

# LOOKING BACK ON THE LANDSCAPE: IMPACTS AND LESSONS FROM THE SANREM CRSP





**SANREM CRSP**

1422 Experiment Station Rd.  
Watkinsville, GA 30677  
USA

Telephone 706-769-3792

Fax 706-769-1471

E-mail [SANREM@uga.edu](mailto:SANREM@uga.edu)

Web site: <http://www.sanrem.uga.edu>

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## Acknowledgements

### Editors

Constance Neely, Gladys Buenavista and Julia Earl

### Copy Editors

Sigrid Sanders, Faye Goolrick and Elinor Ruark

### Graphic Artist

Sue Lawrence

### Contributors

SANREM would like to thank all its partners, especially the farmers, throughout the world who have made an invaluable contribution to the program.

In the development of this document, we would like to thank all those who authored case examples (individual authors are identified with each case example) as well as the following individuals who contributed insights and information along the way:

Bill Hargrove, Christine Bergmark, Clara Cohen, Ian Coxhead, William Dar, Bill Deutsch, Cornelia Flora, Bob Hart, Hans Kammerbauer, Michael Lee, Robert Rhoades, Carla Roncoli, Roger Serrano, Irma Silva Barbeau, B.K. Singh, Jean Steiner, Glicerio "Boy" Tan

The following individuals contributed photographs which are used in this document:

R. Balakrishnan, G. Buenavista, D. Del Castillo, B. Deutsch, J. Earl, T. Gardiner, W. Hargrove, E. Kanemasu, S. Louis, D. Midmore, V. Nazarea, C. Neely, T. Nissen, M. Piniero, D. Poudel, G. Prain, R. Rhoades, J. Roberts, C. Roncoli, I. Silva-Barbeau

### Funding

Funding for printing this publication was made possible by



The Office of International Agriculture  
College of Agricultural and Environmental Sciences  
Office of the Vice President for Research  
The University of Georgia  
Athens, GA

SANREM is funded by



The Office of Agriculture and Food Security  
U.S. Agency for International Development  
Grant No. PCE-A-00-98-00019-00

### Contact Information

SANREM CRSP  
1422 Experiment Station Rd.  
Watkinsville, GA 30677  
Telephone 706-769-3792  
Fax 706-769-1471  
E-mail SANREM@uga.edu  
Web site: <http://www.sanrem.uga.edu>



## Foreword

Policymakers and governments around the world have identified the interface between the growing demand for food and protection of the environment as the overarching challenge of the 21st century. In 1992, the same year as the Earth Summit in Rio de Janeiro, the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP), funded by the U.S. Agency for International Development and managed by the University of Georgia, set out on an ambitious 10-year path "to implement a comprehensive, farmer-participatory, interdisciplinary and inter-sectoral research, training, and information exchange program that would elucidate and establish the principles of sustainable agriculture and natural resource management on a landscape scale."

As a participatory natural resource management program, SANREM faced many new intellectual and operational challenges. For example, the practical and ethical issues of conducting long-term research in places where local households are faced with pressing short-term needs. These conflicting demands reflect a much greater gap between the global societal goals of protecting the environment and immediate household needs. This tension has brought SANREM to define its work as "research for development."

Engaging diverse stakeholders to identify and address constraints on sustainability has been critical to SANREM's participatory approach. The program has linked diverse organizations and bridged various layers of decision-making hierarchies, from local to global levels. Training, information exchange, environmental education, and other mechanisms for institutional and human capacity building have been crucial to the success of the program.

In the first five years, SANREM worked at various scales in seven countries with more than 40 institutions representing government, universities, international research centers, civil society and thousands of individuals. Each of our partners is owed a debt of gratitude, as transforming plans into action was a formidable challenge. Every individual contributed from his or her

knowledge base, enhancing the process. We established solid relationships and trust, and SANREM and its partners developed a true commitment to the future. Together, we learned invaluable lessons.

SANREM developed an iterative methodological strategy to guide the participatory process and to address programmatic and local level goals. The primary local goal was to foster informed decision-makers and capable institutions leading to sustainable relationships between people and their natural resources. This process now has been adapted satisfactorily in several locations globally including the Philippines, Burkina Faso, Ecuador, Cape Verde and Morocco.

Five years into the program, SANREM has learned that sustainability is achieved through the capacity of local people to make decisions, a capacity which allows them to effectively evaluate their alternatives in order to manage for change. This approach necessitates addressing issues of cause and effect rather than symptoms or problems. Therefore, sustainability cannot be considered an end in itself but rather a negotiated process based on the enhanced decision-making ability of all stakeholders including civil society, governments and international bodies.

In this document, we outline SANREM's approach, research results, impacts achieved and lessons learned from our experiences over the first five years. As the editors, we invite you to step into the pages of this document and see where we have been, what we have learned and what we will be doing next.

*Constance Neely*  
Constance L. Neely

*M. Gladys Buenavista*  
M. Gladys Buenavista

*Julia A. Earl*  
Julia A. Earl



## Executive Summary

Phase I of SANREM from 1992-1997 produced a rich variety of impacts, results and lessons learned. This report from Phase I is presented so the broader development and research community might learn from SANREM's experience. By sharing what we've learned, we hope SANREM might contribute to the improvement of other sustainable development activities.

This document will present SANREM's unique participatory approach and methods and summarizes impacts at all levels of intervention, benefits to the United States from the project, research results from various field sites and lessons learned from implementing a collaborative research for development project. It concludes with a brief look to the next five years.

### Approach and Methods

SANREM's approach during its first phase used four philosophical and methodological cornerstones: participation, interdisciplinary teams, inter-institutional collaboration and a landscape/lifescap focus. To implement this approach, SANREM employed a six-step iterative methodology: networking and team-building; participatory landscape/lifescap appraisals; analysis of critical links in a causal web; proposing and testing alternatives; changes in policy, practice technology; and enhanced institutional capacity.

### Impacts

During Phase I, SANREM used a three-tiered impact assessment framework at its three field sites: Burkina Faso, Ecuador and the Philippines. The tiers included changes in awareness or involvement; knowledge, attitudes, skills or aspirations; and policy, practice or technology. Within each of these tiers, impacts occurred at a variety of decision-maker levels ranging from local to provincial to regional and national. The types of natural resource management decision-makers impacted represented all sectors of society, including government, civil society, and research and education. In addition, SANREM's activities also built capacity in terms of awareness, knowledge and skills.



### Benefits to the United States

SANREM's activities benefited the United States in institutional, environmental and methodological domains. Institutional benefits primarily took place in universities, non-governmental organizations, and primary and secondary schools. SANREM's activities addressed environmental areas of concern as highlighted in Agenda 21, the global action plan derived from the Earth Summit. To the extent that environmental problems in developing countries affect the entire globe, SANREM was responsible for beneficial impacts in the United States. Additionally, several places in the United States are using the landscape/lifescap methodology pioneered by SANREM, and SANREM experience abroad has been implemented domestically in terms of participatory landscape research, partnerships in water quality and a global classroom project.

### Results

SANREM conducted intensive research for sustainable development at three key sites in Burkina Faso, Ecuador and the Philippines. The research in these areas focused on two types of outputs: characterization of the landscape/lifescap in order to enhance understanding of causal relationships and addressing sustainable natural resource management strategies. Research addressed topics such as: biodiversity conservation, land management, water quality, food security, economics of sustainability and community capacity.

### Lessons Learned

Lessons learned during the first five years of SANREM project implementation occurred in the areas of participatory research, inter-institutional partnerships, research relevance and the landscape/lifescap research focus. Given SANREM's research for development focus, these lessons may be valuable to both research organizations and development organizations.

### Future

Plans for the next five years of project implementation have been strongly influenced by the lessons learned, impacts and research results gained during SANREM's first phase. SANREM will continue to maintain the philosophical and methodological foundation of the participatory approach. It also will continue to work in representative regions that provide opportunities either to scale up or apply research findings in other areas of the world. In addition, SANREM will broaden its focus to more inclusively support global natural resource decision-makers with information, skills and tools that promote sustainable agriculture and natural resources management.

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# CHAPTER 1: INTRODUCTION

## Envisioning Sustainability at the Landscape Scale

### The Benefits of a Participatory Approach

Building on research and development lessons from the past, SANREM embarked on a unique research approach to sustainable agriculture and natural resource management in 1992. The approach emphasized the participation of all stakeholders in a collaborative research program focused on sustainable development. The participation of farmers, along with scientists, government agencies, private organizations and academic institutions, was identified as a key factor in bringing about positive changes. This participatory approach recognized the importance of including multiple sectors of society from various levels in the political hierarchy while incorporating various scientific disciplines. This approach has proven to be extremely effective in developing improved methods of sustainable agriculture and natural resource management. Many lessons have been learned along the way. The success of the participatory approach has encouraged its adoption by a number of national and international programs with similar goals.

The innovative participatory research for development approach was implemented by the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP), a 10-year research, training and information exchange program funded by the United States Agency for International Development (USAID). In Phase One, 1992-1997, SANREM focused on two ecological zones: the humid tropics and the semi-arid/sub-humid tropics. We established projects in the



Philippines, Ecuador and Burkina Faso, and carried out some targeted activities in Cape Verde, Costa Rica, Honduras and Morocco.

In the spirit of sharing information to improve research and development efforts throughout the world, this document describes the experiences and lessons learned in the first phase of SANREM. The document presents SANREM's philosophy, describes methods, discusses impacts and influences, and includes several illustrative case studies. It concludes by looking ahead to the next five years and Phase II.

### A Mandate for Collaboration

The U.S. Congress created Collaborative Research Support Programs (CRSPs) in 1975 under Title XII of the International Development and Food Assistance Act, which mandates, "... [improving] the participation of the agriculturally related universities in the United States' governmental efforts internationally to increase world food production and provide support to the application of science to solving developing countries' food and nutrition problems." CRSPs are communities of U.S. Land Grant universities working with national agricultural research systems in developing countries, International Agriculture Research Centers, U.S. agribusinesses, private organizations, colleges and universities in developing countries, USAID and other federal agencies such as the United States Department of Agriculture (USDA).

SANREM was created as the result of a special Congressional mandate in 1992. At the time, USAID recognized increasing pressures on vulnerable soil, water, genetic, human and economic resources in many areas of the world and, as a result of these pressures, the potential for increased food insecurity, famine and social and political unrest. The Brundtland Commission and the 1992 Earth Summit exemplified a growing awareness of these disturbing trends. In response to these compelling problems, USAID asked the National Research Council's Board on Agriculture and the Board on Science and Technology for International Development for recommendations for action. A panel of representatives from these boards made suggestions that led to the creation of SANREM. The U.S. Agency for International Development signed a cooperative agreement with a consortium of U.S. land-grant universities led by the University of Georgia in 1992 to establish a 10-year global program.

The mission of SANREM is to implement a comprehensive farmer-participatory, interdisciplinary and inter-institutional research, training and information exchange program to identify and apply principles of sustainable agriculture and natural resource management on a landscape scale. It pursued this approach in response to USAID's strategic objective of improved food availability, economic growth and conservation of natural resources through agricultural development.

Based on a participatory "research for development" approach, a primary purpose of the program was to foster sustainable relationships between humans and natural resources. We have pursued this goal in several distinct ways:

- characterizing the biophysical (landscape) and socioeconomic (lifescape) parameters to better understand linkages and constraints to sustainability;
- designing and evaluating alternative strategies in concert with farmers and community stakeholders; and
- working to enhance individual and institutional awareness and capacity.

Each step of this interactive process was designed to enable decision-makers – local farmers, community groups and provincial planners – to make better-informed decisions about their natural resources.

SANREM's efforts to promote sustainable natural resource management are unique in a number of ways. Its collaborative, participatory approach, and the wide range of organizations involved – including U.S. and host-country universities, non-governmental organizations, national agricultural research systems, international agriculture research centers and private organizations – make it distinctive and atypical among international development initiatives. Although the past decade has witnessed an increasing number of non-governmental organizations (NGOs) becoming involved in participatory development, the involvement of universities as development partners remains relatively rare. Furthermore, universities that employ participatory research techniques with a development focus are rare indeed. As a consortium of universities and private volunteer organizations using participatory practices to conduct research for development, SANREM fills a unique niche in the development field.

### Looking Forward to Phase II

As the experiences and conclusions described in this report make clear, the design of Phase II of SANREM has been strongly influenced by the lessons learned in the first five years. Phase II will continue to employ and build upon the participatory research approach. In addition, however, SANREM researchers recognize that decisions affecting a given set of natural resources may be made at various levels in the decision-making hierarchy. We must include the full spectrum of decision-makers to achieve wise and informed natural resource management decisions. Therefore, SANREM expects to expand its reach from natural resource management decision-makers at farm, landscape and provincial levels to include other key decision-makers at national, regional and global levels. The primary focus of Phase II of SANREM is to conduct research to support decision-makers from local to global levels, both public and private.

The approach will be implemented by providing natural resource management decision-makers with information, tools and training that address three programmatic objectives:

- To develop methods, tools, and institutional capacity to support sustainable agriculture and natural resource management policy design, issues analysis, planning, and implementation at the landscape-lifescape scale by local governments and communities;

Figure 1.1:  
SANREM Research to Support Decision-Makers



- To develop improved methods to assist global, regional, and national decision-makers on broader issues related to sustainable agriculture and natural resource management; and
- To develop improved methods to facilitate sustainable agriculture and natural resource management information and knowledge exchange within and across multiple scales.

To meet these objectives, the SANREM Program for Phase II is being implemented through integrated global and regional projects including Southeast Asia, the Andes and West Africa.

### Impacts and Lessons

Current development theory and practice increasingly promote the sharing of lessons learned among all interested parties - governmental and non-governmental, public and private, local and global - to improve research and development efforts. In keeping with this trend, SANREM has identified a wealth of lessons, results and impacts to share with other members of the research and development community as well as with the public at large. The following chapters of this document provide a synthesis of experiences gathered at the farm, landscape, provincial, national, regional and global levels from SANREM field sites throughout the world.



## CHAPTER 2: METHODOLOGY

### Building a Participatory, Multi-Stakeholder Approach

#### The SANREM Cornerstones

SANREM employed a participatory research approach based on four philosophical and methodological cornerstones. These served as the foundation of SANREM's research agenda during the first phase and included participatory research, interdisciplinary teams, inter-institutional collaboration and a landscape scale of analysis. This platform was designed to bring together scientific and local knowledge systems; ecological, agricultural and social scientists; and development and research practitioners to understand and address natural resource and agricultural problems. We selected the landscape focus because it encompasses a broader analytical framework that incorporates cross-ecosystem linkages – addressing upstream-downstream interactions.

#### INTERDISCIPLINARY TEAMS

SANREM took an interdisciplinary approach in recognition of the fact that the constraints on sustainability are not delimited by discipline. Addressing such constraints required the recognition of a complex array of interactive processes within and between ecosystems, including the physical environment (soil, water, vegetation, climate), the human dimension (population patterns, social structure, cultural norms) and their interactions in the domain of agricultural and natural resource management practices. This called for an interdisciplinary approach that transcended the traditional boundaries among ecological, agricultural and social sciences, and that also encompassed a variety of conceptual and methodological tools to produce an integrated understanding of landscape ecology and of the systemic relationships between its components. The approach joined scientific expertise with the experience of a diverse range of actors such as development practitioners, community leaders and local people.



#### PARTICIPATION

In the nearly five decades since U.S. institutions have been involved in development work, many different approaches have been tried with varying degrees of success. One of the most salient lessons learned during that time period is that development efforts need to incorporate an appreciation and understanding of the priorities and constraints that shape the experience of their beneficiaries through participatory practices. SANREM embraced this lesson and employed it both as a philosophical base for its work and as a practical method in its fieldwork. In particular, SANREM adapted the farmer-back-to-farmer model as described by Rhoades and Booth (1982) to fully incorporate the participation of local community members and natural resource managers in its "research for development" process. Therefore, local farmers and other project participants (including governmental, research and NGO partners) were involved in the full spectrum of the research process, which included problem definition and diagnosis, identification and testing of potential solutions, and evaluation and adoption of practices or policies based on the research findings. To ensure the full participation of a given community, a participatory landscape/lifescape appraisal (PLLA) was carried out to identify all relevant sectors and stakeholders in the research site. The purpose was to understand better the different goals and agendas and to develop common ground of mutual expectations and responsibilities. In implementing a participatory research program, we gave careful consideration to the potential impediments to meaningful participation based on gender, caste, race, ethnicity, religion, socio-economic status, geographical location, residence patterns, and other factors.



By virtue of the cross-cutting nature and breadth of environmental and agricultural sustainability issues, we had to incorporate the diverse institutions implicated in them. Intersectoral and inter-institutional collaboration as defined and practiced by SANREM entailed an ongoing partnership of representatives from a wide range of sectors throughout the research process. Such sectors included U.S. and host-country institutions concerned with sustainability issues, such as universities, research centers, development agencies and NGOs/PVOs, site-specific government agencies, grassroots organizations, farmers' organizations, women's groups, etc. This intersectoral networking and partnering approach broke new ground and provided the basis for many of Phase I's successes. Groups came together who had no previous experience of collaboration or even communication among them. This provided a context that combined their resources in the pursuit of common goals.



#### INTER-INSTITUTIONAL COLLABORATION



The SANREM approach was based on the thesis that in order to understand sustainability and thereby develop strategies to achieve it, we must understand the relationships and linkages in a landscape setting. The term landscape refers to a complex mosaic of biological and physical processes. Lifescape refers to the human dimension relative to that spatial template. The

landscape/lifescape approach was determined to be the most appropriate scale for applied research. This approach required that the research encompass hierarchical analytical units from experimental plots to watersheds, which looked at relationships between agricultural and natural components as well as urban and rural settings. Likewise, on the lifescape scale, the research included individual farmers, families, communities, ethnic groups, institutions and organizations. SANREM's activities emphasized interrelations and interactions within agro-ecological zones as well as across the entire landscape.

#### LANDSCAPE/LIFESCAPE FOCUS



## An Iterative Process

One objective of the SANREM program was to develop a replicable process rather than to formulate prescriptions for a given location. SANREM employed an innovative participatory research approach, modeled after Conway's agroecosystem analysis (1985). The approach included the following six steps, which evolved into an iterative process.

### Network and Build Teams

At each project site, SANREM established a network of collaborating partners. These networks included farmers, communities, local government and non-governmental institutions, universities, and international government and non-governmental organizations. In many cases, we brought together groups who had not previously collaborated, but were nonetheless common stakeholders in natural resources management. In addition to that striking feature, the networks included interdisciplinary research teams from agricultural, ecological and social sciences. This interdisciplinary composition heightened appreciation and understanding of the many different facets of natural resources management. The collaborating partners actively participated in each stage of the research process. This included:

- training in participatory and landscape methodologies;
- use of participatory landscape/lifescap appraisals (PLLA) for biophysical and socioeconomic analysis of constraints to sustainability and identification of research priorities;
- participatory workshops to discuss and identify strategies for implementing activities; and
- implementation of specific activities to address the constraints to sustainability.

Strong relationships, trust and enthusiasm grew among participants through the network and team-building process. SANREM believes these kinds of relationships are key to the longevity of its successes and thus warranted the time necessary to bridge these bonds.

### Participatory Landscape/Lifescap Appraisal

The Participatory Landscape/Lifescap Appraisal (PLLA) was developed by SANREM as a major diagnostic tool in its research process. The objectives of PLLA are:

- to gain an understanding of interrelationships in a given agro-ecosystem;
- to identify and gain a collective understanding of constraints on natural resource and agricultural sustainability from a local community's perspective;
- to initiate and establish community-scientist dialogue;
- to facilitate community identification of natural resources and heighten awareness of linkages in the landscape;



- to gain experience among diverse partners (i.e., international and national scientists, NGOs, local communities, etc.); and
- to develop a participatory research agenda.

The PLLA depends on a variety of tools, strategies and experiences derived from participatory rural appraisal (PRA), rapid rural appraisal (RRA) and farming systems research. What distinguishes PLLA from these approaches is its scale and focus. The scale of PLLA research is conducted at the landscape level as opposed to the farm. The focus of PLLA is to understand relationships on the landscape/lifescap scale, which includes the interaction of human activity with the biophysical environment. It also includes an analysis of the long-term sustainability of a given landscape/lifescap. The PLLA process involves team-building, training, reconnaissance of secondary data and other similar programs, institutional analysis, fieldwork and verification of data and findings.



