a variety of breeds and conditions. The technology is coupled with fecal profiling technology, which allows collection of feces in remote regions and predicting diet crude protein and digestible organic matter. Our collaborators in Mali, Dr. Hamidou Nantoume, IER and Kenya, Dr. Robert Kaitho, KARI have been provided copies of the software and training in its use.

Improved User Interface for EPIC: A new interface dubbed SWAN (Soil, Water, Air, and Nutrients) has been designed and is being constructed to support large numbers of runs and alternative scenarios as are required in conducting impact assessment. The interface is designed with many new features that will facilitate analyses and training activities of the GDSS. SWAN runs in an interactive window from which a user will set up the geographic study area for batch runs of the model. One can edit and refine individual runs or do "global" changes to all the runs in a batch process. The interface is designed to execute hundreds or thousands of individual EPIC runs and organize the output for porting into GIS or ACT. The files in SWAN are maintained using a MS Access Data

base engine with tables set up by project (e.g. Sikasso, Mali or Rift Valley, Kenya). Once the baseline data are set up for a project, the modifications needed to conduct alternative scenario are easily managed within the SWAN System interface. SWAN is being designed with links for future interfacing with GIS and spatial tools such as ACTING for managing input and outputting data.

PYTHON Test of Delivery of Software and Data Over the Web: Work was initiated to determine the best programming language and approach for the online development of our various tools. The NUTBAL PRO model was selected for testing purposes. After extensive tests with JavaScript, Java Applets, Java Beans, and xml-rpc communicating with Python, it was determined that the best approach would be to use straight PYTHON code to write HTML code as needed. This is accomplished by using the Apache web server with a "handler" which allows the web server to understand pages requested by a client with a .py or .psp page extension, namely a PYTHON or a PYTHON Server Page file. The PYTHON handler generates HTML and allows calls to a database without opening any additional ports on the server, or allowing a user to see specifics about a database table on the server. PYTHON will also allow C++ programs to be implemented from within its code, consequently, the nutritional "engine" for the stand-alone NUTBAL PRO will not have to be rewritten because it was originally written in C++. The "Feedstuffs" and "Breedtypes" from NUTBAL PRO Version 1.0 are available online for searching using the method described by clicking on the appropriate links at http://cmeserver.tamu.edu/WEBPRO/index.htm.

Objective 2

Further develop and apply watershed models to assessment of environmental and economic impact of alternative policies and technologies.

Progress Toward Objective 2

A major analysis of the impact of new dairy technology in the Sondu River basin was completed and reported (http://cnrit.tamu.edu/IMPACT). The SWAT model was used to estimate water generated and soil erosion resulting from forage practices related to improved dairy production. The study brought together the agricultural sector model with the SWAT model. Methods for estimating land use were developed. Results suggested a reasonable correlation between modeled and measured stream flow. The External Evaluation Panel recommended further development of models using the Sondu Basin as a test bed.

Objective 3

Develop and use improved indicators of land and water degradation as a function of agricultural practices involving intensification and extensification of production

Progress Toward Objective 3

The initial approach to meeting this objective was to explore use of LANDSAT7 data to identify and map critical indicators of degradation. However, after extensive discussions with EROS, indications are that direct measure of degradation has not proven robust. It is our opinion that we will have to look at the new emerging MODIS satellite technology linked with the experiments we are conducting on point-based biophysical modeling and co-kriging. It may be that LANDSAT7 imagery used in a co-kriging method will prove to be useful. Refer to GLO -21 Global Level Analysis and objective 2 for a more complete description of this activity.

Results and Outcomes

Estimating potential of technology in geographically similar areas: Proof of concept for this methodology has been demonstrated (http://cnrit.tamu.edu/IMPACT). Extrapolations of an INTSORMIL sorghum production system from Mali to Senegal and Burkina Faso were completed. Extrapolation of smallholder dairy technology from Kenya to Uganda and Tanzania was also completed.