Data gathered using PLLAs may complement but not replace quantitative data. The PLLA also provides an opportunity for ground-truthing and contextualization of existing biophysical, demographic or quantitative data. Several key attributes of the PLLA include its rapidity and cost-effectiveness; its capacity to engage local people's knowledge, understanding and perspectives; the rapport established with local people forming the basis for future activities; flexibility (the technique can be used to focus on almost any information); and the process, which can heighten community awareness regarding environmental, social or other issues. Conversely, some shortcomings of the PLLA process include the following: results may be incomplete; results are only as representative as the sample; bias can be introduced by individuals facilitating the appraisal; and the process can heighten expectations among participants for development interventions.

### Analyze Critical Links in Causal Web

Following completion of a PLLA, workshops were held to analyze causal relationships and critical linkages and to establish research priorities. In general, workshops were held one to two months following a PLLA. During that time, the collected information was assimilated and distributed. The workshops also examined interrelations and interactions within agroecological zones as well as across the entire landscape. They addressed problem diagnosis, analysis and prioritization of research questions and projects. Individuals representing government organizations, non-governmental organizations (NGOs), international research centers, local government units, international voluntary organizations, farmer groups, tribal councils and national and U.S. universities attended the workshops.

Figure 2.1: Example of PLLA Results Regarding Causal Relationships in a Filipino Community

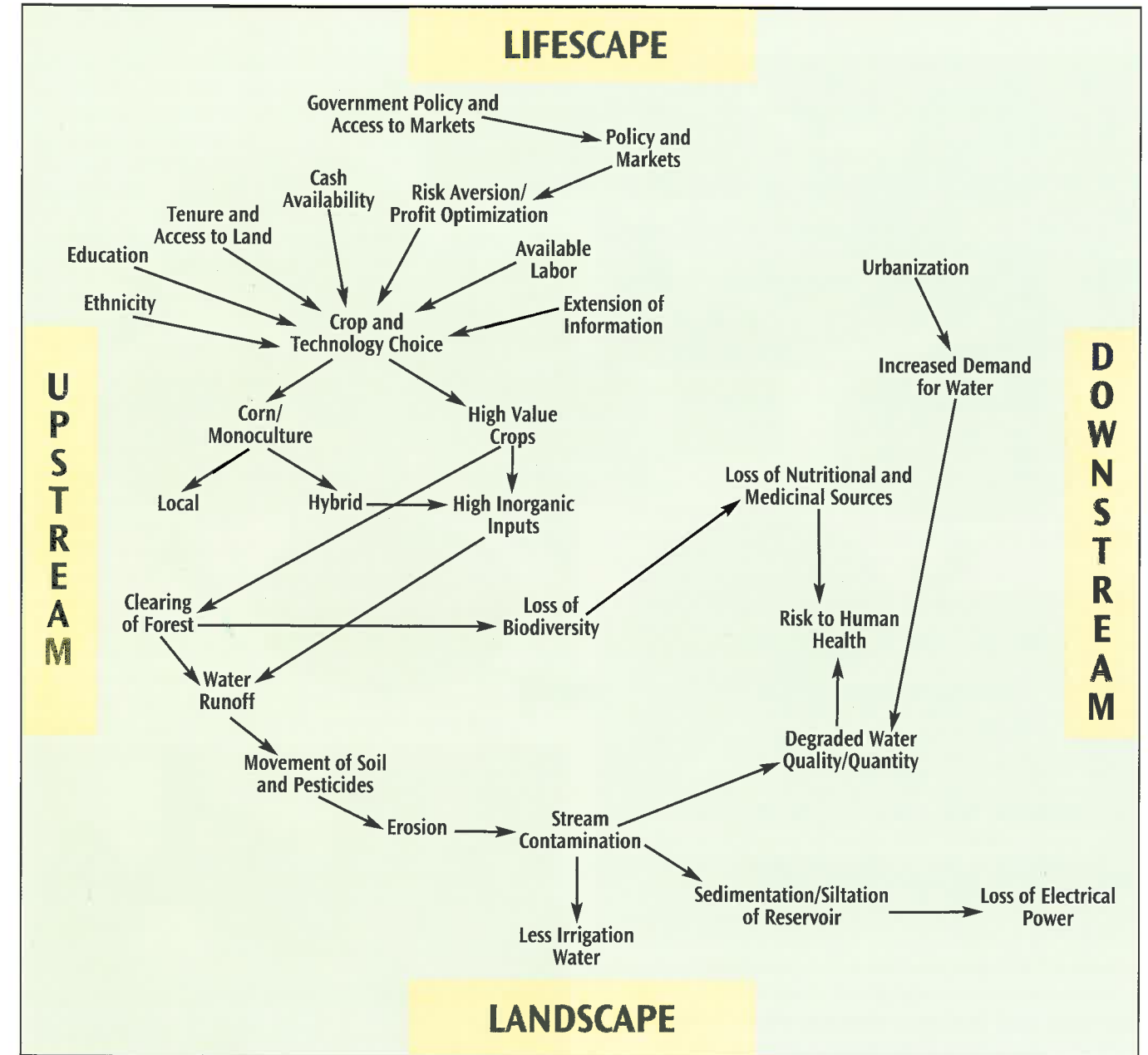


Figure 2.2: Elements of the Water Cycle in Locally Defined Agro-Ecosystems of a Philippine Landscape

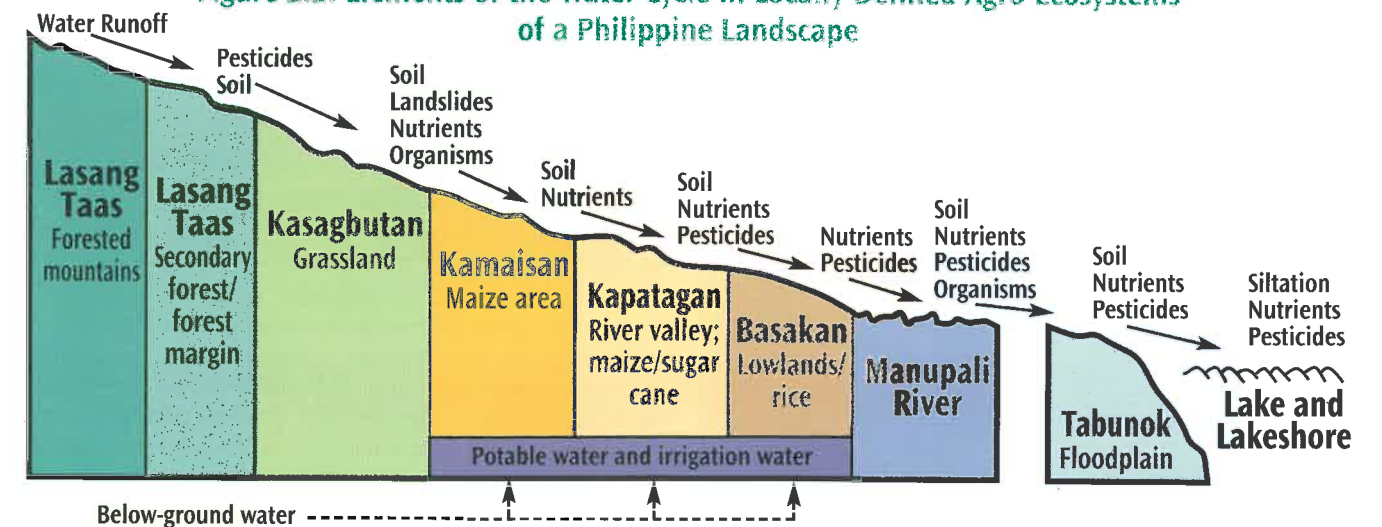
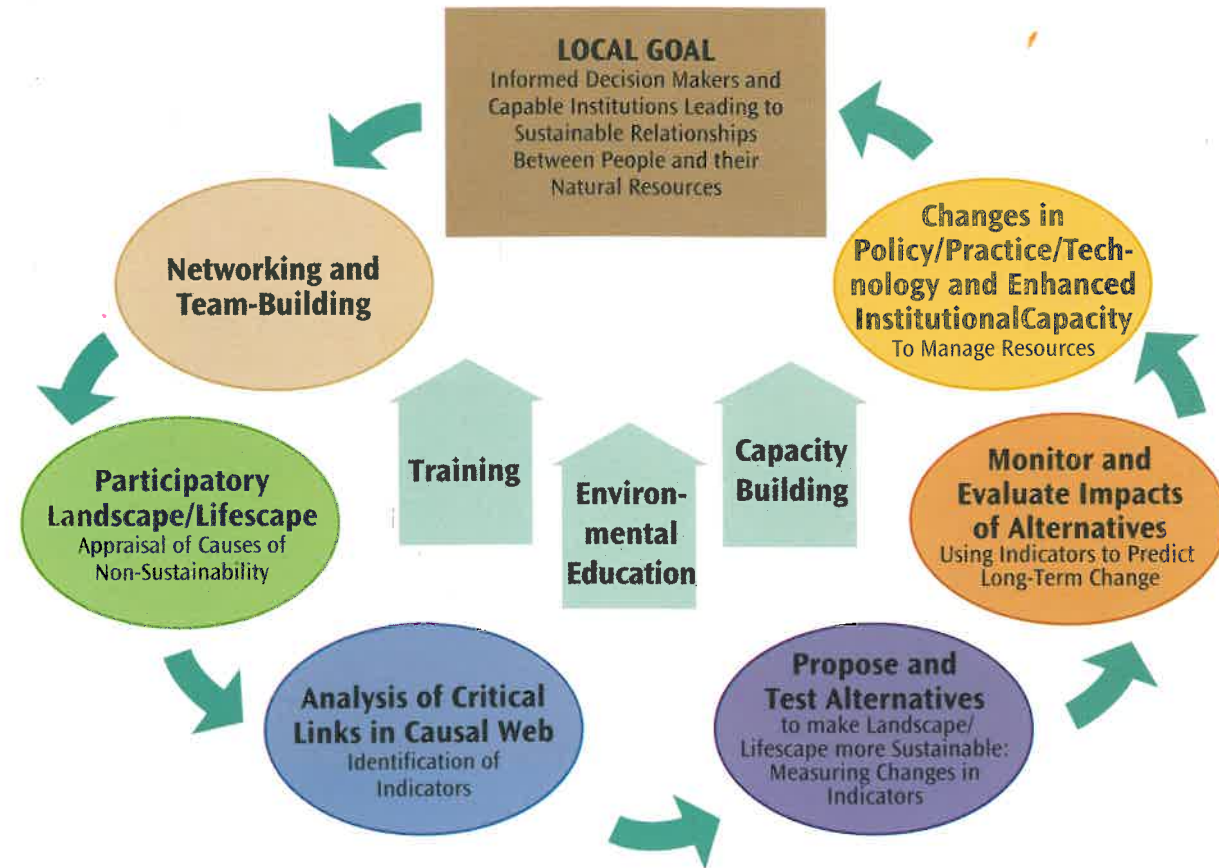




Figure 2.3: SANREM's Six-Step Methodological Framework.



### Propose and Test Alternatives

Following an analysis of critical linkages, two types of research activities resulted. They included 1) investigating and testing causal relationships (i.e., data collection to validate relationships) and characterization of the landscape/lifescap; and 2) designing action research experiments to address constraints to sustainability. These were implemented using the farmer-back-to-farmer model as the guiding framework. Simultaneously, environmental education, training, capacity building and outreach were ongoing.

### Monitor and Evaluate Impacts of Alternatives

Another important step in the SANREM methodology was the establishment of a monitoring and evaluation framework. To monitor both short- and long-term aspects of the program progress, we adapted a classification system to recognize and document impacts and progress toward impacts. An impact was defined as a change in practice that caused enhanced quality of life or improvement in environmental conditions such as the quality or quantity of natural resources. A hierarchical scheme monitored progress toward impacts as exemplified by changes in participant involvement and awareness; changes in participant knowledge, attitudes, skills or aspirations; or changes in practice vis-à-vis natural resource management (see Figure 3.2 in Chapter 3). Critical to this was the use of ongoing participatory monitoring and evaluation



techniques so mid-stream corrections could be made. Participants constantly asked, What is working well? What is working less well? What are the strategies for improving it? The responses to these simple questions led to timely action plans for improving the program as it evolved.

### Change Policy, Practice, Technology and Enhanced Institutional Capacity

Key decision-makers at a variety of levels received data gathered by SANREM participants. This was done to enhance natural resource management and sustainable agriculture practices through changes in policies, technologies, practices, and/or enhanced institutional capacity. Government decentralization in a variety of developing countries has enhanced the usefulness of the SANREM approach, ensuring that data and information are provided to the full spectrum of natural resource management decision-makers.

## Innovative Landscape and Lifescap Approaches

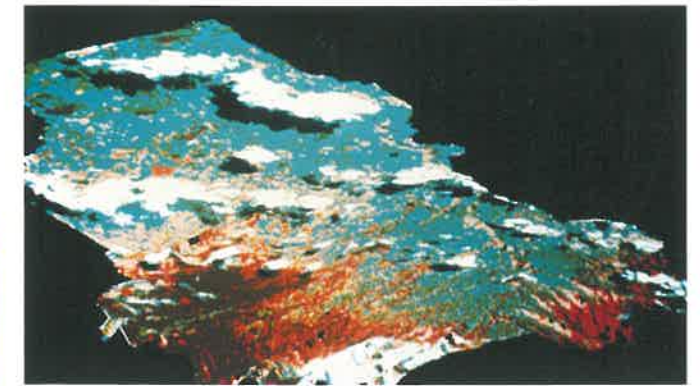
Along with the Participatory Landscape-Lifescap Appraisal, we used a number of other innovative tools to bring researchers and communities together to understand linkages between landscape and lifescap, as well as to promote environmental awareness, set research priorities and plan for future resource management.

### Holistic Management

Holistic Management is a unique decision-making process to help people improve the quality of their lives while simultaneously restoring the environment on which all depend. Holistic management allows people to make economically, socially and environmentally sound decisions based on their values and available resources. Holistic management activities in Burkina Faso led to communities clearly articulating what their lifescap and landscape would look like in the future. This, in turn, provided a basis for community-relevant research.

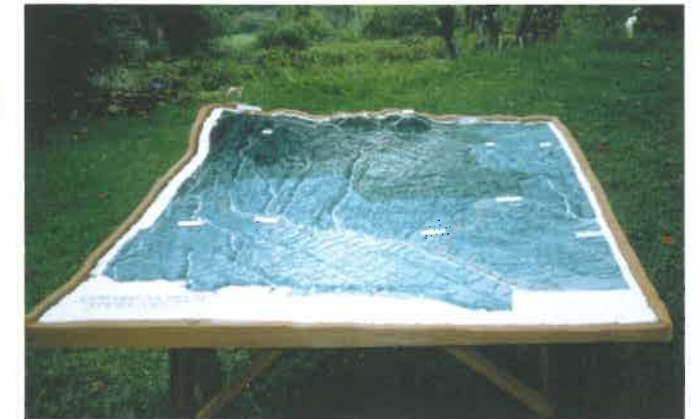


Holistic management trainees discuss local resource map



Watershed map using GIS data

and climate of each site. The GIS work provided a set of digital maps depicting different parameters that could be overlaid to investigate relationships. For example, by putting together maps of soil type, topography and land use, a map of soil erosion potential was created as a tool for natural resource management planning.



A team of researchers and NGO staff built a physical model of the Manupali Watershed of the Philippines (shown above) that has been used to depict upstream-downstream relationships, plan agroforestry research activities with farmers and promote environmental awareness.

### Pictures Where People Matter



Can photographs be used as a communication tool to enable minorities and marginal populations to convey their own views of their world - and to overcome barriers of literacy? In an effort to expand the participatory approach to the development of educational materials, researchers tested the innovative methodology of using photographs taken by farmers in Burkina Faso to elicit perceptions and communicate about issues

of agricultural sustainability. Researchers concluded that participatory use of photography can serve as an effective tool for a range of research and development activities, such as problem assessment, resource inventory, holistic planning, or monitoring and evaluation.

### Models of the Landscape

One of the objectives of the SANREM program was to characterize the biological, physical and social aspects of each research site. The GIS and weather station research projects gathered and organized information describing the soils, topography, land use

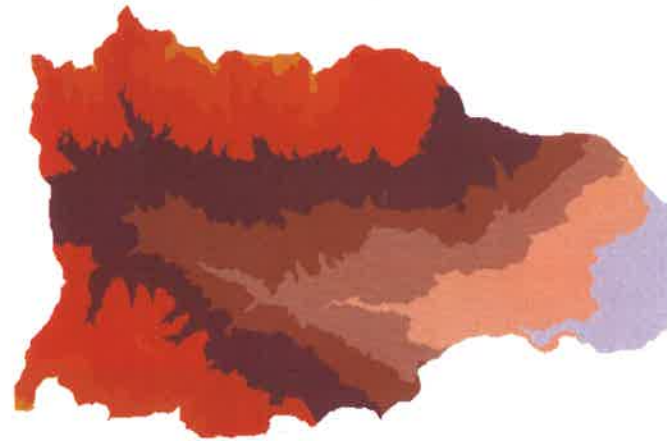
### Water Quality Monitoring



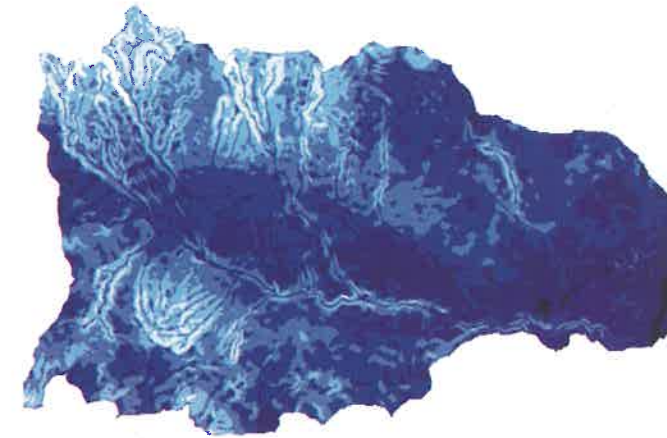


When it comes to decision support tools for watershed management, one does not usually think of a water quality monitoring kit. However, water serves as an integrator in the landscape, and this simple tool kit allowed researchers and community members to characterize changes in water quality from upstream to downstream. In the Philippines, water quality data across the landscape was correlated with deforestation and population densities. This information aided decision-makers at the municipal level in developing a natural resource management plan for the watershed.

### Mapping Ravines as Corridors of Biodiversity



Elevation map of SANREM Philippines research site



Slope map of SANREM Philippines research site

Numerous steep ravines emanate from the Kitanglad range into the agricultural landscape. These valleys are the least disturbed part of the agricultural area and in part harbor diverse natural communities. They may be valuable in radiating and maintaining strands of biodiversity outward from the protected area through the farmed parts of the landscape. Researchers developed a methodology to survey and map the vegetative communities of major ravines of the Alanib River. They surveyed the spatial relationships among natural vegetation, agroforestry and field crop systems on a transect basis. These maps provided a basis for identifying the hotspots where change is needed in land management practices to protect streams and biodiversity along them. Based on this information, ravine habitat management has been incorporated into the municipal natural resource management plan.

### Watershed Surveying Made Easy

Investigators at Zamorano University in Honduras developed a set of field surveying techniques to provide basic information on the physical characteristics of a watershed - determination of boundaries, water flow measurements and land-use planning. Hand calculations and drawings require no special skills and only simple equipment, and have been tested in communities in Honduras. The field procedures allow the drafting of a precise and detailed map of a watershed and are complemented by analytical procedures that can be applied off-site. A series of workshops trained community NGO *paratecnicos* (extension agents), community educators and farmers in the mapping techniques along with watershed management principles. The mapping process provides a systematic and concrete representation of the resource use issues. It also has identified potential and actual water conflicts between upstream and downstream communities that must be resolved to maintain water quality and quantity.

### And That Is TAT

Partners from an indigenous community and SANREM ethnoecologists have implemented two strategies to preserve culturally significant plants. The first strategy preserves plants in local herbaria and communal gardens. The second strategy systematically documents knowledge pertaining to these plants through youth-led memory banking. This research reveals indigenous groups' determination to preserve cultural and biological diversity in resource clusters or microenvironments considered less economically important. Researchers adapted the Thematic Apperception Test (TAT) normally used in psychology to investigate local perceptions of the environment. The ethnoecology research in the Manupali watershed, Philippines, highlights how gender, age and ethnicity shape perceptions and decisions regarding natural resource management.