Correlations between predicted land use status from models and expert opinions in Mali: The studies to examine this relationship have been initiated in the Sikasso region of Mali.
Specific Case Studies: the advisory committee has approved the topics to be modeled; the field studies for collecting farm level data for model development have been initiated.
Capacity building: Through active regional and national level participation by research colleagues in the Malian IER and the Kenya Agricultural Research Institute, we are involving scientists in the development and use of the GDSS. We are engaging NGO users of the product, using their databases and involving them in model development.

Impact

See Activity Set

Publications

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GLO 00-24 Spatially Explicit Analysis

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Introduction

The Spatial Characterization Tool (SCT) and Almanac Characterization Tool (ACT) are being developed to provide interconnecting linkages or information flows through which detailed simulation models can be effectively interfaced with spatial data and the outputs delivered to less detailed simulations (other models in the GDSS). They will serve as both an output visualization tool and an internal database input organizer. SCT is a GIS application tool that accesses gridded environmental data, point data and vector-based information. The tool provides a suite of querying capabilities aimed at the characterization of agricultural and agroecological environments. It operates with Arc Info and Arc View as GIS engines. The ACT is a stand-alone spatially related information and analysis tool prepared at country level and capable of being used at all levels of scale from national to household. SCT/ACT are part of the suite of interactive models and generate input to sector and farm level models. Previously, a number of SCT and ACT have been developed as separate tools for applications for countries in East Africa. The GDSS links these tools to other models and uses it as a mechanism for organizing and accessing data bases and other information in a spatially coherent manner.

The SCT and ACT are being extended for use at the onset of GDSS analyses to scope the problem and define inputs to other models. They also function to link and facilitate iterative interactions between models in the suite and finally to interpret the spatial projections of outputs from one level of scale to another. The ACT will be further developed and expanded and then used as part of the total interactive GDSS. It will be the focal point for acquiring and using NASA and NOAA weather data for impact assessment at varying levels of scale.

A set of JAVA-based software currently called "Common Modeling Environment" is being developed to facilitate linkages between models so that inputs and outputs between models can be done without major modifications to individual models. This is referred to as "middleware" and serves as an interface between models so that interactions may occur without modification of the individual models. This will facilitate networking related models.

Objective 1

Develop and demonstrate the utility of a geo-referenced framework for models, information systems, and analytic procedures. These tools will be expanded to a multi-regional and (ultimately) global scale to make projections of the utility of research products to other geographically similar areas

Progress Toward Objective 1

Almanac Characterization Tools (ACT) for both Mali and Kenya have been delivered in-country and training sessions have been conducted. For Mali, special attention was given to the regional nature of the IAG results 'extrapolation' and the Mali ACT contains simulation zones and simulated (crop) results for both Burkina Faso and Senegal. In addition, in cooperation with CIRAD, the Mali ACT was provided with a French language tutorial/manual. Future version of the ACT will be fully multi-language enabled. Finally, the Mali ACT included a separate, higher resolution database specifically organized for Sikasso district.

New tools have been incorporated into the ACT to meet the needs of IAG team goals. An area-weighted averaging utility has been built for IAG use with an area calculator available in the new release of the ACT (version 3.0 due in March of 2001). The ACT team has been working to add significant functionality improvements to the software. Improved metadata handling, improved graphics and a more robust interface are further complemented by the additional modules for map layout (a cartographic tool), a shapefile editor, a tool to automate conversion of GPS coordinates into a shapefile for full integration into the ACT, and a full intersection capability. Several of these new functions were created in direct response to feedback from in-country training. For example, we have created a mechanism to calculate the area of any feature in the ACT as well as the distance between user-selected points. Other new features of the ACT include a vertical scale bar – the better to display all variables – as well as the capability to set a specific color for any variable. Efficient data visualization has always been a goal of the ACT and the new version has several new features to enhance the synthesis of spatially registered information. For example, one can now automatically generate 'pie charts' for all polygons on a map based on data from each polygon – this will enable the vibrant mechanism to visualize results from multiple scenario of the Agricultural Sector Model. Finally, we are building a mechanism to interpolate point observations over space. This development is designed to provide a spatial look at the results of the NUTBAL program, helping to identify areas where significant change or below normal conditions exists.

The strength of the ACT remains in its designed capability to manage a diversity of spatially registered information, from census and other routinely collected variables organized by political entity to point-based observations and simulation results. The ACT team continues to enhance the inter-connective capability of the ACT with the suite of models used by the IAG. These linkages enable the more rapid synthesis of simulation results as well as the more effective visualization and interpretation of the results.

The Sikasso region database provided with the Mali ACT 2.02 (July 2000) has been further enhanced by the addition of several databases: a higher resolution soils database; the location of CMDT villages; the location of ESPGRN villages; a crop-use intensity database based on NDVI imagery from the USGS; and the location – with daily precipitation data – of a national meteorological database. These data serve to provide the IAG the foundation database to establish a spatial

sampling frame for a high-resolution examination of activities in the Sikasso region and they establish an appropriately finer resolution biophysical database for subsequent simulations (planned for 2001).

Using spatially explicit analysis (interpolated surfaces, spatial models of the surfaces, and a cluster analysis of the spatial model results), a set of 11 simulation zones in the Sikasso region was defined based on precipitation and temperature, soils type, and population. Three sub-areas of the Sikasso region were defined along district boundaries to link their associated economic information with the ASM.

For each simulation zone, representative farms need to be selected for subsequent economic, adoption, and biophysical (modeling) analysis. Two sets of geo-referenced farm level data were identified: CMDT maintains current and historical data on the farms that use its services and the IER monitors a number of farms in parts of the Sikasso region for which there are historical data on yields and other aspects of performance. At the village level, there is a general census of farms that describes the use of the resource based controlled by the village. This database includes estimates of farm size and attributes and census data identifying individual farmers.

With these data, the IAG is preparing to conduct a rapid appraisal to assure the creation of a sample of farms that represent the spectrum of activities in the region. The simulation zones represent the highest order stratification for the Sikasso region. Once set, these simulation zones provide the basis for identification of representative farms for more detailed assessment and subsequent inputs to models. We will record, for each representative farm, the level of infrastructure that supports the village in which the farm resides.

Results and Outcomes

The provision of country level Almanac Characterization Tools in Mali and Kenya (other countries under separately sponsored research) along with training workshops for users at various levels of government demonstrates clear delivery of product with immediate utility by customers. The objectives of the research under this activity and its clear linkage with that of the other activities in the GDSS demonstrates that the overarching objectives of this research are being achieved and now put to practice. Linkages with FAO, INSAH, AGRHYMET, and other regional and global institutions are helping the GDSS meet its goals in this area. There is growing interest among the USAID Missions and other sponsors in using this product.

Impact

See Activity Set

Publications

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Corbett, J.D., S.N. Collis, B.R. Bush, E.I. Muchugu, R.Q. Jeske R.A. Burton, R.E. Martinez, *J.W. White, D.P. *Hodson and **N. Thomas, 2000. Syria Almanac Characterization Tool (ACT v2). A resource base for characterizing the agricultural, natural, and human environments of Syria (database v1.0). A joint ICARDA (International Center for Agricultural Research in Dry Areas) - Blackland Research and Extension Center (Texas Agricultural Experiment Station, Texas A&M University System) CDROM Publication. Financial support from ICARDA. BREC Report No. 00-06, September 2000, documentation and CD-ROM. * CIMMYT, Mexico City (International Maize and Wheat Improvement Center) ** ICARDA, Aleppo, Syria (International Center for Agricultural Research in Dry Areas)

Corbett, J.D., S.N. Collis, B.R. Bush, E.I. Muchugu, R.Q. Jeske R.A. Burton, R.E. Martinez, K.D. Kehn, R.L. Gutierrez, A.L. Prater, J.W. Stuth, J. Angerer, and M. Shilling, 2000. Almanac Characterization Tool (ACT v2). A resource base for characterizing the agricultural, natural, and human environments of Mali, Texas Agricultural Experiment Station, Texas A&M University System, Blackland Research and Extension Center Report No. 00-05, July 2000, documentation and CD-ROM. Financial support from SANREM CRSP and USAID Africa Bureau.