### A Link That Makes A Difference: The Priming Experience

Thirty-five farmers in the Manupali River watershed in the Philippines participated in a SANREM experiential training in cooperative practice, sustainable agriculture and natural resource management. The activity established a foundation in environmental awareness, cooperative effort and community leadership prior to launching the SANREM research activities. Local and international NGO partners combined to lead a workshop on collective decision-making and sustainable agriculture techniques. The training preceded a field trip from the bioserve at the top of Mt. Kitanglad to the dam that controls the Manupali



River and down to the ocean. Participants also visited demonstration farms as well as locations exemplifying unsustainable resource use. These activities allowed farmers to see where they are in the upstream-downstream continuum, and illustrated the importance of linkages in the landscape. Farmers completed the training by charting a farm development plan for integrating new ideas into current farming practices. Both aspects - exposure to and training in sustainable farming practices, and the visits to understand the linkages in the landscape - were also conducted in Burkina Faso and Ecuador.

### Migration, Environment, And Sense Of Place



Most policies aimed at sustainable forest and land management in tropical regions of the world do not account for differences in the kinds of farmers impacting the environment. Policy-makers typically see migrants as individual males who settle unoccupied land by first clearing the forest before bringing their families. A multi-factorial study of 300 migrants to the SANREM Nanegal site in Ecuador shows this to be a myth; in fact, migrants arrive as households with excellent environmental knowledge but with strong variations among migrants in landscape perceptions. Older, landed migrants value the landscape for conservation while younger, landless migrants without futures in the area do not. Women migrate for the family and value "rootedness," while male migrants are more interested in production and economic ventures. These differences in landscape "senses of place" are important to understand in planning and policy-making for sustainability.

### Oral History Tells The Story

A History Workshop and Oral History Day held in four communities in Ecuador provided a platform for collective discussion and



insights into the environmental history of the region. While creating an enhanced "sense of place," the participatory storytelling activities also revealed how the forests, water, soils and settlements had changed since the days of the Yumbos, the earliest known inhabitants of the region. While learning that their present lives have a continuous relation to the past, especially in the economy of natural product and agricultural trade, the people of Nanegal realized that their environment is not as productive as before. Copies of the oral histories, videos and recordings were kept in the local communities as their own folk benchmark for the future.

### Gender Analysis

In view of the issues shaping natural resource management, labor allocation and access to resources as they relate to environmental sustainability, the program has promoted the integration of gender analysis in research activities through training workshops and development of methodological tools. A permanent working group on gender analysis has been constituted at the global level to better integrate gender and other markers of social inequality in research approaches; to review various approaches to gender and social analysis; and to assess their implications and impacts on research findings and long-term sustainability.



### Economics Within and Beyond the Landscape

An analysis done by agricultural economists showed that prices set outside the watershed play important roles in land use and land allocation decisions within the watershed in the Philippines. When this finding was combined with information on market integration, national and regional market phenomena, including agricultural price policies, they have the capacity to exert significant influence on crop and technology choices. Since Lantapan farmers are closely linked to national markets, technical progress that raises productivity throughout the economy will have local effects through changes in crop or input prices.

### Looking for Indicators

At EARTH University in Costa Rica, the Participatory Landscape/Lifescap Appraisal was adapted to focus on scientific and indigenous indicators of sustainability. Indicators identified through the PLLA in the La Argentina community became integral to student thesis project definition, execution and evaluation. A baseline data set was developed on indigenous and scientific indicators in social, economic and environmental areas.

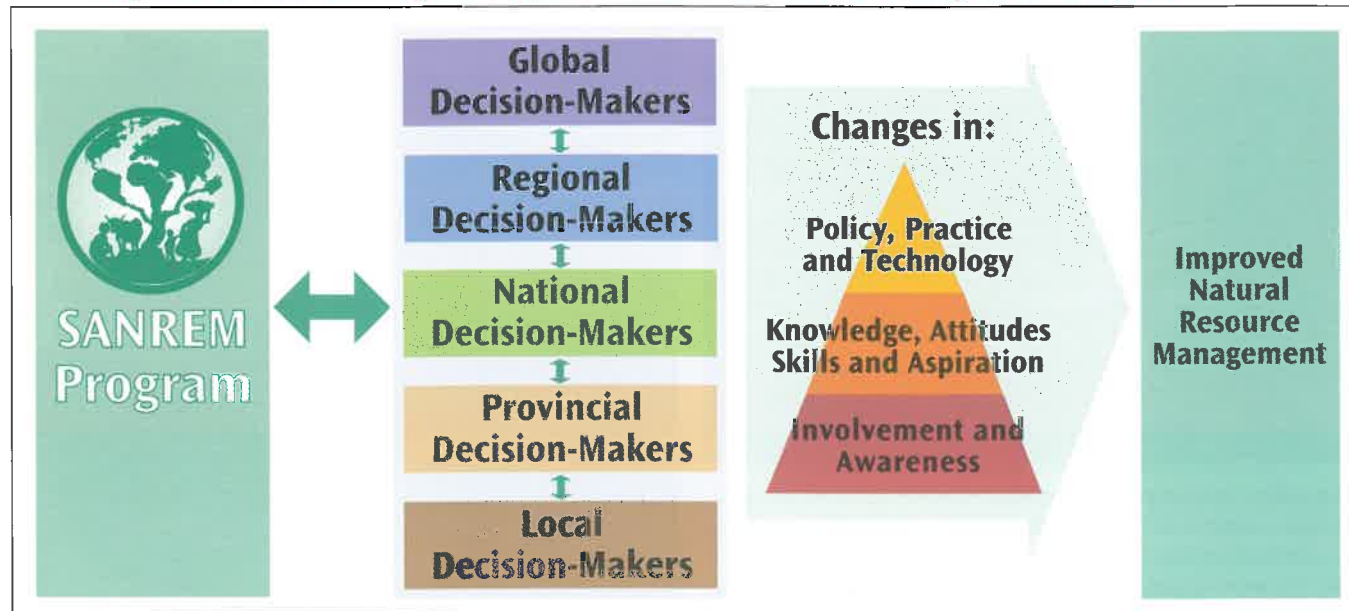


## CHAPTER 3: IMPACTS Making a Difference

In addition to the research results and the variety of relevant lessons learned, SANREM has been responsible for a wide range of both short-term and long-term impacts. These impacts have occurred at different levels in the natural resource decision-making hierarchy, ranging from farm and community groups to municipalities to provincial and national levels.

As depicted in Figure 3.1, SANREM's unique "participatory research for development" approach allows it to reach and influence various types of decision-makers at different levels in the decision-making hierarchy. SANREM program activities and impacts should ultimately lead to improved natural resource management.

Figure 3.1: SANREM Program Impacts on Natural Resource Management Decision Makers



Using the evaluative criteria of SANREM, an impact judged to be of "long-term significance" must cause measurable changes – in practice, technology or policy – by any of various types of decision-makers in government, civil society, the private sector or communities related to sustainable agriculture and natural resource management. These changes can occur at the farm, community, provincial, national, regional or global levels. (See Figure 3.1)

To follow this progress in implementation, SANREM adapted a monitoring and evaluation scheme with an impacts classification system of three levels (Bennett and Rockwell 1995). These three levels of impact build upon and reinforce each other. They do not necessarily occur linearly but may occur concomitantly or synergistically. The first stage or degree of impact may be categorized as a change in people's involvement in or awareness of sustainable resource management activities and issues.



International participants at multi-institutional workshop in Cape Verde

Figure 3.2: SANREM's Impact Assessment Framework – Levels of Change



As these changes crystallize, they form the foundation for the next level of impact: a change in people's knowledge, attitudes, skills or aspirations. As these two levels of change solidify, they in turn provide the base for the most significant impact level, a change in practice, technology or policy that results in enhanced quality of life or improvement in environmental conditions such as the quality or quantity of natural resources. The three levels of impact are depicted in Figure 3.2.

This chapter presents the impacts of SANREM according to these three categories:

- changes in policy, practice, or technology;
- changes in people's knowledge, attitudes, skills and aspirations; and
- changes in people's involvement and awareness.

Within these categories, impacts will be reported according to the societal level at which they occurred (i.e., local, provincial or national) with reference to the different type of decision-makers and/or stakeholders who benefited.

### Capacity Building

SANREM activities contributed to capacity building and institution strengthening, processes that enhance the ability of organizations to sustain themselves independently over the long term. During its first phase, SANREM was responsible for building awareness of sustainability issues, contributing to knowledge of causal linkages regarding environmental degradation and improved natural resources management, facilitating skill transfer, and improving information sharing and networking among organizations and institutions – all of which contributed to capacity building. In other words, improvements in levels of awareness, knowledge or skills enhance the ability of organiza-



NGO and IARC facilitators lead agroforestry workshop

tions and individuals, as well as contribute to sustainable natural resource management policy-making, practices or technology.

Changes in policy or practice potentially provide the most enduring level of impact. However, organizations or individuals may not attain that level of change without first changing their levels of awareness and knowledge. Once changes at these levels have occurred, the ability to formulate natural resource management policy, modify practices or implement new technology may occur. Thus, SANREM's impact assessment framework provides a hierarchy for assessing levels of change leading to impact and also contributes to capacity building.

SANREM's capacity building activities enable local and national institutions to participate effectively in the SANREM partnership and to sustain activities after the program is phased out. Institutional development efforts have focused not only on enhancing the ability of institutions to plan, conduct and evaluate research, but also on enhancing the ability to expand the scope of their mandate and interests and the range of skills and resources upon which they can draw. SANREM helped establish



Field researchers and local participants analyze local resources

local organizational structures with a number of roles. It provided forums for local people to debate environmental issues, enabled local leaders to acquire skills and experience, and offered an example of representation in collective decision-making. SANREM also developed local government capacity, enabling local governments to assess community needs, formulate development plans, and link with other institutions at local and national levels to pool and/or mobilize additional resources. Increased NGO capacity has been demonstrated by enhanced inter-agency collaboration, heightened access to resources and information, improved standing and credibility and research skills acquisition. At national and international levels, researchers have benefited from participation in SANREM research and training, which has introduced them to innovative approaches and concepts such as participatory research, gender analysis and indicators of sustainability. Many of SANREM's Phase I impacts have had direct and indirect effects on capacity building.

A comprehensive chart depicting impacts at all three levels from SANREM's first phase follows in Table 3.1. Three specific case studies that demonstrate the progression from changes in awareness or involvement, to knowledge and skills, to policy and practice are found following Table 3.1. Further details regarding Phase I impacts are found in the subsequent text of this chapter.



Figure 3.3: SANREM Impacts, Phase I – 1992-1997

| LEVEL OF CHANGE                                 | IMPACT  |
|---|---|
| <b>Change in Policy, Practice or Technology</b> |   |
| <b>LOCAL</b><br>Community Decision-Makers       | <ul style="list-style-type: none"> <li>• More than 1,250 farmers from Burkina Faso, Ecuador and the Philippines apply sustainable management practices on their farms.</li> <li>• Community committees host natural resource management debates and proactively plan development activities (Burkina Faso, the Philippines and Ecuador).</li> </ul>   |
| <b>Government</b>                               | <ul style="list-style-type: none"> <li>• The SANREM approach of science- and participation-based research is integrated in development of the municipal Natural Resources Management Development Plan (NRMDP) (The Philippines).</li> <li>• The Natural Resource Management Council (NRMC), which assists local governments in formulating policies and programs regarding sustainable management and natural resource use, is institutionalized by municipal government (The Philippines).</li> <li>• Research and development committees are created in local government councils (<i>Barangay</i>) (The Philippines).</li> <li>• Local governments seek and use SANREM research outputs in policy and decision-making regarding water quality and environmental issues.</li> </ul> |
| <b>Civil Society</b>                            | <ul style="list-style-type: none"> <li>• Local environmental NGOs form at variety of sites as participants acquire specialized skills from participating in SANREM research:                             <ul style="list-style-type: none"> <li>– Tigbantay Wahig – The Philippines,</li> <li>– AGEHOR (Association for Holistic Resource Management) – Burkina Faso,</li> <li>– Cape Verde Farmers' Association – Cape Verde.</li> </ul> </li> <li>• Local organizations engage in entrepreneurial activities complementing their involvement with SANREM: ATSAAL (Agroforestry Tree Seed Association of Lantapan) (The Philippines).</li> </ul>   |
| <b>PROVINCIAL</b><br>Government                 | <ul style="list-style-type: none"> <li>• Provincial Planning and Development Office adopts policies promoting participatory approaches in natural resource management planning (The Philippines).</li> <li>• Provincial governor cites influence of SANREM in design of environmental policies (The Philippines).</li> </ul>  |
| <b>Civil Society</b>                            | <ul style="list-style-type: none"> <li>• Plan International (an international NGO) uses SANREM research results in development strategies (Burkina Faso).</li> </ul>  |
| <b>NATIONAL</b><br>Research and Education       | <ul style="list-style-type: none"> <li>• Participatory and Collaborative research approaches are adopted at partner institutions (Burkina Faso, The Philippines, Ecuador, Honduras, Costa Rica and Cape Verde).</li> </ul>  |
| <b>Government</b>                               | <ul style="list-style-type: none"> <li>• A national government uses a SANREM-supported plan in the formulation of National Watershed Management Strategy (The Philippines).</li> </ul>  |
| <b>Civil Society</b>                            | <ul style="list-style-type: none"> <li>• The intellectual property rights national policy was influenced by SANREM activities. A position on trade secrets was taken to protect local community knowledge (Ecuador).</li> <li>• New NGOs are developed (Burkina Faso) and there is increased networking and cooperation among NGOs for joint NRM efforts (Ecuador).</li> <li>• NGOs operating in Ecuador are using the SANREM methodology in other natural resource management projects.</li> </ul>   |
| <b>REGIONAL</b><br>Researchers                  | <ul style="list-style-type: none"> <li>• The participatory research model is extended to other research and development programs in the Southeast Asia region. Inter-institutional collaborators include ACIAR (Australian Center for International Agriculture Research), NARS (National Agriculture Research Systems), IARCs (International Agriculture Research Centers), IBSRAM (International Bureau for Soils Research and Management) and PCARRD (Philippine Council for Agriculture, Forestry, Natural Resource Research and Development).</li> </ul>   |
| <b>Government</b>                               | <ul style="list-style-type: none"> <li>• The intellectual property rights policy and trade secrets model developed in Ecuador is being promoted throughout Latin America.</li> </ul>  |
| <b>GLOBAL</b><br>Civil Society                  | <ul style="list-style-type: none"> <li>• Memory banking work of ethnoecology project (especially as developed in the Philippines with UPWARD) adopted by Native Seed Search (United States), Southern Seed Legacy (United States) and IPGRI (International Plant Genetic Resources Institute) (FAO, Italy).</li> </ul>  |

| LEVEL OF CHANGE   | IMPACT  |
|---|---|
| <b>Change in Knowledge, Attitudes, Skills or Aspiration</b> |   |
| <b>GLOBAL, REGIONAL, NATIONAL, PROVINCIAL &amp; LOCAL</b>   | <ul style="list-style-type: none"> <li>• Capacity is enhanced among participants through training, information exchange and participation in research activities (Burkina Faso, Ecuador and The Philippines).</li> <li>• Skills of researchers, graduate students and undergraduate students are upgraded through involvement in training and research activities (all sites).</li> <li>• Graduate and undergraduate students receive formal training.</li> <li>• The quality of environmental science education in the United States and host country schools improved.</li> <li>• International workshops are convened by SANREM focusing on providing skills in GIS, participatory research and indicators of sustainability.</li> </ul> |
| <b>Change in Involvement or Awareness</b>                   |   |
| <b>GLOBAL, REGIONAL, NATIONAL, PROVINCIAL &amp; LOCAL</b>   | <ul style="list-style-type: none"> <li>• Awareness of sustainability in project areas is heightened and new partnerships are developed.</li> <li>• PLLAs are performed at all sites. PLLA results are subsequently used by a variety of decision-makers.</li> <li>• International partnerships are mobilized.</li> <li>• SANREM institutes a staff exchange with FAO (United Nations Food and Agriculture Organization) Land and Water Division, Department of Agriculture. SANREM methodology was introduced.</li> </ul>   |



Key government and non-governmental dignitaries in the Philippines demonstrate support for the SANREM-Philippines partnership

### Examples of Impacts

SANREM's efforts to improve natural resource management and sustainable agriculture were manifested at three impact levels during its first phase. SANREM tried to bring about change in: awareness; knowledge and skills; and policy or behavior. Three case studies demonstrating causal flows between each of these

levels follow. The case studies are in reference to the development of natural resource management policies among multiple decision-makers, water quality monitoring and holistic management.



## Changes in Natural Resource Management Awareness, Knowledge and Policy: The Philippines

SANREM has increased awareness and involvement, enhanced knowledge and skills, and subsequently fomented change in local, provincial and national policies and practices. This is particularly evident at the Philippines site in the case of the development of the Natural Resources Management Development Plan (NRMDP) and other enhanced natural resource management policies.

### Changes in Policy, Practice or Technology

#### National

- National government use of SANREM-supported Lantapan Natural Resources Management Development Plan (NRMDP) in formulation of its National Watershed Management Strategy

#### Provincial

- Recent inclusion of environmental considerations in provincial development planning process evidenced by provincial concerns expressed regarding World Bank-funded Urban Water and Sanitation Project for local governments
- Provincial Planning and Development Office adoption of specific policies promoting technologically sound and friendly agricultural programs through multi-sectoral participatory processes
- Provincial governor, in State of the Province Address regarding sustainable agricultural development, pledged to “put into practice the good experiences encouraged by SANREM in Lantapan [municipality] by linking research and development to promote holistic watershed management and sustainable farming systems”
- Provincial use of SANREM and NRMDP planning processes to support decision-making activities
- New partnerships promoting sustainability embraced by provincial government, evidenced by public and private joint ventures and academe as strong partner in all levels of local governance

#### Local/Municipal

- Development of the Natural Resource Management Council using the SANREM research model
- Capacity and team building workshops
- Strategic planning workshops using SANREM data
- Creation of the NRMDP document through a collaborative participatory process
- Formulation of local policies and programs regarding sustainable natural resource management
- Development and adoption of the municipal NRMDP created by joint government and citizen effort
- Local business investments and development directed by NRMDP land use planning guidelines
- Lantapan provision of resource persons for natural resource management planning to other cities
- Linkage between other local governments in Bukidnon Province and the Lantapan NRMDP
- Municipal Solid Waste Task Force organized to design and implement integrated Solid Waste Management Program
- Municipal projects designed in compliance with NRMDP
- Municipal budget inclusion of supplements for the NRMDP operational budget

- Non-destructive livelihood projects for indigenous peoples supported by mayor
- Tree nursery and tree planting projects established to enhance conservation
- Resolutions adopted to protect natural resources by the Sangguniang Bayan (a local legislative body)
- Creation of Resource and Development Committees in *Barangay* development councils

### Changes in Knowledge, Attitudes, Skills, Aspirations

#### Provincial

- Provincial government partnership with SANREM in bringing municipal natural resource management planning process to fruition through provision of technical information and facilitation of discussions
- Provincial planners’ participation in SANREM data-sharing workshops

#### Local/Municipal

- Municipal, *Barangay* and other government officials ranked SANREM as a first source of information regarding soil erosion, water quality and deforestation due to increased agricultural activity
- Mayoral participation in workshops in which SANREM PLLA data was shared with municipal representatives

### Changes in Involvement or Awareness

#### Provincial

- Introduction to multi-sectoral, collaborative, participatory approach to address environmental issues through participation in SANREM workshops and meetings
- Provincial planners involved in design of SANREM research questions

#### Local/Municipal

- Mayoral participation in early SANREM Participatory Landscape Lifescape Appraisal research design
- Municipal administration representation in early meetings regarding SANREM philosophy and methodology



Dr. William D. Dar, Acting Secretary, Department of Agriculture and SANREM partner, addresses SANREM strategic planning meeting

## Water Quality Monitoring in the Philippines and the United States

### Policy, Practice or Technology

- Water Watch Participation in state regulatory hearings regarding government protection of streams – Water Watch testimony resulted in reclassified and upgraded stream protection (United States)
- Municipal government inclusion of research findings and recommendations in Lantapan Natural Resource Management Development Plan (NRMDP) (Philippines)
- Mayoral appointment of Tigbantay Wahig as president of Municipal Natural Resource Management Council (NRMC, a policy-making body) (Philippines)
- Formation of Citizen Advisory Council that regularly meets with state water regulatory agency to discuss citizen data, issues and concerns (United States)
- NGO involvement in water policy debates and formulation (Philippines)
- Collection of credible water quality data in order to influence policy (United States and Philippines)



Local policy makers discuss water quality results with SANREM scientist

- Local citizens catalyzed to form community-based environmental NGOs that monitor water quality (Water Watch, United States; Tigbantay Wahig, The Philippines)

### Knowledge, Attitudes, Skills, Aspirations

- Capacity-building trainings to enhance understanding of water quality and watershed stability using portable test kits and other analytical tools
- Development of water quality indicators demonstrating broader state of environmental quality (Indicators include: Community Perceptions, Memory and Experience; Eroded Soils in Streams; Soil Loss and Altered Stream Flows; Bacterial Contamination of Water; Demographics and Land Use)
- Knowledge and global awareness among participants built through shared water quality monitoring methodologies between Alabama and the Philippines (also cost effective)
- Research results disseminated to community members, educators and local policy-makers



Tigbantay Wahig members using water quality test kits

### Involvement or Awareness

- Workshops and exercises with community groups in Alabama (United States) and Bukidnon Province (The Philippines)
- Participatory Landscape Lifescape Appraisals (PLLAs) performed (Bukidnon, the Philippines)
- Introductory meetings with various representatives from community groups, individual farmers and government regarding SANREM project goals, philosophy and methodology (Philippines and United States)

#### Terms:

**Water Watch**, a U.S. citizens environmental advocacy group and SANREM participant.

**Tigbantay Wahig**, or Water Watchers in Binukid language. Philippine water quality monitoring NGO formed of local citizens following participation with SANREM





## Holistic Management: Donsin, Burkina Faso

### Policy, Practice, Technology

- Developed and implemented policies and practices regarding improved cattle management: limited grazing in fallow areas; communal pasture conflict resolved and jointly managed by neighboring communities
- Soil erosion practices implemented: grass seed (*Andropogon* spp.) planted along semi-permeable, anti-erosion, rock contour lines
- Defined community vision for state of environment with implications for policy direction



Soil and water conservation structures in West Africa

### Knowledge, Attitudes, Skills, Aspirations

- Participatory community discussions held to assess state of the environment
- Identified and analyzed cause and effect relationships regarding environmental and economic problems
- Identified underlying conditions requiring resolution in order to reach community-identified natural resource management goals
- Goal setting regarding desired state of local environment



Community meeting in Donsin



- Training of holistic management facilitators that emphasized the sustainable use of available resources to attain collectively defined goals of quality of life and environmental integrity against dependence from outside aid

### Involvement or Awareness

- Initial meetings between community members in Donsin and SANREM team members to describe goals and methods of SANREM project
- Holistic management themes introduced in community meetings



### Change in Policy, Practice, or Technology

The most critical level of SANREM's impact-assessment framework documents changes in practice, technology or policy that positively affect ecological integrity or quality of life – for example, major changes such as widespread adoption of conservation practices, institutional approaches to sustainability, or creation of environmentally sound policies. These positive impacts are categorized, first by the decision-making hierarchy level at which they occurred (community, local, provincial, national, regional, global), and then by the type of decision-makers involved, including community members, government units, research institutions and civil society (NGOs).

## LOCAL LEVEL

SANREM was actively involved at the local level during its first phase. It worked closely with individual farmers, traditional leadership, representatives of non-governmental organizations and government officials. This section will report impacts that occurred at this level.

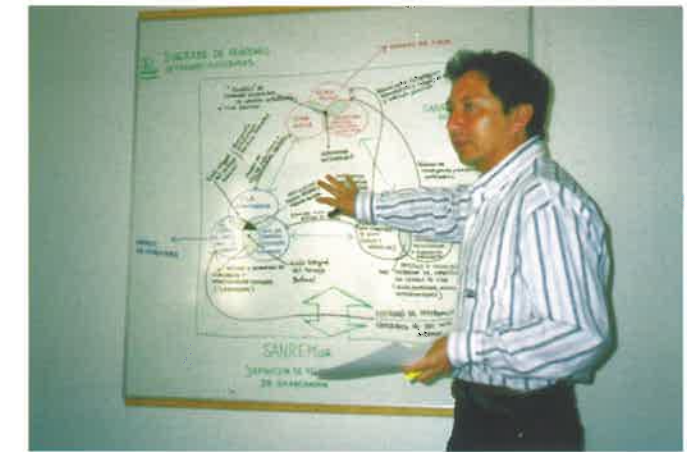
### Community Decision-Makers

#### Extension and Adoption of On-Farm Practices for Sustainable Agriculture and Natural Resources Management

Direct and indirect participation in SANREM activities has enhanced community awareness of environmental concepts and subsequent changes in natural resource management practices. These concepts include the linkage between land, water and biodiversity; attitudes towards maintaining environmental quality; and adoption of sustainable agriculture practices. As a result of training and on-farm research in sustainable agriculture at all three sites, more than 1,250 farmers are now applying sustainable management practices on their farms. In particular, they have learned how to analyze constraints to sustainability and how to identify and design interventions leading to more sustainable and productive farming systems. Examples of improved farming practices from each site include inter-cropping of sugarcane and beans in Ecuador, contour planting of pineapple hedgerows in the Philippines, and grass-seed planting along anti-erosion rock lines in Burkina Faso.

#### The Philippines

Results of the impact study conducted in the Philippines (Buenavista, Coxhead and Kim 1998) indicate significant associations between proximity to the project and the propensity to be aware, hold attitudes and even adopt practices consistent with project goals. This study indicates that SANREM has influenced the spread of ideas and information in its target community. The



study also demonstrated that *barangay*, municipal and other government officials ranked SANREM highly as a source of information on environmental and natural resources issues. They ranked the project as their first source of information in several areas of concentrated SANREM activity, including soil erosion, water quality and deforestation due to agricultural expansion. The study concluded that influencing local officials and key community members, who act as information gatekeepers, has indirectly contributed to broader environmental awareness. (Results of this survey are found in Table 3.1.)

#### Ecuador

The SANREM Andes project conducted a similar survey regarding awareness and changes in production techniques (Carranza, Andrade, and Cartagena, 1998). The Ecuadorian farmer survey participants indicated that they apply SANREM-inspired techniques and knowledge on their farms as a result of exposure to, or participation in SANREM projects. The percentage of respondents who continue to implement new farming practices in the following domains include:

- Family Gardens 19.4%
- Cropping Systems 60.6%
- Livestock 76.7%
- Soil Management 84.4%



**Table 3.1: Adoption rates and frequencies (in parentheses) of selected agricultural practices, by proximity to SANREM project in the Philippines (random sample)**

|                                     | Adoption rates (%)* and frequencies |               |   |                                  |                                     |                          |               |
|-------------------------------------|-------------------------------------|---------------|---|----------------------------------|-------------------------------------|--------------------------|---------------|
|                                     | Adoption (%)*                       | Hosted Trials | FFS/<br>Training/<br>Seminar/<br>Field Trip | Attended<br>Barangay<br>Meetings | Conversation/<br>Seminar/<br>Others | Know/<br>Not<br>Involved | Don't<br>Know |
| Contour plowing                     | 85.7<br>(72)                        | 100.0<br>(15) | 88.9<br>(8)                                 | 80.0<br>(32)                     | 75.0<br>(6)                         | 100.0<br>(4)             | 87.5<br>(7)   |
| Integrated Pest Management (IPM)    | 22.3<br>(23)                        | 68.8<br>(11)  | 23.0<br>(3)                                 | 9.8<br>(5)                       | 30.0<br>(3)                         | 25.0<br>(1)              | 0.0<br>(0)    |
| Contour strips/<br>hedgerows        | 68.4<br>(52)                        | 92.9<br>(13)  | 57.1<br>(4)                                 | 58.3<br>(21)                     | 42.9<br>(3)                         | 100.0<br>(3)             | 88.9<br>(8)   |
| Plant trees or grasses<br>on border | 95.2<br>(100)                       | 100.0<br>(17) | 100.0<br>(13)                               | 94.3<br>(50)                     | 100.0<br>(8)                        | 100.0<br>(5)             | 77.8<br>(7)   |
| Regular fallowing                   | 56.9<br>(62)                        | 58.8<br>(10)  | 50.0<br>(7)                                 | 57.4<br>(31)                     | 60.0<br>(6)                         | 80.0<br>(4)              | 44.4<br>(4)   |
| Regular crop<br>rotation            | 67.0<br>(71)                        | 80.0<br>(12)  | 57.1<br>(8)                                 | 71.2<br>(37)                     | 54.6<br>(6)                         | 100.0<br>(4)             | 40.0<br>(4)   |

\* Denominator = adoption + non-adopters who have the option to adopt (e.g., denominator for contour plowing excludes farmers with only flat land, denominator for IPM excludes farmers who do not grow vegetables; all denominators exclude tenants reporting that landlords forbade adoption, and so on)

**Community Groups Engage in Collective Decision-Making Concerning Local Environmental and Development Issues**

Subsequent to SANREM activity, community committees hosted debates on local natural resource management decision-making in the Philippines, Burkina Faso and Ecuador. This process enhanced local capacity for participatory planning and collective decision-making. Community groups in these countries also have become proactive in planning and participating in development activities. This new “action” focus has occurred as a result of their experience in working side-by-side with SANREM teams composed of researchers, development agents and government representatives. An example of collaborative goal setting for environmental and economic issues is found in the case study of holistic management in Burkina Faso on pp. 55-56, in Chapter 5.

In the Andes, four communities in Ecuador conducted a census using the “autodiagnóstico” or community-led self-diagnosis. As a result of participating in this SANREM process, one of the communities sought and received legal recognition from the government, opening up the possibility of land titling (greater tenure security leading to better resource management) and receipt of increased government services and support (health, education and welfare). Community members found that organization and supra-local linkages were necessary to enhance management of agricultural and natural resources.

**Government Decision-Makers**

Actively involving the local government in SANREM decision-making and implementation activities has positively influenced local government officials in pursuing a participatory approach to development and natural resource management planning. This is particularly well demonstrated in the Philippines in the formulation of the municipal Natural Resources Management

Development Plan (NRMDP), municipal Natural Resource Management Council (NRMDC) and the creation of research and development committees in Barangay development councils. Please see the case study on p. 20 for a complete view of impacts regarding natural resource management from the level of changes in awareness and involvement; knowledge and skills; and policy, practice or behavior.

The SANREM Philippines project demonstrated that both local and provincial governments, such as the Lantapan Municipal Government and the Bukidnon Provincial Government, can be vital and effective partners in the research process. Government and community participation with SANREM brought science and an appreciation of sustainable natural resource management principles to the local development process. This is particularly relevant in the context of government decentralization, which moves power and decision-making authority from centralized national bodies to local ones. The phenomenon of government decentralization is on the rise, particularly in developing countries such as the Philippines. This pattern of institutional impact at the municipal government level due to SANREM is also evident in the Andean and Sahelian sites. Local governments in Ecuador and Burkina Faso are eagerly seeking and actively using research outputs in making policies and decisions related to water quality and environmental issues.

**Civil Society Decision-Makers**

Active participation in SANREM activities by members of civil society has enlivened the formation of community-based organizations responsive to local resource management issues. While these organizations have developed to become strong advocates of environmental conservation and protection, they also have acquired entrepreneurial skills. A variety of examples from various SANREM field sites demonstrate these points.

**Local Civil Society Impacts**

**Tigbantay Wahig**

In the Philippines, a new grassroots organization, the “Tigbantay Wahig” (or Water Watchers) was created by SANREM-trained water quality monitoring teams. Their goal is to improve their ability to inform the community and influence local policy on matters of water quality.

**L'Association pour la Gestion Holistique des Ressources (AGEHOR)**

In Burkina Faso, the Association for Holistic Resources Management (Association pour la Gestion Holistique des Ressources) was founded in Boulsa as a result of SANREM-sponsored holistic resource management training. Its goals are to provide training, to assist villagers in resolving conflicts and to promote literacy and self-reliance. This association has facilitated natural resource management conflict resolution regarding grazing areas and has initiated a content-based adult literacy program in More that incorporates holistic resource management themes.

**Cape Verde Farmers' Association**

Based on their involvement in a multi-institutional SANREM Coordination Committee in Cape Verde as well as other SANREM training, the farmers' association was able to bid on and be awarded contracts to do their own development projects.



**Entrepreneurial Tree Seed Bank**

Filipino farmers were inspired to organize themselves into a seed production association following their participation in a SANREM-facilitated workshop on tree seed collection, handling and diffusion practices. The association, known as the Agroforestry Tree Seed Association of Lantapan (ATSAL), is supported by ICRAF (International Center for Research in Agroforestry). ATSAL developed a strategy for quality seed production and diffusion by small holders in the Lantapan municipality. ATSAL has scaled up its activities in less than a year to the municipal, provincial,



national and international levels. In 1997-1998, ATSAL supplied seeds to a variety of individuals and organizations including fellow farmers in Lantapan, the European Union-Agrarian Reform Support Program's (EU-ARSP) tree-farming projects, which target thousands of small holders throughout the Philippines; the Department of Environment and Natural Resources (DENR); and the International Center for Research in Agroforestry (ICRAF). It is hoped that the ability to demonstrate the connection between environmental advocacy and alternative, profitable and sustainable livelihood strategies will result in widespread interest in expanding tree-based production systems in watersheds.



## PROVINCIAL LEVEL

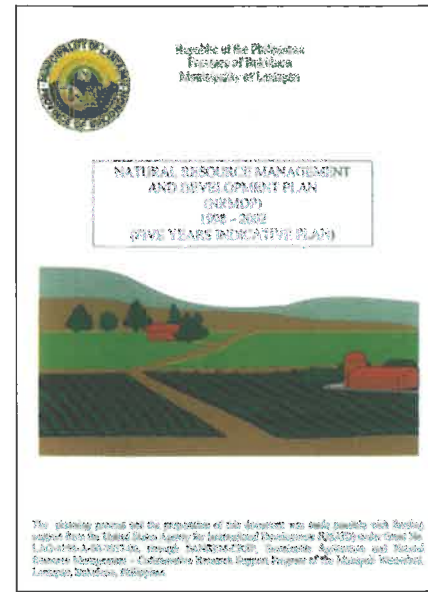
In addition to impacts at the local level in a variety of sectors, SANREM also has had impacts at higher administrative levels such as provincial and national.

### Government Decision-Makers

In the Philippines, specific policies promoting sustainable development were adopted by the Provincial Planning and Development Office. SANREM research has been cited as contributing to these policies. Full details regarding this example may be found in the case study on page 20.

### Civil Society Decision-Makers

In Burkina Faso, Plan International, an international NGO (non-governmental organization), uses SANREM research results as an input to its development strategies at several levels. These levels include the Donsin watershed, other villages in Burkina Faso, and throughout the West Africa region.



## NATIONAL LEVEL

Institutional impacts have occurred at the national level as well as local and provincial levels. These impacts are evident within national research institutions, government and civil society.

### Research and Education Decision-Makers

Several national research institutions that served as SANREM research partners have adopted SANREM's participatory and collaborative approach. This influence is evident at sites throughout the world in universities and National Agriculture Research Systems (NARS). University researchers and national research institutions in the Philippines, Costa Rica, Honduras and Ecuador have incorporated interdisciplinary and inter-sectoral collaboration and participatory methodologies in their own research and teaching. These approaches also are integrated in their strategic plans of action in the Philippines, Burkina Faso and Cape Verde.

### Participatory and Collaborative Approaches Adopted at National and International Partner Institutions

#### Burkina Faso

The National Center for Scientific and Technological Research (CNRST) of Burkina Faso adopted many aspects of SANREM's approach and philosophy. Most notably, CNRST has put the "farmer first," which is a radical change from the conventional ways of doing research in this region of the world.

#### Cape Verde

Based on a two-year collaborative research and training program with SANREM, INIDA (National Institute for Agricultural Research and Development, Cape Verde) is now implementing on-farm participatory research projects. The projects are designed based on a PLLA and have been developed by interdisciplinary teams of researchers, along with development partners and farmers. Additionally, INIDA has established a 10-year strategic plan that includes participatory monitoring and evaluation; maintaining and promoting highly trained, quality researchers; inter-

institutional, interdisciplinary research; better linkages with farmers and the extension service; and on-farm research.

#### Ecuador

In Ecuador, host country and U.S. institutions have demonstrated a strong commitment to elaborating on the research themes developed in SANREM's Phase I and to apply SANREM concepts to their work in other areas. They have chosen to continue working together and have sought funding from a variety of sources to sustain the collaborative relationships and research activities. SANREM's collaborative inter-institutional approach has facilitated the creation of long-term institutional relationships essential for the success of sustainable development.

#### Honduras and Costa Rica

Participatory and interdisciplinary approaches to sustainability have been incorporated into the curricula of two agricultural universities, EAP/Zamorano and EARTH, that train students from most Latin American countries. Many of the students will take on positions in government and agribusiness. Students have carried out community based projects that integrate biophysical data collection with research on indigenous knowledge, social organizations, economic environments and quality of life.

#### The Philippines

The Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) has applied the SANREM approach to improve its proposal evaluation mechanism (integrating holistic, interdisciplinary and multisectoral considerations); to guide its efforts to balance the institution's traditional commodity focus with the landscape/lifescape approach to research and development; to strengthen its integrated research and development program to include components such as the environment and sociocultural dimensions; to enhance its medium-term research and development plan; and to guide the implementation of its natural resource management-related programs (Dar and Serrano, 1998).

### Government Decision-Makers

At the national government level, the SANREM Philippines project provides a seminal example of institutional impacts. The national government of the Philippines has employed the SANREM-supported Lantapan municipal Natural Resource Management Development Plan (NRMDP) in its formulation of the National Watershed Management Strategy. More specifically, the Water Resources Development Project recently completed a national framework of strategies for sustainable management of natural resources within all the watersheds in the Philippines. The SANREM-supported plan was cited as a model demand-driven municipal government-led watershed resource management plan. Please see the full case study on page 20.

### Civil Society Decision-Makers

SANREM has been particularly influential in Burkina Faso in developing new non-governmental development organizations, and in Ecuador in facilitating networking among NGOs. SANREM has also witnessed an increase in non-governmental organization (NGO) collaboration with research and government institutions. In many cases, the NGOs have also developed greater capacity to conduct and use research for development planning and environmental advocacy.

### National NGO Initiatives

#### Ecuador

A new alliance to address landscape ecology issues has been formed in Ecuador. Several NGOs that had collaborated with SANREM are now working together to expand protection of the nearby Maquipucuna Reserve. Experience and data from SANREM's first phase are being used to apply for United Nations Environment Program and the World Bank's Global Environment Facility (GEF) financing to develop biological corridors between reserves in the area.

A member of the SANREM consortium, the University of Georgia Anthropology Department and EcoCiencia/SUBIR (an Ecuadorian NGO) contributed to Ecuador's national intellectual property rights policy. Their contribution was a comparative ethnoecology

of the Cotacachi-Cayapas project. A position on trade secrets was taken to help local communities protect their knowledge of valuable medicinal plants. The trade secret model is being promoted throughout Latin America.



#### Burkina Faso

SANREM was the model for the "Sustainable Development Council," a non-profit organization established by Dr. Salibo Somé (Assistant Professor at the Institute of Rural Development, University of Ouagadougou and a SANREM principal investigator). The objectives of the organization are to provide guidance to a full range of development partners in sustainability of natural and human resources; to raise awareness about the stakes and options related to environmental degradation; to collect and demonstrate methods for environmental education in primary and secondary schools as well as undergraduate colleges; to collect and demonstrate strategies for restoring and maintaining biodiversity; to create opportunities for experience and information exchange in sustainable agriculture, natural resource management, peri-urban and urban development planning, waste management, and conflict management; and to develop written materials aimed at educating, training and improving awareness of the richness, beauty and complexity of ecosystems and of human behavior with respect to building universal well-being.





## REGIONAL LEVEL

The broadest level of impact initiated during Phase I of SANREM occurred at the regional level. This was a considerable accomplishment in terms of scaling up from the farm and landscape levels. Phase II will pursue this scaling up approach to a much greater extent than Phase I.