GLO 00-25 National and Regional Applications of Decision Support Systems

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The 2000-2001 (Year 3) work plan for this activity contains a matrix that shows the relationship between the seven activities and the locations where specific activities are being undertaken. National pilot studies for further development and application of the GDSS are being undertaken in Mali and Kenya. The results of these studies, the suite of integrated models, will be applied in other countries of West and East Africa respectively. They will also be used by regional organizations that deal with multi-national issues. The seven activities in this set are closely integrated and, to some degree, their separation into different packages is arbitrary. This activity focuses on the case studies being done in contrast to the activities under GLO 21-24, which emphasize methodology.

Introduction

The Activity Set Description identifies a set of specific engagements that will provide test platforms for the further development and integration of the models in GDSS. The two major efforts are the Mali and Kenya FIVIMS-GTOS Pilot Studies. These and other such efforts involve collaboration with the Secretariat for the Food Insecurity and Vulnerability Mapping Information System (FIVIMS), the FAO Worldwide Agricultural Information Center (WAICENT) and several activities within the FAO Department of Sustainable Development.

The specific development of models in the Global Decision Support System is mostly documented under other activities. In this work plan, the activity to apply the models in case studies specifically applicable to our national partners is described. Decision-makers at various government levels counterparts in national agricultural research and extension systems are engaged. The relationship between the models and their applications is shown in Table 5 of the Activity Set Description and is repeated here for convenience of the reader.

The overall strategy is to use the priority of the commitments of developing countries to international conventions and the points of contact in FAO for promoting methods to achieve the goals of these conventions at the national level. This provides a means of gaining visibility and

priority *at the national decision-maker level* for the suite of models being developed under GDSS. Their participation from the outset will help ensure ownership and use of the products of this research in enhancing the sustainable increases in food production and natural resource management. The Activity Set Description contains a matrix that shows the relationship between the specific test platforms (case or pilot studies, real-world scenarios) and the areas of ongoing model development. In addition to linkages with national decision-makers, we will also engage decision-makers at other levels, from farm to global, in the development of the GDSS integrated methodology package for impact assessment. We will collaborate with national research programs at both national and regional levels to engage sub-national and lower levels of decision-makers.

The GDSS is being developed with active participation of national research programs and regional organizations that promote linkages among national programs. Our collaborators participate in the planning, conduct, and interpretation of collaborative research. National farm organization advisory committees and planning task forces on model use ensure relevance and focus of the products. Under this activity, special attention will be focused on collaboration with FAO and SANREM partners in the development of regional and national decision support systems. We will work through practical real life impact assessments at varying levels of scale.

Objective 1

Extend and expand the integrated package of decision support tools through cooperation with partners by using specific case studies at varying levels of government as platforms or real-world scenarios for development of methods

Progress Toward This Objective

A major report on the effort supported by several sponsors was completed in September 2000. It is titled "Impact Methods to Predict and Assess Contributions of Technology (IMPACT) (http://cnrit.tamu.edu/IMPACT). This report deals with case studies evaluating the impact of an INTSORMIL – IER sorghum production system using improved germplasm, ridge tilling for water management and increased use of fertilizer. Results from this study were extrapolated to Senegal and Burkina Faso using a method called geographic equivalence developed in these studies. The evolution of smallholder dairy technology in Kenya was the other major case study reported. Again, the geographic equivalence method was used to extrapolate the results to Tanzania and Uganda.