### Researcher Decision-Makers

The participatory model of combining scientist- and farmer-managed research has been extended to other research and development projects in Southeast Asia, including projects funded by the Australian Center for International Agriculture Research (ACIAR). In particular, experience with global and local partnerships in SANREM has influenced the Filipino National Agriculture Research Systems (NARS), enhancing the organization and management of regional research consortia and laying the groundwork for linkages with organizations such as the International Agricultural Research Centers (IARCs). Furthermore, the gains SANREM made at the Philippines site have attracted other regional research organizations such as International Bureau for Soils Research and Management (IBSRAM) and the Australian Center for International Agriculture Research (ACIAR) to conduct research in the Lantapan municipality. Complementary research agendas and resources among these projects are being ensured by the Philippine Council for Agriculture, Forestry and Natural Resource Research and Development (PCARRD), which plays a coordinating role for regional projects.

The SANREM experience in the Philippines has contributed to broader research within Southeast Asia. In particular, the economy of sustainability will be examined in Thailand during Phase II of the project.

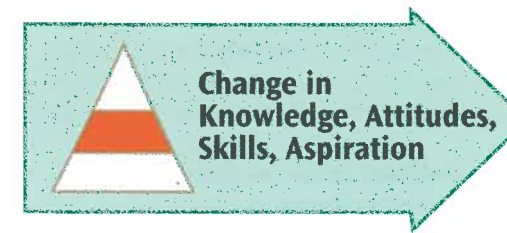
### From the Philippines to Thailand

The SANREM experience in the Philippines has been instrumental in the design of research being conducted in Thailand. Within SANREM-Southeast Asia, the close collaboration of researchers from different disciplines with the community made it abundantly clear that a participatory, multidisciplinary and multi-sectoral approach is critical to identifying the right research questions and finding answers to them. The Thai project, funded by the Ford Foundation, has attracted the interest and involvement of a

wide range of researchers and policy advisors spanning economics, agronomy, forestry, development studies, econometrics, political science and rural sociology – quite a departure from the usual research model in Thailand. The success of this method will depend in part on the continuing success of SANREM as a proving and learning experience. Thailand is widely regarded as setting the path along which many other Southeast Asian developing economies will travel in terms of economic growth, policy and environmental problems. However, in one very important respect – progress in the devolution of resource management rights and responsibilities to local government units – the Philippines is far ahead. What researchers learn from the Thai project, coupled with other SANREM lessons, should provide a robust foundation for extrapolations and applications to Indochina, Indonesia and countries elsewhere in the developing world.

### Summary – Impacts Demonstrated by Changes in Practice, Technology and Policy

Clearly, SANREM has had a number of substantial impacts in numerous settings, as demonstrated by key changes in practice, technology and policy. These impacts are manifested at all levels of society, from local community groups to national research institutions. The rich variety of sectors impacted includes private, non-governmental, government, university and research organizations. Continued SANREM activity during Phase II will enhance and expand these impacts.



SANREM participants have benefited from a variety of opportunities to participate directly in research, training and outreach activities. These opportunities and activities enhance the knowledge, attitudes, skills and aspirations of individuals and groups involved. Individual and organizational capacities are enhanced. Positive changes at this level move the program upward in the impact assessment hierarchy, ultimately resulting in adjustments or modifications of “practices” related to ecosystem integrity or quality of life. The following accomplishments were achieved in the first phase of program implementation.

## LOCAL AND PROVINCIAL LEVELS

A variety of training, information exchange and participation in research activities occurred at the local level during the first phase of SANREM. These activities enhanced knowledge and skills regarding sustainability and natural resources management of the participating individuals.

### Community, Government, Non-Governmental Organizations and Research

From its inception, SANREM established community-based education, ecological awareness, information exchange and other types of informal training as a priority to complement the formal training at the undergraduate, graduate and visiting scientist levels. Although these activities may not have led to instantaneous changes in policy, practice or technology, they have established a substantial foundation for standardizing methodologies, building capacity, strengthening community leadership and heightening awareness of sustainability. The information and skills garnered in these trainings have enabled individuals to critically consider natural resource management practices in their own back yards as well as in the entire watershed in which they live. An environmentally literate citizenry, in turn, may participate at higher rates in public policy debates regarding sustainable manage-

ment, and may hold various government, non-governmental and research organizations accountable for implementing sound environmental practices. The following trainings have contributed to the phenomena of improved practices at the farm level and governmental policies at the local, provincial and national levels. (See examples on pp. 18-19 that trace these effects.)

- More than 520 individuals at the community level have been trained in environmentally sound practices related to agriculture, animal husbandry and water resources.
- More than 130 individuals have been trained and involved in participatory methods and diagnosis of constraints to sustainability through the PLLAs at each site.
- More than 120 individual farmers have actively engaged in on-farm research.

Community awareness regarding environmental relationships and concepts has increased due to regular interaction between the SANREM research team and community leaders, both governmental and non-governmental. This phenomenon is particularly well documented in the Philippines and Ecuador (see pages 23-24).

## NATIONAL AND REGIONAL LEVELS

SANREM facilitated changes in knowledge and skills at national and regional levels in addition to those at local and provincial levels. Synergistically, these changes, along with others, have provided the foundation for subsequent development in improved natural resource management policies, practices and behaviors.

### Upgraded Skills and Enhanced Knowledge of Researchers, Professionals and Students through Training, International Workshops and Participation in Research

In the initial phase, training and workshops focused on providing program participants with appropriate methodologies and tools required for participatory research on a landscape scale. SANREM expanded its information exchange beyond internal partners, often community-based, to regional and international workshops and conferences. These trainings, as with those that occurred at the local level, have contributed to higher levels of knowledge and skills among the participants regarding sustainable natural resource management. The participants have brought their knowledge and understanding to the classrooms, research institutes, development organizations and advisory panels on which they serve. A chart presenting a comprehensive set of training topics and participants follows in Table 3.2 (page 31).



- More than 620 researchers and professionals in eight countries increased their research skills through training and workshops on a variety of conceptual and methodological issues, including indicators of sustainability, geographic information systems, participatory methodologies, gender analysis, statistics, proposal writing and other relevant topics.
- 30 graduate level students were either fully or partially funded by SANREM.



- Four Master's level students from Cape Verde graduated and returned to their national research programs.
- 22 undergraduate students were trained in community-based research and participatory methodologies.
- 15 senior students performed their senior theses through SANREM.

**Morocco**

SANREM joined forces with Chemonics International to implement a USAID project on Water Resources Sustainability (WRS) in Morocco. As a result, a participatory diagnostic activity conducted by SANREM and Ecole Nationale Agricole-Meknes (National School of Agriculture in Meknes) did much to increase the capacity to work with local communities. A workshop on participation provided a unique opportunity to bring together researchers from ENA-Meknes, representatives from USAID-Morocco, the WRS project, the Ministries of Environment and Agriculture, Energy and Mines, INRA-Settat (The National Institute for Agriculture Research) and other agencies. The workshop led to the successful integration of methods and objectives and a collaborative alliance that served as the foundation for subsequent fieldwork and demonstrations.

**International Workshops**

SANREM hosted several regional and international workshops and conferences to exchange information or train individuals in research tools. Summaries of three of the major workshops that SANREM facilitated follow.

**Geographic Information Systems – Tooling the Planners of Tomorrow**



GIS training participants in Bangkok

A workshop on "The Role of GIS (Geographic Information Systems) in Developing and Transferring Sustainable Agriculture Technologies in the Tropics" was held at the Asian Institute of Technology in Bangkok, Thailand, in 1995. An enthusiastic group of 28 people from a dozen Southeast Asian countries attended. The participants, few of whom had any previous GIS experience, received training in the theoretical aspects of GIS as well in the computer skills required to use the methodology. They applied these skills analyzing data sets brought by participants from their respective countries. Local government officials attended the last days of the workshop to see the outcome of the training. SANREM collaborated with other international programs and centers such as ICRISAT (International Crops Research Institute for Semi-Arid Tropics) and IRRI (International Rice Research Institute) in sponsoring this event, with the additional contributions of AVRDC (Asian Vegetable Resources and Development Center), ICRAF (International Center for Research in Agroforestry) and NASA (U.S. National Aeronautics and Space Administration).

In Central America, seven students and six professors from EARTH University were trained in Teledetection and GIS by Marcelo Guevara from CDC (Center for Data Conservation) in Ecuador.

**Bits of Wisdom and More to Learn: An International Dialogue in Participatory Research**

A workshop on Participatory Collaborative Research Methodologies took place at Tuskegee University in Tuskegee, Alabama, in June 1995. The workshop gathered 73 participants representing 31 organizations and 17 countries to share insights from multiple vantage points and to capture operational lessons regarding respective experiences with participatory, collaborative research. Participants included those who worked at the field level; led research projects; and managed, coordinated or evaluated programs at the global scale. One outcome of this workshop was a work tool, "Questioning Knowledge," for critical reflection on participatory collaborative research.

Participant comments regarding the workshop included the following: "It was like a family reunion, where you meet relatives you did not know, but you get to like them and count them as part of the family." – David Deschler, Cornell University.

"I felt very positive about the quality and variety of interactions. The discussions were very good, better than usual, people were speaking their minds and actively grappling with difficult issues." – Bill Deutsch, Auburn University.

**Demystifying Indicators of Sustainability**

SANREM has addressed the challenge of indicators of sustainability through numerous national and international forums. INFORUM (an information exchange consortium) organized a moderated electronic conference for participants to exchange ideas and discuss issues. In vigorous testimony to the global reach of electronic media, the forum drew online participation from approximately 235 people from 35 countries and from different multi-lateral, bilateral and national public and private institutions. Participants shared more than 20 documents. The conference made progress in defining the type of conceptual frameworks needed to develop indicators of sustainability. It became clear, for example, that indicators must be developed within a framework linking a hierarchy of systems from field to farm to community and upward to national policy level systems.



Participants practice interviews during ethnoecology workshop

The electronic conference served as a preparatory conference for an international workshop on the topic, where representatives presented 22 papers and 21 posters from a wide range of disciplines, perspectives and affiliations. Workshop sessions focused on translating the concepts and experiences into workable

approaches for use in SANREM research activities. The proceedings were published by SANREM in 1994.

Building on these workshops, there have been numerous other activities related to indicators, including:

- a workbook on participatory process designed to lead to indicators at the community level;
- a workshop held at EARTH University in Costa Rica to better understand how to use participatory landscape/lifescape appraisals to identify indicators of sustainability;

- a workshop held in Burkina Faso that derived integrative indicators;
- a workshop co-sponsored by USAID and the World Bank on indicators for agricultural development of donor organizations and the CGIAR; and
- participation in the development of a GTZ (Gesellschaft für Technische Zusammenarbeit)-led workshop which resulted in a field workbook on Indicators of Sustainable Land Management.

| Topic   | Participants   | Scale and Location  |
|---|--|---|
| <b>Innovative Research Approaches to Sustainability</b>   | <ul style="list-style-type: none"> <li>• 42 Consortium Scientists and Graduate Students</li> <li>• 35 Consortium Member Scientists and Graduate Students</li> <li>• 20 Members of the National Research Council</li> </ul>   | Global, Athens, GA<br>Global, Blacksburg, VA<br>Global, Atlanta, GA   |
| <b>Indicators of Sustainability</b>   | <ul style="list-style-type: none"> <li>• 235 Scientists from 35 Countries</li> <li>• 100 Scientists and Development Workers</li> <li>• 25 Representatives of International Development and Research Organizations</li> </ul>   | Global, Electronic Conference<br>Global, Washington, DC<br>Global, Athens, GA                               |
| <b>Participatory Research Methodologies</b>   | <ul style="list-style-type: none"> <li>• 73 Participants from 31 organizations and 17 countries</li> </ul>   | Global, Tuskegee, AL  |
| <b>Participatory Monitoring and Evaluation</b>  | <ul style="list-style-type: none"> <li>• 30 Principal Investigators</li> <li>• 85 Researchers, Development Workers and Community Members</li> <li>• 40 Researchers and Extension Agents</li> <li>• 20 Partner Institution Representatives and Community Members</li> </ul> | Global, Little Rock, AR<br>National, Ouagadougou, Burkina Faso<br>National, Cape Verde<br>National, Ecuador |
| <b>GIS (Geographic Information Systems)</b> <ul style="list-style-type: none"> <li>• Role of Geographic Information Systems in Developing and Transferring Sustainable Agriculture Technologies in the Tropics</li> <li>• Teledetection and the Use of GIS</li> </ul> | <ul style="list-style-type: none"> <li>• 28 Researchers and Government Leaders from 12 SE Asian Countries</li> <li>• 13 EARTH Professors and Students</li> </ul>   | Regional, Bangkok, Thailand<br><br>National, Costa Rica   |
| <b>Buffer Zone Management and Agroforestry</b>  | <ul style="list-style-type: none"> <li>• 70 Researchers, Development Workers, and Local Government Leaders</li> </ul>  | National, Mindanao, Philippines   |
| <b>Participatory Appraisal (at secondary sites)</b>   | <ul style="list-style-type: none"> <li>• 32 Researchers, Extension Agents, and Community Members</li> <li>• 30 SANREM Site Scientists and Costa Rican Community Members</li> </ul>   | National, Cape Verde<br>Global, Costa Rica  |
| <b>Proposal Writing</b>   | <ul style="list-style-type: none"> <li>• 25 Researchers, Extension Agents, NGO and GO Professionals</li> </ul>   | National, Cape Verde  |
| <b>Experimental Design and Statistical Analysis</b>   | <ul style="list-style-type: none"> <li>• 30 Researchers and Extension Agents</li> </ul>  | National, Cape Verde  |
| <b>Planning and Administering Programs in Sustainable Agriculture and Natural Resource Management</b>   | <ul style="list-style-type: none"> <li>• 10 Researchers</li> </ul>   | National, for Cape Verde held in US   |



| Topic   | Participants  | Location        |
|---|---|-----------------|
| Hedgerows Systems   | 100 Farmers   | The Philippines |
| Sustainable Agriculture Conservation Farming Systems                      | 179 Farmers   |                 |
| Biodiversity in Gardens and Composting                                    | 130 Women Gardeners   |                 |
| Natural Resource Management Priorities                                    | 40 Women Farmers  |                 |
| Biodiversity Conservation   | 25 Women Farmers  |                 |
| Collection Classification and Tissue Culture                              | 4 Women   |                 |
| 8 Workshops on Conservation Principles and Practices                      | 100 Farmers and 30 Government Officials   |                 |
| Role of Local Government in Research Activities and Sustainable Resources | 198 Government Officials  |                 |
| IPM Field School for Vegetable Production                                 | Vegetable Farmers   |                 |
| Ethnoentomology   | Vegetable Farmers   |                 |
| 14 Water Quality Monitoring Training                                      | 320 Community Members, Educators, Health Professionals and Local Government Officials | Burkina Faso    |
| 4 Workshops on Holistic Management  | 12 Extension Workers and Community Members  |                 |
| Zai Tool Making   | 4 Community Blacksmiths   |                 |
| Photographic Technique  | 18 Farmers  |                 |
| Practical Literacy in Moré  | 10 Farmers  |                 |
| Village Tree Management   | 1 Farmer  |                 |
| Gender and Social Stratification  | 40 Community Members and Researchers  |                 |
| Ethnoveterinary Medicine and Nutrient Cycling                             | 18 Extension Agents, Community Members, and Researchers                               | Ecuador         |
| Water Quality Monitoring  | 30 Students, Staff and Community Members  |                 |
| Agriculture and Livestock Registers                                       | 16 Farm Families  |                 |
| Census Taking   | 16 Community Members  | Costa Rica      |
| Medicinal Plant Drying  | Community Members   |                 |

### Summary – Changes in Knowledge, Attitudes, Skills and Aspirations

Phase I of SANREM was responsible for a rich variety of substantive changes in people's knowledge, attitudes, skills and aspirations. These changes, which are the precursors to higher-level policy and behavioral changes, took place in local communities, national centers and international gatherings. Participation in SANREM research activities, trainings, workshops and educational opportunities was responsible for these changes.



Full stakeholder participation in the research design, information exchange and networking phases of the project was necessary for subsequent impacts to occur at attitudinal or behavioral levels. SANREM viewed this participation as a critical advantage in enabling the program to continue beyond the life of the project. Participation in these activities constituted the first, most fundamental tier in SANREM's hierarchy of impacts.

## LOCAL, PROVINCIAL AND NATIONAL LEVELS

As the program evolved, we observed results at higher levels – as exemplified by changes in knowledge and practice. Impacts at the most fundamental level – involvement and awareness – are observable primarily through participation in trainings and activities facilitated by SANREM. Examples of these impacts follow.

### Local, Provincial and National

#### Heightened Awareness of Local Sustainability Issues and Development of New Partnerships

SANREM has been responsible for heightened levels of awareness regarding sustainability and has served as a highly effective catalyst for new partnerships among researchers, development professionals and community members, including local leaders. To encourage community participation in the early stages of the research program, we held numerous field tours, workshops and information sessions. A summary of some of these activities follows.

- 365 individuals attended activities on topics such as sustainable agriculture, home gardening, biodiversity conservation, soil conservation and environmental protection.
- More than 100 individuals were involved in activities and events to raise awareness and provide information about environmental sustainability to government representatives and local leaders.
- More than 100 individuals participated in a "Ritual of Understanding" held at the request of the Tala-andig tribe to sanction both the relationship between the tribe and SANREM participants, and the initiation of research activities in its ancestral territory.
- The University of San Francisco-Quito in Ecuador has been instrumental in raising awareness among local populations. A rich database on plant species has been created and left with the communities. Information from it is being used to leverage funds from the outside.

In addition to these workshops, Participatory Landscape/Lifescape Appraisals (PLLAs) were performed at all sites. This process built participant understanding and awareness of environmental relationships in a given landscape as well as informing research implementation.

- More than 295 individuals, including community members, government representatives, development agents and national and international researchers, participated in the PLLAs.
- The PLLA process occurred in five countries: the Philippines, Burkina Faso, Ecuador, Cape Verde and Morocco.
- More than 100 community members actively participated in an "autodiagnóstico" in four communities in Ecuador.

In addition to this wide variety of workshops, trainings and conferences, which augmented levels of awareness and involvement, a number of programmatic relationships also developed as a result of participating in Phase I of SANREM. These relationships have developed among sites as well as between developing countries and the United States, thus contributing to growing international experience in "lessons without borders." These partnerships include the EPA-funded Water Watch Program in Alabama and Tigbantay Wahig (the Philippine Water Watch organization) and the Global Classroom Linkage Project, which engages primary and secondary school students in exchanges and activities to enhance environmental awareness.

#### Partnering with the United Nations

SANREM and the United Nations Food and Agriculture Organization (FAO) Land and Water Division have secured a partnership for future work together. In the past year, through an ongoing joint effort, SANREM has worked closely with FAO, lending its expertise in participatory planning and inter-sectoral work to FAO's strategic planning toward the year 2015. SANREM helped develop a set of guidelines on participatory planning for sustainable land management. In the future, FAO and SANREM will engage in joint work on understanding decision-maker needs as well as activities related to the Commission on Sustainable Development's review of progress in sustainable agriculture.

A foundation for meaningful change was created through individual and group participation in awareness-building activities. These events included participation in awareness-raising events such as Participatory Landscape/Lifescape Appraisals (PLLAs). Changes in levels of involvement and awareness regarding themes of sustainability created the foundation for subsequent changes in knowledge, attitudes and ultimate practices and policies.

### Impacts – Conclusion

The first five years of SANREM project implementation have yielded a variety of impacts. These impacts have occurred at three different levels: involvement in activities, heightened awareness, changes in knowledge and skills, and changes in practice or policy. These impacts appeared in all sectors, including government, research institutions, civil institutions and individual actions, and have taken effect at the farm, landscape, municipal, provincial, national and regional levels. SANREM's commitment to an approach that builds from the bottom up will continue during Phase II of the project. In particular, support for natural resource decision-makers at all levels will continue, with an added element of support to global decision-makers.



## CHAPTER 4: BENEFITS TO THE UNITED STATES Extending the Results Home

The benefits of the SANREM program to the United States are tangible and can be classified into three broad categories: institutional, methodological and environmental. However, SANREM is unlike other CRSP commodity-based programs in which research that results in improvements in crop germplasm, pest control and other production practices is likely to directly benefit U.S. agriculture. Instead, the focus of SANREM is on sustainable natural resources management, and the benefits and impacts, both locally and globally, are more difficult to quantify.

### Institutional Benefits

SANREM activities have benefited the United States through institutional capacity building activities, including improved opportunities for students and faculty to engage in interdisciplinary team field research; expanded curricula and course content to address global environmental issues; innovative approaches and methodologies in graduate and undergraduate programs at partner institutions; and efforts to make ongoing programs more participatory, demand driven and relevant to clientele needs.

### Universities

Participation with SANREM has strengthened agricultural and environmental programs at U.S. universities. It has enriched the training of faculty, students and staff with opportunities for field research, international collaboration and other types of training. These partnerships have particularly benefited smaller universities, such as Western Carolina University, and those that are historically committed to the education of minority students, such as Tuskegee University. The impacts on all participating U.S. universities include:

- Students and faculty have benefited from opportunities to engage in field research and to work on interdisciplinary teams with colleagues in developing countries. For example, at least seven graduate students and one undergraduate student



*International research experiences shared at U.S. workshop*

from the United States have been supported by and/or have participated in SANREM activities. This has provided them with international training and experience.

- Faculty from different disciplines and departments, from the same and from different institutions, have collaborated, often for the first time.
- Global environmental issues and innovative approaches and methodologies have been incorporated into graduate and undergraduate courses taught at partner universities. For example, the SANREM experience has been incorporated into the Environmental Literacy Program/requirement at the University of Georgia, which teaches 3,000 students per year.
- Educational institutions have broadened the international scope of their programs and have established or strengthened linkages with developing countries. For example, an institutional relationship has been formed between Tuskegee University and the University of Ouagadougou in Burkina Faso, providing opportunities for faculty and students to collaborate cross-culturally.

### Non-governmental Organizations

The collaboration of academic institutions with non-governmental development organizations is one of the most innovative elements of the SANREM approach. It enables those with scientific expertise to work hand-in-hand with those who have field experience and close relationships with local communities. NGOs, such as the Heifer Project International and the Center for PVO/University Collaboration in Development, have reported considerable benefits derived from the partnership with SANREM. Benefits from these inter-institutional partnerships have included:

- NGO staff have gained direct experience in field research in developing countries. They have participated in training and workshops on the SANREM approach and participatory research methodologies.



*U.S. graduate student at field site in the Philippines*

- NGO programs have employed output and results from SANREM research in other programs. They also have expanded the scope of their interventions both geographically and sectorally.
- Several partners have been able to leverage additional support for their programs as a result of their participation in SANREM. The Andean project, for example, is using data and experience from the first phase to leverage funding from the Global Environment Facility (GEF) Program.
- Native Seed Search (Tucson, Arizona) has adopted the memory banking work of the Ethnoecology project, especially as developed in the Philippines with UPWARD. The Southern Seed Legacy has also adopted the approach.

### Classroom Linkages

Teachers and students have benefited from the establishment of global classroom links between U.S. primary and secondary schools and SANREM sites. Such links are ongoing between schools in Virginia and Cape Verde; Alabama, Georgia (U.S.) and the Philippines; and Georgia (U.S.), Ecuador and Burkina Faso. These linkages provide the following benefits:

- Students learn environmental science and multicultural issues through firsthand experience and personal relationships by exchanging essays, drawings and photographs with children from other countries and cultures.
- SANREM researchers serve as classroom resources by sharing their research findings and teaching students to use scientific equipment and techniques.
- Teachers continuously expand and update their science training and course curricula by incorporating SANREM research findings and by participating in other SANREM activities.

### Environmental Benefits

SANREM addresses environmental issues that have worldwide consequences and are of global concern. Forest protection and water quality are examples of such issues. Agenda 21, a global environmental action plan that grew out of the 1992 Earth Summit, is founded on the premise that natural resource management in the developing world impacts the United States. Protection of forests, for example, directly impacts the global carbon cycle and thus impacts global climate change. Water quality issues, such as those SANREM is addressing in the Philippines and Morocco, directly impact coastal fisheries and water quality of the oceans. However, these impacts are difficult if not impossible to quantify directly in the short term, particularly for a small research organization. SANREM contributes to this global body of knowledge and will develop a global knowledge base in Phase II.

### Methodological Benefits

SANREM develops, evaluates and tests innovative methodologies and approaches to participatory, landscape scale research. These methodologies and approaches are currently being used in a variety of domestic programs. Several examples are listed and briefly described below.

- The USDA Southern Region Agricultural Experiment Station director is considering incorporating initiatives in agroecosystems approaches in its work.



*U.S. farmer participant in USDA watershed quality project*

- The USDA is planning a domestic activity fashioned after the SANREM approach. The upper Oconee River in Georgia has been selected for a landscape/lifescap project under the leadership of the USDA/ARS J. Phil Campbell, Sr. Natural Resource Research Center in Watkinsville, GA, and in collaboration with SANREM.
- The community of Griffin, GA (where the UGA Experiment Station that housed SANREM originally was located), received a grant from the USDA Community Food Security Program to conduct a community assessment of food security. The results of this study will be used to plan and implement community interventions. The assessment will use the PLLA methodology developed by SANREM and will be conducted under the guidance of SANREM scientists.
- Iowa State University is currently working with the Land Stewardship Project in Minnesota to identify and adapt participatory indicators of sustainability for the United States.

## Bringing our Lessons Home

### Visions and Local Linkages in Participatory Landscape Research

The Piedmont region of the Southeastern United States faces many of the same constraints to sustainability as its southern sisters in the humid tropics. The southern Piedmont is characterized by expanding urban areas with increasing demand for finite water and land resources. Competing land uses such as agriculture, forestry, industry, urbanization and recreation can result in conflicts. Each land use has unique upstream-downstream impacts. Additionally, many southern U.S. farmers have relatively small land holdings and limited resources, and historically have been under served by agricultural research and education efforts.

In 1994, SANREM provided training at the USDA-ARS J. Phil Campbell, Sr., Natural Resource Conservation Center to introduce the researchers to landscape and participatory research approaches being used in the Philippines, Ecuador and Burkina Faso. Dr. Jean Steiner, Director of the research station, saw that these approaches could help focus their five-year program of work. Additionally, the Conservation Center has developed several successful proposals funded by the Sustainable Agriculture



Research and Education (SARE) program and the Georgia Environmental Protection Department. These grants employ concepts developed within SANREM for participatory research, participatory monitoring and evaluation of outcome-based research. The SANREM training in Holistic Management also has influenced the developing Whole Farms planning and research program at the Conservation Center.

The partnership between SANREM and USDA-ARS has since been strengthened and formalized for joint efforts in both domestic and international arenas. In the Phase II proposal for SANREM, the USDA-ARS is a consortium member and will be integrating research results into the Knowledge Base and Decision Support Program of SANREM.

“This will provide synergistic benefits to both programs as we look at principles relating to sustainability that transcend a specific site or system,” says Dr. Steiner. Partners are now exploring a possible participatory landscape-lifescap appraisal (PLLA) for the upper Oconee River Basin of Georgia to complement their geo-referenced natural resources database and to bring in more socioeconomic data. Although funding will come from different sources, the SANREM and USDA-ARS partnership has paved the way for a U.S. domestic site and established an immediate mechanism for exchanging lessons between developed and developing countries.

### Partnerships in Water Quality Monitoring

Rural Philippines and Alabama conduct similar water quality monitoring activities and continue to share approaches, methodologies and lessons. In both project settings, water quality of both coastal marine and inland freshwater environments is threatened by land use impacts such as soil erosion and sedimentation, excess nutrient runoff and bacterial contamination. It is becoming increasingly well known worldwide that non-point-source pollution cannot be adequately addressed without an informed and concerned public willing to take action to solve the problems.

The Philippines water quality monitoring initiative is a component of SANREM research activities in the Manupali watershed and is largely modeled after the Alabama Water Watch (AWW). AWW is a volunteer water quality monitoring program funded by the U.S. Environmental Protection Agency (EPA) and the Alabama Department of Environmental Management in response to citizen interest in participating in statewide water issues. The overall goal of both projects is to foster the development of community-based water monitoring groups and to collect credible water quality and quantity data that lead to environmental and policy improvements. This is primarily accomplished by improving community understanding of water quality issues and watershed stability with simple test kits and other analytical tools.

Sharing methodologies used in the Philippines and Alabama saved time and money for development of techniques and resources, and conveyed a sense of “global to local” environmental awareness. For example, in the Philippines a protocol for bacterial monitoring was developed which is now being used widely in the AWW program. Data from the Philippines served as a case study in the AWW training and workbook.

Both Filipino and American citizen monitors benefited from knowing that they were using the same equipment and

approaches, and both had a sense of participating in a global effort and helping others with information gathered. In both projects, research results were disseminated to community members, educators and local policy-makers by both citizen monitors and program managers.

Parallel yet complementary efforts in water quality monitoring in rural Philippines and Alabama demonstrate vital lessons in linking global communities and citizen organizations in research. Although implemented in different environments and cultures, the synergy and global focus of the SANREM/Philippines project and the Alabama Water Watch have proved beneficial to both.

### Global Classrooms



*Filipino students receive training in Auburn-led water quality analysis*

In an effort to promote environmental awareness and conservation efforts among future residents of the watersheds where SANREM has been working, the program has created a project on Global Classroom Linkages. These linkages provide a means for students around the world to share information about their landscapes and lifescapes with students in North America. The project started with an exchange of letters of introduction between classrooms in Georgia and the Philippines, and soon letters were flowing between Alabama and Ecuador, and between Cape Verde and Virginia. The ongoing dialogue between students became a means of sharing cultural information, perceptions about their natural resources and the environment, gardening techniques and, of course, drawings and pictures. In the case of Mrs. Cheryl Gardner in Rome, Georgia, and Mrs. Natividad Durias in Lantapan, Philippines, the teachers also corresponded, and both classrooms had experience with water quality monitoring efforts led by Dr. Bill Deutsch of Auburn University. The Global Classroom Linkages project has offered students the opportunity to establish and learn from long distance friendships.



*International SANREM participants exchange water quality methodologies for use in primary school curricula in Alabama*

### Site Descriptions

SANREM research activities focused on three core sites: The Philippines, Burkina Faso and Ecuador, initiated in a time progression during the first phase of the program. These sites were chosen to represent three regions of the world and to depict the ecological zones of the humid tropics and the semi-arid tropics. Each of these ecological zones has several general characteristics that makes it of keen interest in studying sustainable agriculture and natural resource management in a landscape setting. For the mountainous and humid tropics, these characteristics

include reserves of plant genetic diversity; centers of both cultural and biological diversity; high rates of soil loss and sedimentation; significant downstream impacts; zones of human migration; and significant forest resources. For the semi-arid tropics, the characteristics of interest include desertification; high spatial variability; increasing human population pressure on the land; food supplies that are highly dependant on the vagaries of rainfall; and vulnerability to famine.



**ANDES  
REGION**  
Ecuador

**WEST AFRICA  
REGION**  
Burkina Faso

**SOUTHEAST ASIA  
REGION**  
Philippines



## The Philippines



### Landscape

The SANREM Philippines program was implemented in the Manupali watershed, incorporating the municipality of Lantapan, in central Bukidnon province on the southern island of Mindanao. Lantapan is 15 km south of the provincial capital of Malababay and 130 km southeast of Cagayan de Oro, the closest major trading center and port. The watershed is located on the steep slopes of Mt. Kitanglad and Mt. Kalatungan, volcanic peaks that dominate the landscape. The Manupali River forms the southern boundary of Lantapan; and the watershed, interlaced with tributaries, drains about 40,000 hectares. It is a land-locked region with river flatlands descending toward the coast to the north and climbing in all directions through rolling hills to some of Mindanao's highest mountain ranges from 1,100 to 2,200 meters. Almost half of the land in the watershed has slopes of 40 percent or more, and much of the soil is deep clay. The upper Manupali watershed has been subjected to heavy deforestation as agriculture has intensified; these higher elevations are now experiencing losses in biodiversity and critical levels of soil erosion. The region has a six-month monsoon season with annual rainfall averaging 2,300 mm.

### Lifescap

Lantapan is home to tribal groups indigenous to Bukidnon, primarily the Talaandig; and to settlers, the Dumagat, Ilocano and Igorot, who have arrived from coastal Mindanao and other Philippine islands. The watershed is divided into smaller political divisions called barangays. Population increase has been rapid in the last three decades, rising at least four percent annually from 14,500 in 1970 to 39,500 today. Agriculture dominates the economy; most farms are smaller than 5 hectares and most families live close to subsistence level. Low altitude flatlands, where irrigation is available, are devoted to rice or sugar cane production. At higher elevations, potatoes, vegetables, maize and coffee are the major cash crops with root crops and bananas grown as

subsistence crops. There is some livestock production – pigs, goats, and fowl, with cattle and water buffalo raised as draft animals. As the first SANREM research site, the Philippines program began in November, 1992.

### Interactions

The key problems affecting the landscape/lifescap identified by land-users and community members were deforestation, declining soil fertility, decreasing crop yields, increasing soil erosion, diminishing water supplies, water pollution, loss of biodiversity, lack of alternative sources of credit, lack of access to education and health care, and health and nutritional problems. An example of landscape-lifescap linkages is the clearing of forested land to plant potatoes and other high value vegetable crops in upland areas. This practice is associated with loss of soil quality in lowland areas, subsequent population migrations that force tribal people into higher elevations, and the introduction of the market economy into the area. The concomitant loss of forest cover contributes to both soil erosion and stream siltation. This causes declining water quality and quantity, the silting up of water reservoirs and consequent reduction in power output. In another example, recent expansion of sugar and corn cultivation at low altitudes and vegetables and corn at higher altitudes has occurred at the expense of perennial crops at higher altitudes. These perennials include pasture/grassland, forest/bush fallow, and coffee. The replacement of perennial land use with short season and annual crops on sloping lands is associated with rapid increases in soil erosion and land degradation. Field measurements in Lantapan confirm rapid increases in soil erosion.

Work in the Philippines is expanding to Southeast Asia, where SANREM will work to support decision-makers in circumstances where global and regional markets strongly influence local natural resource management options.

## Burkina Faso

### Landscape

Burkina Faso is a land-locked country in the Sudano-Sahelian region of West Africa, which lies between the Sahara desert and the forested coastal zone, one of the poorest regions in the world. The SANREM research site was situated within the watershed surrounding the village of Donsin, located about 100 kilometers northeast of the capital, Ouagadougou. This semi-arid region has among the highest rates of environmental degradation in the country. It covers about 6,400 hectares and is surrounded by severely eroded and deforested escarpments, with a seasonal river along its northern boundary. Loss of soil fertility and scarce, erratic rainfall (an average of 650-750 mm, 25-30 inches, per year) are the main constraints on agricultural production. Rainfall occurs during a period of three to four months (from June to September), mostly in the form of heavy downpours, which means that much water can be lost and yet can be damaging to crops and soils. The water retention capacity of eroded soils also hinders the ability of crops to make the most of the available rainwater. Water quality is also a major problem affecting animal and human health.

### Lifescap

Almost 200 household compounds are scattered throughout the watershed of Donsin. A compound is composed of a homestead, which includes an extended family and is surrounded by a family farm. The compounds are home to 1,550 people, mostly belonging to the Mossi ethnic group. Men, women and older children work in family fields, where they grow millet and sorghum as the staple crops, and cowpeas, peanuts, rice and vegetables for cooking ingredients. Despite their hard work, most families suffer food shortages during the months preceding the new harvest, when most of their food supplies are exhausted. Cash earning opportunities, except for the sale of poultry and small ruminants, are scarce. Young men migrate to the Ivory Coast to work as farm labor, and women engage in petty trade during the dry season. Access to markets is limited by the lack of

transportation and the lack of an all-weather road to connect the village to other larger urban centers. The SANREM Burkina Faso program was initiated in August, 1993.

### Interactions

Several key linkages between landscape and lifescap were identified at the Burkina Faso research site. These linkages were manifested as problems stated by the community. They included poor soil fertility, limited and contaminated water, livestock management concerns, management of uncultivated lands, and human health and nutrition. The major limiting factors to productivity at the research site are reduced soil cation exchange capacity, reduced nutrient and organic matter content and increased soil compaction. Soil moisture is one of the limiting factors for crop production. Contaminated water is an equally limiting factor for human health and work productivity. Livestock management is integrated with crop production. Manure produced by livestock is the major source of fertilizer for fields. However, the amount produced is too limited to maintain and improve soils due to the small number of livestock most households own. There is a great disparity in livestock ownership among households. Uncultivated lands are highly utilized for fuelwood collection and tree cutting for tools or construction material. These activities have a greater impact than small ruminant grazing. A high percentage of households (60-70 percent) are unable to meet their food needs through on-farm production. Higher levels of household and women's personal livestock ownership have a positive correlation with children's nutritional status.

In the next phase, the West Africa Project will be based in Mali and will give SANREM a unique opportunity to support decision-makers in circumstances where there is stakeholder conflict over access and use of natural resources exacerbated by weather variability and climate change.





## Ecuador

### Landscape

The research site for the SANREM Ecuador program is a 34,000 hectare watershed within the Alambi River and Guayallabamba River basins in the buffer zone south of the Cotacachi-Cayapas Ecological Reserve, a major national park. The watershed is perched along steep slopes of Ecuador's northwestern Andes Mountains about 100 km from the capital city of Quito. This area is situated in the middle of four nature reserves. The Andean landscape, relatively dry and peppered by plots of corn, sugar-cane, vegetable crops, eucalyptus trees and scattered homes, changes toward the coastal provinces. The mountain ridges in the protected reserves are still carpeted with a dense tropical cloud forest. However, along the slopes and the river valleys, the landscape is an agricultural patchwork. Villages have gathered along the wide terraces carved by the waters of the Guayllabamba River. In this region, the hillsides are a mix of scattered forest and crops where the slopes are steep, separated by wide expanses of crop and grazing lands on the high plains.

### Lifescape

Attracted by employment opportunities and the favorable soil and climate conditions, settlers have been flowing into this region continuously for the past 100 years in a drive to extend



the agricultural frontier. A mixture of farmers, ranging from large hacienda owners to small-scale subsistence farmers to medium sized sugar cane operation owners, inhabits the watershed, home to about 3,000 people. Due to its accessibility to the markets of Quito, this region has been used for the production of sugar cane, fruit trees and cattle. Crops mainly are grown close to town on clustered plots separated by live fencing. Crops include a mosaic of banana and citrus groves, sugar cane fields and family gardens growing cassava, plantain yucca, sweet potato, maize and beans. Farther away from town, along the hillsides, the land is used for grazing cattle, and the landscape is transformed into pastureland and forest. The SANREM Ecuador program began in 1994.

### Interactions

In Ecuador, the causal linkages associated with the communities in which SANREM worked can be described in several steps. Migrating rural populations place pressure on marginal areas (frontier forests and hill-lands) where land is still available and land prices are relatively low. The migrating populations come in stages, which include subsistence pioneers who clear forests for lumber and land speculation; *hacendados* from Quito who buy cleared land and install low maintenance but poor quality pasture; and market-oriented producers in sugar cane, short cycle crops and other products. The end result is the creation of a mosaic landscape-lifescape which, although sparsely settled and highly fragmented, becomes increasingly deforested and degraded through time. The land's ability to support the existing populations declines due to a lack of investment and appropriate technologies. Pressure on this already fragile production base and marginal environment is exacerbated by structural inequities in returns to farmers' investment (labor and capital), forcing a continued invasion of relatively poor lands for agriculture. Many farmers seek temporary work in nearby commercial ventures such as cane alcohol production, thus contributing to a growing landless or near landless population of floating migrants. Due to rapid changes in all farming systems and socio-cultural patterns, scientific and indigenous knowledge alike becomes inadequate to meet local farmers' needs. This cycle is further exacerbated by a lack of strong government policies or interventions that support rural dwellers.

In the next phase, SANREM's Andean Regional Project will provide research and methodological support to local, regional and global decision-makers concerned with sustainable mountain development in regions characterized by fragile highland-lowland interactive landscapes.

## Additional SANREM Initiatives

In addition to the three core sites, SANREM was invited to work on very focused activities related to participatory research and training in Cape Verde, Morocco, Costa Rica and Honduras.

### Cape Verde



SANREM was invited by USAID/Cape Verde to collaborate with the Watershed and Applied Research and Development Project (WARD) to provide training, technical assistance, and research planning assistance to the national research institution, the National Institute for Agricultural Research and Development (INIDA), the Directorate General of Agriculture, Silviculture, and Animal Husbandry (DGASP) and the National Institute for Rural Engineering and Forestry (INERF). An emphasis was

placed on enhancing capabilities to conduct participatory research that would result in greater short-term agricultural productivity, increase income to producers, and increase long-term agricultural and environmental sustainability.