After the inaugural workshop on this study that was held in December 2000, a second planning workshop on the Mali Pilot FIVIMS Study was held in July 2000 with representatives of government, the national research institute, and selected NGOs. This resulted in selection of specific case studies to be undertaken as part of this year's activities. This was followed by a meeting of research collaborators in November 2000 for final selection and development of specific plans for conducting a major field study on farms in the Sikasso Region of Mali. We plan to conduct a major case study on the impact of intensification on cropping systems involving assumptions of an extension of technology using existing research results coupled with an ex ante analysis of the impact of major breakthroughs such as the use of GMOs and/or substantial increase in mechanization. Other case studies to be done include (a) a decision matrix for managing drought, (b) impact of off-farm income on the total farming enterprise, (c) economic and environmental consequences of options for land and livestock management strategies and (d) moving subsistence farmers toward small-scale agriculture. In theses studies we are developing or improving farm level,

sub-regional, regional and national models. We are involving both national and regional research partners and collaboration with CMDT and the Sasakawa Global 2000 project in Mali. We continue to have active involvement by the representatives of the key parts of the government that will be the ultimate users.

After a series of meetings over a 15 month period with the Office of the President, relevant ministries, and KARI, a major planning workshop was held in Nairobi in September 2000 to initiate the field studies related to the Kenya Pilot FIVIMS study. The meeting was well attended by government officials, a key NGO- The Kenya Institute for Public Policy Research and Analysis, The International Livestock Research Institute, and the Kenya Agricultural Research Institute. Representatives participated from the Governments of Tanzania and Uganda as well as from ASARECCA. The result is a definitive plan of action for a field study of farms in the Rift Valley region of Kenya with the same general objectives as for the West African studies. Planned case studies directed to the goal of enhanced food security include: (a) impact of alternative strategies for *intensification* of production of food and cash crops, (b) impact of *extensification* of agricultural production, (c) alternative water management strategies, and (d) drought management matrix involving three production systems and three states of nature. An alternative scenario, resources permitting would be assessment of the impact of various post-harvest and storage strategies.

The GDSS models for use in the Mopti region by the WAP have been completed and await progress by our partners to put them to use.

Objective 2

Participate with SANREM and other partners in developing deliverables, conducting or participating in workshops and providing training in using the SANREM GDSS methodologies.

Progress Toward Objective 2

A major workshop on impact assessment methods was sponsored by USAID in July 2000. The workshop participants included senior staff of USAID, representatives from all the CRSPs, representatives of the international agricultural research centers, the World Bank and other interested parts of USAID. Detailed presentations and discussions on the global decision support system were made. The CRSP council is developing an overall plan on how individual CRSPs will conduct and report impact assessments on their products. The GDSS will be considered as one of the tools.

A similar but briefer presentation was made to a meeting of the individuals responsible for impact assessment in the International Agricultural Research Centers in Rome in May 2000 under the auspices of the CGIAR's Standing Panel on Impact Assessment. This and follow-on engagements with the leadership and executive of this panel are exploring the possibilities of using the GDSS for impact assessment by the International Centers.

Meetings with our several FAO partners and collaborators were held in Rome in November 2000. This resulted in a decision to expand the MOU with the Worldwide Agricultural Information Center past the FIVIMS agenda into the broader agenda of sustainable production of food. Plans for joint proposals for external funding to expand this relationship were made.

As reported under GLO 24, the Mali and Kenya Almanac Characterization tools were completed and delivered and workshops were held with users on their use.

Members of our team made presentations to the External Evaluation Panel and the External Management Team in October and November 2000 respectively

See the section of this report on GLO-26 for details on training and capacity building in national and regional programs.

Results and Outcomes

The case studies completed earlier were made available to the INTSORMIL and Peanut CRSPs and their IER partners for Mali and to ILRI-KARI-Ministry of Agriculture in Kenya as products that illustrate the impact of their research and development activities.

The overall momentum of engagement with national and regional users is being maintained and progress continues toward the achieving the planned results and outcomes.