### Honduras and Costa Rica

The SANREM activities in Costa Rica and Honduras were unique among site programs. In these two Central American countries, the research activities were primarily through institutional linkages with Escuela Agrícola Panamericana (Zamorano, Honduras) and EARTH (Escuela de Agricultura de la Region Tropical Humeda, Costa Rica) universities. The activities centered on integrating participatory research methods into the course curriculum and encouraging undergraduate theses that involved community relevant projects.



### Morocco

SANREM joined forces with ENA-Meknes (Ecole Nationale d'Agriculture-Meknes) to undertake a USAID funded program entitled Water Resources Sustainability. The team conducted a PLLA to identify constraints on improving soil and water conservation and quality of the Oued Nakhla watershed, with the goal of designing a demonstration project to address the constraints.



## Introduction to Case Examples

Through the research implementation process, SANREM focused on two key types of research outputs: those that centered on characterization of the landscape/lifescape to better understand key causal relationships, and those that addressed sustainable natural resource management strategies in terms of land, water and biodiversity as well as cropping and animal systems. Because of the participatory nature of the research, there were both direct influences upon natural resource management and indirect influences. Direct influences immediately affected the natural resource base. Indirect influences provided information to communities and planners that changed the way decisions were made about natural resources.

SANREM has a rich collection of research activities and findings, and it would like to share all of them. However, that is not possible in a document of this length and nature. Instead, a handful of examples have been chosen from the Philippines, Burkina Faso and Ecuador to describe activities and results at the farm and provincial levels. These will be presented by themes of biodiversity conservation, land management, water quality assessment, human nutrition and environment, economics of sustainability and community capacity. In the last section, a publications list is presented of all of SANREM's activities. We hope the reader will use this as a resource to learn of other activities.



## Biodiversity Conservation

### Eliciting Culturally Significant Indicators

Virginia Nazarea, Robert Rhoades, Erla Bontoyan, and Gabriela Flora

Researchers adapted the Thematic Apperception Test (TAT) to investigate patterns in local perceptions about the environment and identify culturally significant indicators of sustainability and quality of life. The ethnoecology research in the Manupali watershed highlights the manner in which gender, ethnicity, and age influence people's perceptions about natural resources and their proper management.

The appreciation of indigenous knowledge ranks higher for females than for males while the opposite is true for sense of responsibility, negligence, and commercialization (Table 5.1). Furthermore, improvement of livelihood, social stratification, and government control were more salient for males than for females while quality of life indicators such as family and community relations and human health were more important for females. This reflects a gender-based differentiation in perceptions and roles, with male concentration on external relations relevant to markets and policies and female concentration on internal relations that secure day-to-day subsistence and fulfills a sense of aesthetics and rootedness.

When dominant themes are disaggregated by ethnicity (Table 5.2), usefulness remains the major concern for all ethnic groups but beauty of the crops is more salient for the Ilocanos/Igorots than for either the Dumagats or Talaandigs. This is corroborated by the fact that the Dumagats pay more attention to commercialization. The Talaandigs may at this point be too burdened with the hardships of life to pay too much attention to the beauty of the environment or its commercialization potential. Social stratification and government authority are relatively dominant themes for the Talaandigs, as is increasing difficulty of life, a further indication of the oppressive weight of their sociopolitical and economic marginality.

When differentiating informants according to age (Table 5.3), the 50 to 59 group tended to depart from the other age groups with respect to most themes. Of all the age groups, the 50s category paid the least attention to beauty of environment, beauty of crops, usefulness of environmental features, government control, and social stratification. In addition, these informants expressed the least "unwillingness to use agricultural inputs," "ambivalence toward agricultural inputs," and concern for luck in productive ventures, improvement of livelihood, and difficulty of life. The results indicate that this age group is the most attuned to modern technologies as well as market integration, suggesting the hypothesis that those who came of age during the Green Revolution are more commercially oriented. While the results indicate that the Green Revolution fostered an ideology emphasizing dominance over, rather than harmony with, the environment, they point to a positive prognosis that the younger generation is returning to an appreciation of the values of a generation once removed.

**Table 5.1: Comparison of significant means of themes: by gender**

| Theme                                | Female |      | Male |      | F Statistics |
|--------------------------------------|--------|------|------|------|--------------|
|                                      | Mean   | SD   | Mean | SD   |              |
| Sense of responsibility              | 0.16   | 0.37 | 0.88 | 1.92 | 4.06**       |
| Negligence in caring                 | 0.12   | 0.33 | 0.35 | 0.56 | 3.66*        |
| Commercialization                    | 2.08   | 2.18 | 4.15 | 3.35 | 7.36**       |
| Appreciation of Indigenous knowledge | 3.64   | 3.50 | 1.88 | 2.57 | 4.04*        |
| Sample Size (N)                      | 25     |      | 26   |      |              |

**Table 5.2: Comparison of significant means of themes: by ethnicity**

| Theme                         | Dumagat |      | Ilocano/Igorot |      | Talaandig |      | F Statistics |
|-------------------------------|---------|------|----------------|------|-----------|------|--------------|
|                               | Mean    | SD   | Mean           | SD   | Mean      | SD   |              |
| Beauty of crops               | 0.72    | 1.07 | 1.06           | 1.35 | 0.20      | 0.56 | 3.06*        |
| Social stratification         | 0.83    | 1.10 | 0.50           | 0.86 | 2.27      | 3.79 | 2.52*        |
| Increasing difficulty of life | 0.11    | 0.32 | 0.00           | 0.00 | 0.40      | 0.74 | 3.02*        |
| Sample Size (N)               | 18      |      | 18             |      | 15        |      |              |

\*p<=0.10; \*\*p<=0.05

**Table 5.3: Comparison of significant means of themes: by age**

| Theme                 | 40-49 |      | 50-59 |      | 60+  |      | F Statistics |
|-----------------------|-------|------|-------|------|------|------|--------------|
|                       | Mean  | SD   | Mean  | SD   | Mean | SD   |              |
| Beauty of environment | 3.20  | 2.62 | 1.53  | 1.64 | 4.06 | 4.93 | 3.04*        |
| Beauty of crops       | 0.93  | 1.22 | 0.16  | 0.50 | 1.06 | 1.30 | 5.15**       |
| Usefulness            | 10.53 | 2.92 | 7.37  | 3.35 | 9.29 | 3.35 | 3.72**       |
| Government control    | 0.80  | 1.21 | 0.42  | 0.77 | 1.82 | 2.90 | 2.40*        |
| Social stratification | 1.20  | 1.21 | 0.37  | 0.83 | 1.94 | 3.60 | 2.01*        |
| Sample Size (N)       | 15    |      | 19    |      | 17   |      |              |

\*p<=0.10; \*\*p<=0.05

### Protecting a Priceless Legacy

Virginia Nazarea, Robert Rhoades, Linda Burton, Lourdes Bongcayao, Romualdo del Rosario and Maricel Piniero

The commercialization of agricultural practices has made a significant impact in the majority of farming communities in the Manupali watershed. Along with this commercialization comes the serious risk that culturally significant plants may become irretrievably lost. The ethnoecology research conducted in the watershed reveals the importance of documenting and analyzing local plant knowledge in relation to gender and ethnicity in order to facilitate the conservation of both indigenous botanical wisdom and culturally significant plants.

The different ethnic groups of the Manupali watershed have incorporated into their traditions a wide variety of herbs and medicinal plants as well as useful and ornamental shrubs, trees and vines. Typically, these plants grow, or are grown, in micro-environments along trails and in home gardens rather than in agricultural fields. This research reveals the persistence of indigenous groups in preserving cultural and biological diversity in small resource clusters considered less economically important and, therefore (quite fortunately), not targeted for development.

Partners from the community and members of the SANREM ethnoecology team have implemented two strategies to preserve culturally significant plants and botanical knowledge. The first strategy is to preserve culturally significant plants in local communal gardens established for in situ conservation based on the



A Philippine professor identifies local species in bioserve with area participants.

principle of conservation through use. This was accomplished with the collaboration of indigenous groups, women's groups and public schools. The second strategy is to develop an inter-generational program called youth-led memory banking to systematically document and transmit cultural knowledge pertaining to these plants. A manual, *Yesterdays Ways, Tomorrows Treasures*, has been developed to guide local youth in this effort.

### Smallholders and the Management of Tree-Based Production Systems for Biodiversity Conservation

Sam Koffa and Dennis Garrity

Concerns have been raised worldwide about the loss of biodiversity associated with the alarming rate at which tropical forests are disappearing. The Philippines, in particular, is estimated to account for 160 of the world's 304 threatened commercial tree species (according to a 1991 report of the World Conservation Monitoring Center), and the nation's rate of forest depletion is conservatively estimated at 100,000 hectares per year (in a Master Plan for Forestry Development report by the Department of Environment and Natural Resources, 1990). Government reforestation projects, in which smallholder farmers are often tapped only as a source of cheap labor in creating large plantations to protect against fire and human encroachment, have failed repeatedly because of lack of local participation. An alternative approach is needed.

Recent evidence suggests that smallholders will plant trees on farms if given rights to the trees and land (not necessarily owning the land), and that they are the key to reforestation success in the tropics. The reforestation model involving smallholder participation is potentially a superior method of expanding tree coverage. This case material discusses two key elements in enabling smallholders to incorporate trees into their farming within the buffer-zone of the Kitanglad Nature Park.



Tree nursery in the SANREM Philippines research site

Rapid rural system appraisal (RRSA) and, later, participatory rural appraisal (PRA) methodologies emerged in the 1980s, combining practical work and rigorous research methods to offer opportunities for community-based natural resources management planning and action. Exercises in three buffer-zone villages were carried out (see Koffa and Garrity 1996), designed to identify and assess smallholders' tree-planting practices, preferred tree species, and pertinent management constraints and knowledge gaps.

The unavailability of quality germplasm; inappropriate collection of germplasm; inappropriate tree propagation; inadequate



plantation establishment and management; tree harvesting; and government policies banning the harvesting of some tree species are among the most serious constraints on reforestation in Lantapan. These constraints, our research indicates, are key determinants in a farmer's decision about whether to engage in tree-planting.

### An Enabling Strategy

Two main elements of a strategy for enabling smallholder participation in tree-based production systems are 1) development of quality germplasm production and management systems and 2) development of reputable sources or markets for agroforestry seed.

In 1997, ICRAF (International Center for Research in Agroforestry) conducted a case study to examine tree seed collection among smallholders in Lantapan. These practices were found to be generally poor and likely to cause genetically inferior seed. Using such seed would cause increased seed waste and poor plant performance. These results were discussed in a three-hour workshop held with smallholders. During the workshop, farmers were inspired to organize into a seed production association now known as the Agroforestry Tree Seed Association of Lantapan (ATSAL). To date, 48 ATSA members have been trained in seed handling.

In less than a year, ATSA seed strategies have been scaled up to municipal, provincial, national and international levels. In 1997-1998, ATSA supplied seed to the European Union-Agrarian Reform Support Programme's tree-farming projects targeting thousands of Philippine smallholders. ATSA also has marketed seedlings of a variety of agroforestry species cultured by smallholders. To date the association has gained significant earnings from seed sales and seedlings. Currently, there are three farmer experts in seed handling and nursery management who belong to ATSA.

With ATSA, farmers are realizing it pays to protect the natural resources upon which their lives depend. The incorporation of tree crops into farming systems within the buffer zone will curb encroachment on the Kitanglad Nature Park and will enhance biodiversity. The ATSA model could prove useful throughout the tropics.

### Capacity Building

Because smallholders need to have the appropriate nursery management skills, we conducted hands-on training in community-based (decentralized) nurseries. While larger, centralized nurseries would offer smallholders only opportunities as laborers, they could play a larger role in managing decentralized nurseries. We noted four reasons why community-based nurseries are more appropriate to our work than centralized types:

- Distribution efficiency. Because our immediate clients (smallholders) live in isolated villages, transport of seedlings is made easier by establishing small-scale nurseries in or close to these scattered villages.
- User sensitivity. Better provision of a diversity of seedlings is possible because farmers produce for and by themselves.



ICRAF scientist discusses biodiversity issues during a SANREM field day

- Economic equity. Decentralized nurseries require relatively low inputs and can be established near homesteads, benefiting socially isolated and economically disadvantaged people.
- Sustainability. Decentralized nurseries are a credible approach to sustaining forest resource development, transferring production to end-users. Currently, 15 community-based nurseries and more than 25 small-scale woodlots have been established in 8 of the 14 villages in Lantapan.

### Lessons Learned

- On-farm, client-driven research such as this forges critical links between researchers and smallholders. It ensures that research is driven by the needs of clients, leads to better problem solutions, and enables researchers to respond more quickly to changing conditions and farmer needs.
- Successful conservation projects are nurtured, requiring the participation and consideration of a variety of stakeholder points of view. Taking these views into account requires some rethinking of the purpose of research projects.
- The landscape-lifescape approach enhances sustainable development and the conservation of biodiversity. When smallholders benefit from conservation activities involving seeds and seedlings, they will have the incentive to engage in these activities for decades and create a lasting social contract with conservation objectives.

ICRAF's work with SANREM integrates biodiversity conservation with local needs, creating unparalleled public response to environmental issues in Lantapan. This positive response, at least from smallholders, will eventually cause decreased land degradation and increased productivity. A concrete example of this change is seen in the establishment of community-based nurseries and small-scale tree plantations, which foster local involvement. Once one community deems a conservation strategy successful, that strategy will spread to other areas. This is critical if wide conservation coverage is to occur with limited investment and remain sustainable.

## Land Management

### Introducing the Intercrop in Sugar Cane in Ecuador

Fabián Calispa, Marco Castillo and Robert Rhoades

Second to livestock, sugar cane is the most important agricultural endeavor in the Nanegal region. It is planted on more than 13 percent of the land area. Cane has been grown continuously for 20 years on most fields, usually on extremely steep slopes. Traditionally, herbicides have not been used on the majority of fields. Instead, hand weeding, natural ground cover and crop residue mulch have been used to control weeds. Hand weeding is performed two or three times per year and provides employment for a number of families, especially those who do not own land.

SANREM's participatory diagnostics revealed a gradual decrease in sugar cane productivity, which has motivated a number of farmers to use herbicides, a practice cheaper in the short run than hand weeding. However, this change in weeding practice has caused immediate biophysical and social repercussions. The elimination of native vegetation reduces nutrient cycling, and the loss of soil cover accelerates soil erosion. Further, the practice will likely require the use of synthetic fertilizers to compensate for losses in soil quality and nutrients and to maintain sugar cane yields. The use of herbicides also displaces local employment opportunities.

To this end, farmers, researchers and NGOs developed a new sugar cane management system combining traditional systems of farmer knowledge with current agroecology techniques. This system would reduce erosion, increase soil fertility and, at the same time, reduce costs and diversify labor possibilities. The team also wanted to set an example of how short-run production goals could be matched with longer-term environmental and social sustainability goals.



Sugarcane harvest in Ecuador

Based on information and discussions gained during the diagnostic stage, the team decided to introduce an intercrop of beans into the sugar cane production system. Intercropping sugar cane with beans would provide an additional crop and increase the income of farmers, while improving the efficiency of nutrient cycling and providing local landless people labor opportunities. Because the technique broke with tradition, the first

farmer to do the experiment endured a great deal of joking and laughter from other farmers, who thought he must be "mad." However, the experiment succeeded and an innovation was born. Neighboring farmers were soon calculating the profits the "mad" farmer was making by planting beans in early cane among the stubble. Soon they started to follow suit.



Hillside beanfield at Ecuador study site

Native vegetation provided cover, conserved moisture and prevented proliferation of weeds; fertilizers and fungicides were reduced; and the cane alcohol yield was increased. On the socio-economic side, profits increased and local employment was provided. Researchers calculated that a 37 percent cost savings was achieved by planting beans in cane stubble through a decrease in cultivation expense and a net increase in income. Over the longer term, there was a measurable increase in soil nitrogen through biological fixation by the beans, which in turn is related to improvement in biomass and organic matter.

One year after introduction of this technology, more than 100 hectares (approximately 25 percent of the land area in sugar cane) have been put into the bean-cane intercropping system. While it is too early to fully appreciate the impacts of the approach, farmers calculate that alcohol production from sugar cane is increased by 45 percent from fields where beans are intercropped, which increases income to the farmer of more than \$1,000 per hectare. With beans yielding an additional 3,000 pounds per hectare, an additional profit of \$390 is realized.

Therefore, by adopting this technology, there is a short-run income increase of approximately \$1,400 per hectare. Furthermore, there have been adaptations since this management practice started. A new variety of beans (*Brazilian azuqui*) has recently been introduced and has been shown to double production yields.

This example of teamwork and farmer-guided research vividly illustrates technology diffusion and how short-run production goals can be paired quite successfully with long-term sustainability goals.



## A Partnership for Change: Restoring and Maintaining Soil Fertility in Donsin

Salibo Somé

One of SANREM's principles for participatory research on resource management issues entails designing a program based on concerns identified by the local community. In the village of Donsin, researchers met with local farmers to gather information about soil fertility and strategies for growing crops on bare soils. Farmers described the difficulty of restoring the fertility of the zipele, bare and highly compacted soils characteristic of the region. In addition, they expressed concerns about making and using compost for growing crops.

Typically, farmers in the Donsin watershed used zaï, (hand dug shallow holes for moisture and nutrient retention) mulching and a combination of the two practices to grow crops on bare soils. Often, the deep hoeing method was used before planting, and crop yields, even without manure application, were abundant.



Locally collected organic fertilizer

Farmers and researchers designed experiments using the following six treatments: zaï and manure; zaï without manure; deep hoeing and manure; deep hoeing without manure; surface mulch; and bare surface.

Results showed that surface mulching and deep hoeing used independently were comparable in their efficiency in increasing sorghum yields on highly compacted, bare soils. However, better results were obtained when the two treatments were combined. The greatest improvements in sorghum yields were obtained with the triple combination of deep hoeing, mulching and manure application.

The application of zaï without surface mulch did not increase sorghum yields and was comparable to yields on no-till bare soils. These results indicate that water loss from soil denudation is a critical constraint for crop production in the watershed.

In addition to the soil treatment experiment, farmers participated in designing compost pits and were encouraged to use the compost as fertilizer. Fifty farmers, including ten women, were trained in compost pit construction and visited a nearby village where composting is a common practice. These individuals built their own compost pits and took an active role in the study trials. Although the compost trials were not completed at the term of the project, farmers were able to observe the rates of decomposition from different types of treatments.



Local farmer examines water retention capacity of zaï technology

These participatory experiments have made a difference in land management practices in Donsin. Most farmers in Donsin now have a compost pit close to the house. The pits are built using grass, hay or a combination of both, and retain moisture by taking advantage of the rains during the growing season.

Nearly all producers now commonly practice surface mulching to conserve soil moisture. The adoption of the zaï method has increased with more than 28 percent of the producers using zaï to restore soil fertility in compacted areas of their fields. The combination of the two techniques has been adopted by less than 9 percent because of the increased labor demand.

Despite its greater effect on sorghum yield, deep hoeing has not been widely adopted because of the physical labor required. Although six pick-axes were provided to ease the digging, only three farmers are using them for their intended purpose. All other farmers use them to dig zaï.

The participatory research process has proven to be a positive experience for the farmers of the Donsin watershed and promoted dialogue between farmers and scientists. This watershed project illustrates the strength of combining participatory research and demonstration activities to provide tangible results for a community.



Corn seedlings growing in nutrient and moisture rich zaï holes

## Making a Living in Agriculture: Sustainable Vegetable Systems in Mindanao, Philippines

David J. Midmore, Todd M. Nissen and Durga D. Pudel

Agricultural systems in tropical uplands are characterized by steep and unstable slopes and highly erosive rainfall. Efforts to enhance the sustainability of agricultural practices in tropical uplands can have far-reaching benefits for an entire region – including both uplands and lowlands – by reducing soil loss, reducing the threat of flooding and increasing the availability of clean water.

Vegetable farmers in the northern uplands of Mindanao, Philippines, joined forces with researchers in an attempt to identify production technologies that can reduce soil erosion and increase income potential. The farmers and researchers quantified the benefits and disadvantages of several different sustainable agriculture practices, including commodity diversification, contour hedgerows, and interplanting of trees and vegetables.

### Preliminary Survey

The project began with a survey of the farming community to characterize the different types of farming used in the mid to higher reaches of the Manupali watershed and to determine farmers' perceptions about soil erosion and sustainable agriculture practices. Farmers identified deforestation and current farming practices as responsible for soil erosion; contour farming and cover cropping were considered the best ways to reduce soil erosion. Leguminous contour hedgerows were not considered practical for these high-input, and often labor-limited, vegetable farmers; the extra labor and resulting competition with the vegetables from aggressive hedgerows were not a worthwhile trade-off for farmers who already used nitrogen fertilizers. Planting perennials for erosion control was only seen as desirable if they generated additional income without requiring much extra labor.