Impact

See Activity Set

Publications

See the section of this report on GLO 00-26

GLO 00-26 Delivery Systems and Capacity Building

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As shown in the 2000-2001 work plan for this activity, the other activities in this set contribute significantly to work done here on delivery systems and capacity building. With recognized overlap with these activities, we continue to believe that the importance of the work documented under this activity justifies its having this clear visibility. The intent is to focus on the post-research phase of the activity set.

Introduction

There are several key components involved in successful transfer to ensure utility of the products of the GDSS. Several are built into the ongoing collaborative efforts with partners and customers and are reflected in the work plans of other activities. However, specific elements that are defined in this activity are incremental to the ongoing participatory process. The following table shows the spectrum of efforts that contribute to development of delivery systems and capacity building. The table distinguishes between those described under other activities and those described here.

Objective 1

Prepare and deliver products from the GDSS that are in usable form and format for national and regional partners

Progress Toward Objective 1

As described elsewhere, the delivery of the Mali and Kenya Almanac Characterization Tools provides access to the relevant foundation data on these countries as regards their agriculture, natural resources, and human and other resources. Training workshops have shown that national and regional users find this tool, which is available in CD-ROM, to be very useful and usable.

FLIPSIM, PHYGROW, and NUTBAL, all programs used in the GDSS, have been demonstrated to be useful and usable by developing country partners. EPIC has been used in many developing countries, but is relatively more complex and requires further packaging. The agricultural sector model is being used in Kenya but also requires further packaging for broad utility in the non-research communities of developing countries

Objective 2

Participate with national and regional partners in information, training and evaluation workshops on the products of the GDSS

Progress Toward Objective 2

July and November workshops on the Mali FIVIMS Pilot Study provided excellent exposure and capacity building for our Malian research partners as well as users of the GDSS as they continue to participate in the development and evaluation of the models and in the case studies to which they are applied. A reporting and capacity building workshop on assessing the impact of smallholder dairy technology was presented in September 2000 to our collaborators in Kenya, Tanzania, Uganda, and ILRI.

Objective 3

Provide long-term training of national analysts in both research and operational parts of the government

Progress Toward Objective 3

No long-term training occurred in this reporting period. Plans for a Malian scientist to spend three months at Texas A&M were delayed to allow his participation in the field studies now underway in Sikasso. The major effort in this period was directed toward finding funds to sponsor this more comprehensive capacity building effort outside the SANREM appropriations. A joint proposal with FAO for packaging the GDSS to make it more usable and for related capacity building was prepared and submitted to multi-national donors and awaits their action.

Objective 4

Engage with national and regional partners in ongoing training and mentoring on the use of the GDSS and its component parts in impact assessment

Progress Toward Objective 4

Thus far, the training and mentoring of national users has been done with collaborators in the development of the GDSS. Under this objective, we plan to engage in both national and regional workshops for the broader audience of both research and governmental users of these methods. As we enter year four of SANREM II, we plan to gradually shift from the national pilot studies to regional applications and capacity building. We envision the national players who have participated in the development and evaluation of the models as becoming the trainers. We look toward our regional partners such as INSAH and AGRHYMET to facilitate training workshops on a multi-national basis. Our level of effort will be paced by the success we have with FAO acquiring additional funding for this important part of the program.

Results and Outcomes

Since we are still in the development phase of this effort, we have not fully achieved the expected outcomes from this activity. However, as noted above, we believe we are on track and schedule toward achieving these goals. Collaborators and users in the pilot study countries and their regional organizations are enthusiastic about the capability, they are anxious to learn to use the methods, and

decision-makers at several levels continue to say that they have need for and will use the GDSS product.

Impact

See Activity Set

Publications

Summary of Presentations Made During the Planning Workshop on Development and Evaluation of Models and methods to Improve the Assessment of Status and Estimate the Economic and Environmental Impact of Options to Enhance Food Security. A Pilot Study Conducted in the Republic of Kenya. Nairobi, Kenya. September 13-15, 2000.

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