Data collected in the survey also illustrated the precarious nature of current vegetable production systems, both for the farmer and the local population. One-third of the fields were farmed on slopes greater than 18 percent, and pesticides were applied an average of 26 times during the tomato season, with only slightly lower frequency for other vegetable crops.

### Field Trials of Conservation Technologies

Field trials were established in 1995 and carried out for seven cropping seasons on a purpose-rented research site and on farmers' fields throughout the vegetable production zone. The

| Table 5.4: Effects of erosion control measures on cumulative soil loss, runoff and nitrate loss through runoff, averages per cropping season. |                   |                       |                  |
|---|-------------------|-----------------------|------------------|
|   | Soil Loss<br>t/ha | Runoff 1000's<br>l/ha | Nitrate<br>kg/ha |
| Up-and-down   | 23.3a             | 254a                  | 4.6a             |
| Contouring  | 13.5b             | 147b                  | 3.3a             |
| Strip cropping  | 15.6b             | 205ab                 | 3.5a             |
| Hedgerows   | 16.2b             | 171b                  | 2.5a             |

Values with same letter within a column are not statistically different at P<0.05

farmer-managed plots were established at the wish of the farmers to evaluate the effectiveness of commodity diversification and strip and hedgerow species for erosion control and income enhancement. The species planted in hedgerows were asparagus, pineapples, pigeon peas and lemon grass. The 1-hectare researcher-managed plots were established to compare the effectiveness of various agronomic practices in reducing erosion and enhancing income.

The average soil loss in plots managed with current practices was 50 to 70 percent greater than in research plots managed with conservation practices. Soil loss in the first season was reduced 50-75 percent by strip and contour planting. Hedgerow species had no effect at first but became increasingly effective over the seven seasons of the experiment.

Crop yields did not suffer from the adoption of soil conservation practices, but yields did decline over time in all treatments, probably from increased acidification. Most crops showed net economic losses throughout the experiment. Economic analyses of research-managed plots showed that labor accounts for a large proportion of total costs, and price fluctuations, especially for tomato and cabbage, increase the risk of financial loss.

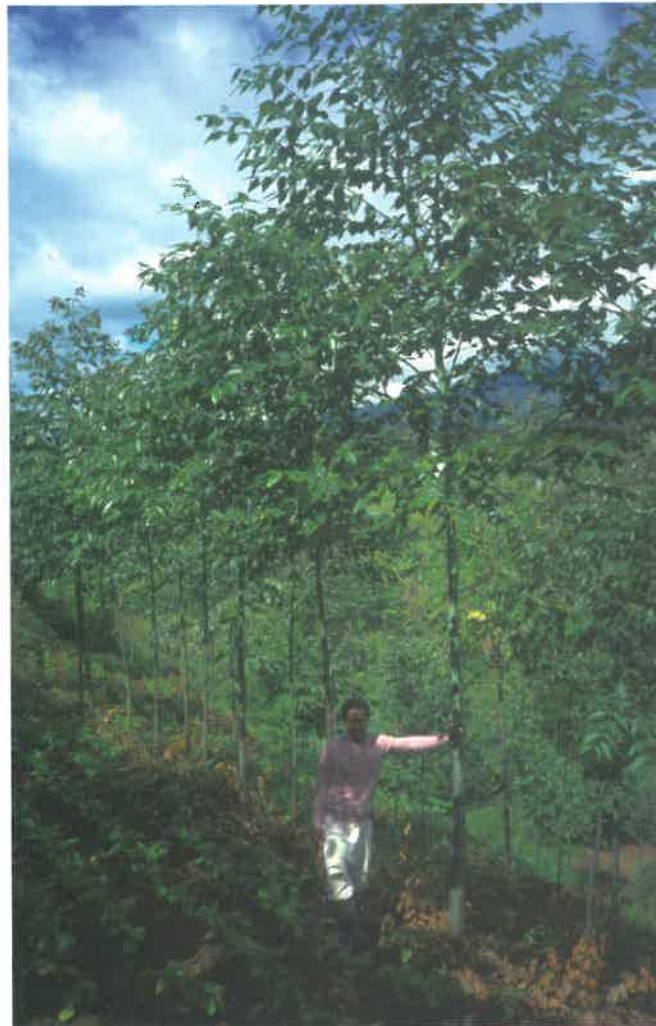
### Compatibility of Trees with Vegetables

Another part of this study investigated the benefits of planting fast-growing timber species among vegetables and other farm crops. From an environmental perspective, perennial cover on the sloping uplands is the best protection against soil erosion, and strategies for helping farmers move toward more perennially based systems need to be found. Farmers on Mindanao are interested in timber trees because of a recent rise in prices and expected income. Studies were conducted to examine how timber-planting farmers might optimize returns.

Experiments were established on three major sites: two in cooperation with farmers and one on rented land. After two years, intercropped trees were considerably larger than non-intercropped trees, apparently benefiting from excess nutrients applied to vegetables. Intensive weeding and nutrient management of the intercropped vegetables also significantly reduced the costs of managing trees. Returns to both land and labor were consistently higher under intercropping than planting sole stands of trees, suggesting that small farmers may be more efficient timber producers than plantations, and that with appropriate policies, they may have a significant role to play in the timber-production efforts of the Philippines.

The research also showed that, although returns to land were higher with vegetables only (assuming consistent yields), optimized returns to labor were higher under timber-intercropping. Vegetable farmers are often more limited by labor than land, which is another reason timber farming is enjoying increasing popularity. In order to optimize returns, farmers need to understand when declines in vegetable yield (as a result of competition, mainly for light) outweigh the benefits of residual tree fertilization and weeding. Stand basal area, a common index in forestry to evaluate competitiveness within a stand, was found to adequately predict intercrop losses. (Figure 5.1) This index can easily be measured in the field by the farmer, and it can be used to help design optimal planting densities and thinning regimes.





On-farm agroforestry test plot in the Philippines

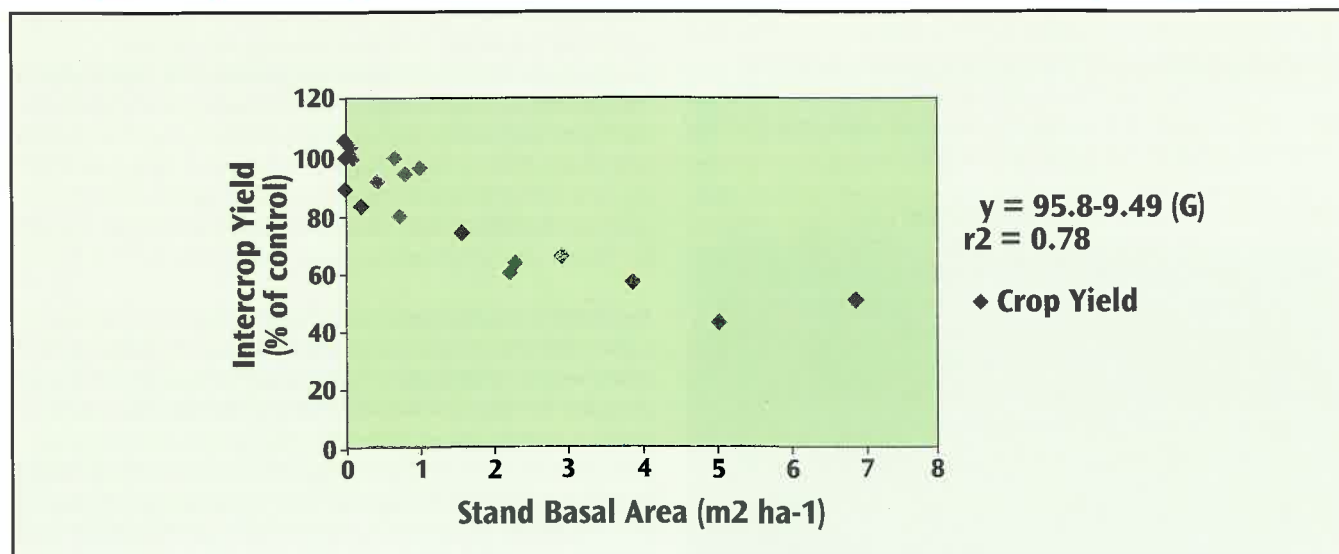
### Farmer Participation and Potential Benefits

The research project in Mindanao is informing farmers, teachers and politicians about how soil erosion can be reduced through management practices and how these practices can improve water quality. Farmer participation has been an essential component. The results are of direct relevance to farmers because the research is based on their needs. Monthly meetings have allowed information exchange, pinpointed problems and increased the awareness of common farming difficulties. Farmer cooperators have requested the installation of more plots to test the benefits of other erosion control practices.

Visits to the research sites by regional, national and international policy makers and industry representatives are creating a demand for similar activities elsewhere. Bukidnon Resources Company, Inc., (BRCI) a subsidiary of Del Monte that produces tomato paste, is now testing the use of contour strips and hedgerows in tomato fields on sloping lands.

The participatory model used in this experiment is being adopted by other research and development projects in the region, such as the ACIAR-funded reforestation project in Bukidnon, Mindanao. Models to evaluate the impact of management practices on soil erosion are being developed on a watershed scale and on a smaller scale for farmers. These innovative modeling approaches will have applications in both developed and developing countries.

Figure 5.1: Intercrop Yields Decline as Stand Basal Area of *Eucalyptus deglupta* Increases



## Water Quality Assessment

### Community-Based Water Quality Indicators and Public Policy in the Rural Philippines

William G. Deutsch, Allison L. Busby, Jim L. Orpreco, Janeth P. Bago and Estela Y. Cequina

The following is an account of how a rural community in the Philippines worked with scientists and government and non-government workers to develop science-based indicators of water quality.

The Philippines is water rich but faces a water conservation crisis. The main threats are soil erosion and sedimentation, runoff and bacterial contamination. Because the government alone cannot solve all environmental problems, citizen participation is crucial. The Philippines has moved squarely toward governmental decentralization, allowing more local control through the Local Government Code of 1991. This trend has laid the foundation for community-based environmental management and policy.

The Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP) was created to involve local farmers and other stakeholders in participatory research. In The Philippines, SANREM worked on the Manupali River watershed in the central Bukidnon Province of Mindanao. Most activity in the region centers around the municipality of Lantapan in the northern portion of the watershed. Upland forests, buffer zones and agricultural areas comprise the landscape. The population is a diverse ethnic mix numbering 39,000.

The overall goal of the project was to foster the development of a community-based water monitoring group to collect credible water quality and quantity data that would lead to environmental and policy improvements. Workshops and exercises trained interested community groups in the evaluation of water quality, using portable test kits and other basic analytical tools. The project researchers and volunteer water monitors selected 16 sampling sites on four main tributaries of the Manupali River, representative of the diverse landscape. After several months of involvement in the project, the core group of water monitors formed an officially registered people's organization called Tigbantay Wahig, or "Water Watchers," in the Binukid dialect.

#### Community-based Water Quality Indicators

Many international development agencies are studying environmental indicators to improve program management and extension. The approach of this project was to develop water-quality indicators, scientifically valid yet practical, for use at the local level. Months of testing showed parameters related to soil erosion, stream-flow disruption and bacterial contamination were the most productive indicators.

Indicator #1: Community Perceptions, Memories and Experience Discussions with residents revealed concern about water contaminants as well as soil erosion and stream and canal sedimentation. Health records showed above-average infant mortality and many common ailments caused by water-borne pathogens. Local traditions were considered, and science often merged with



tribal custom. For example, one man left a rice offering to the water spirit after conducting tests at a stream.

#### Indicator #2: Eroded Soils in Streams

Erosion is of particular concern in agricultural Lantapan, where farmers understand that soil loss means less production. Measurements of suspended solids in streams showed degradation far beyond simple observation of "clear" or "muddy" streams. Increases in suspended solids increased from west to east in the river valley correlating with increased agricultural use and urbanization. Heavy rains coinciding with the plowing season accounted for dramatic increases in suspended solids.

#### Indicator #3: Soil Loss and Altered Stream Flows

Low-tech methods of measuring stream flow, which featured ropes, measuring sticks and floats, were designed to better suit the volunteers. Monthly measurements were taken on the four streams on the same day to produce graphs of seasonal flow. Property damage and crop loss from flooding underscored the importance of stream discharge as an early alert to watershed disruptions.

#### Indicator #4: Bacterial Contamination of Water

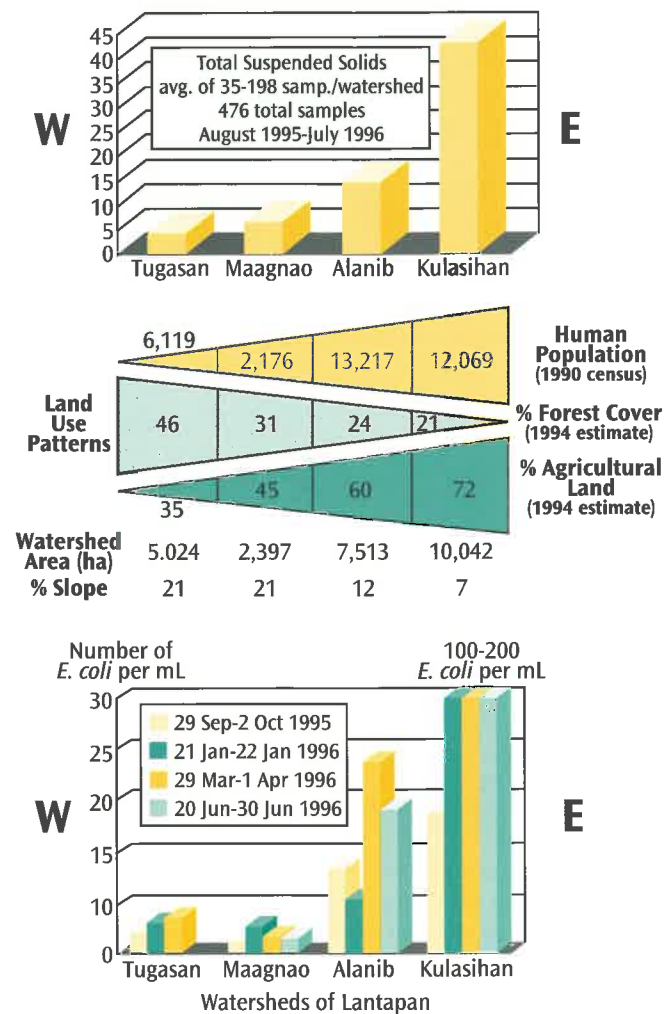
Lantapan residents, especially the women, were concerned about bacterial contamination in water supplies, as this indicator was strongly tied to family health. Many residents also said they could no longer drink from several streams, whereas they had done so in the past without risk. Using simple, accurate and inexpensive methods, four surveys on the four major tributaries of the Manupali were conducted in different seasons. Results were surprisingly similar to suspended-solid patterns, with bacterial degradation increasing from west to east. Drinking-water surveys also revealed *E. coli* contamination through breaks in pipes.

#### Indicator #5: Demographics and Land Use

The community-based indicators were compared with census and remote-sensing data, showing a disturbing pattern: a decrease in forest cover and an increase in land use from west to east across the Manupali River valley. For example, abrupt increases in suspended solids occurred when forest cover dropped below 30 percent and farmland exceeded 50 percent. (Figure 5.2)



**Figure 5.2: Water Quality Indicators on an Upstream-Downstream (West to East) Continuum and Relationship with Slope, Landscape, and Population**



**From Indicators to Policy**

The indicators revealed that Lantapan was paying the price of development through streams laden with silt, contaminated by bacteria and unstable in seasonal flows. Much of this degradation had occurred within human memory. A "Walk Through Time" exercise - in which the western areas of the watershed represented the natural conditions of the past and the eastern zones represented the costs of development - was used to increase public understanding and action.

The Natural Resource Management and Development Plan presented to the local government identified fragile areas needing immediate attention. This plan will likely become a model for environmental efforts in other municipalities. Implementable actions include continuous water-quality monitoring and expansion of the Tigbantay Wahig group. The president of the group also has been appointed to the new Natural Resource Management Council of Lantapan to provide a direct link between water monitors and government.

The project has affected local decisions and policies, including the choice of alternative water sources after springs were found to be contaminated. Also, youth are becoming aware of environmental indicators through presentations at schools and involvement of teachers in the SANREM project. The Philippine Department of Education, Culture and Sports has endorsed the project.

The project has helped convince residents and policy-makers of the value of water monitoring, but the project is still in its infancy, and more work is needed to create clear conservation measures.

The Lantapan project found strong consensus about the water quality problems among academics, government and farmers. This consensus and an established citizens' monitoring group will sustain environmental efforts. The SANREM project brought government and community interests together to develop a menu of water-quality indicators. This hands-on approach provided tremendous motivation for community participation.

**Future Needs and Applications of Indicators**

Three major needs have emerged:

- To test and compare community-based indicators with those of researchers. Less sophisticated water indicators, while simple and inexpensive, must be weighed against lack of precision and potential for bias through side-by-side studies.
- To apply indicators to restoration activities. After five years of research in Lantapan, the community and the government are ready to use the environmental indicators to help restore degraded areas through identification of high erosion and sedimentation rates and of bacterial contamination. These indicators can be used to build a case for federal aid to replace drinking-water pipes.
- To extend the development and use of indicators beyond Lantapan. Information about the project has been presented to 15 other municipalities in Bukidnon Province.

SANREM intends to expand this approach throughout Southeast Asia and other areas of the world.

Community involvement in water-quality research means that research and community action occur simultaneously. Initial results indicate greater potential for benefits in a collaborative project than one attempted in isolation. The collaborative approach also brings findings that might ordinarily remain in professional journals directly into the political process. The Lantapan project suggests that science combined with community involvement creates a greater potential for policy impact.

**Human Nutrition and Environment**

**The Impact of Sustainable Agriculture and Natural Resources Management on the Nutritional Status in Donsin, Burkina Faso**

*Irma Silva-Barbeau, Daniel Kaboré, Daniel Taylor, Marie-Claire Sorgho, Laraba Illy, Mamounata Belem and William L. Hargrove*

In the Sahel, complex interrelated environmental and anthropogenic factors have created a rural milieu impoverished in moisture, biomass, soil nutrients and plant and animal biodiversity. This impoverishment is reflected in the quality of life of the people who depend, almost totally, on this system for their livelihoods.

The watershed of Donsin, in the Mossi Plateau of Burkina Faso, exemplifies such an environment where malnutrition strongly impacts children, women and men. Malnutrition during childhood and in women of reproductive age may be debilitating. The long term consequences of malnutrition may result in adults with reduced work capacity or mental efficiency. The immediate cause of malnutrition is inadequate food intake stemming from low food availability at the household level. Beyond these immediate causes are underlying causes that are social, political, economic and cultural in nature.

The inability of households or individuals to get enough food on a persistent and stable basis is described as food insecurity. The West Africa sub-region has experienced three distinguishable elements of food insecurity: seasonal, transitory and chronic. The Donsin watershed may experience all three, but especially seasonal and chronic food insecurity.

This study was designed with two major goals. The first was to better understand the interrelationship between nutrition and sustainable agriculture and natural resources management; the second was to assess the contribution of sustainable agriculture and natural resources management activities to sustainable health and nutrition of the stakeholders in the watershed. Research was conducted on a random sample stratified by neighborhood. Backward elimination multivariate regression was applied in the analysis of the determinants of malnutrition. Only the major salient findings are presented briefly here.

**Food Insecurity**



*Donsin women winnow grain in food preparation process*



Residents of the watershed of Donsin are highly food insecure. More than 50 percent of the households reported not producing enough food or earning enough cash to meet household food needs. Per capita daily kilocalories available at the household level was 70 percent of the FAO daily recommended dietary allowance. Households are almost exclusively dependent on local production (crop and livestock) and the income generated from the same, or from other agricultural related products for their livelihoods. Coping mechanisms revolve on what they produce and gather or on what they can sell, trade or share with their immediate relations. Nearly 25 percent of the households resorted to harvesting unripe crops to fend off hunger.

**Nutritional Status of Men, Women and Children**

The results indicate that in a given pre-harvest hungry period as many as 72 percent of the children under 5 years of age are wasted or acutely malnourished. A few months later, during the post-harvest period of plenty, more than 53 percent of these children regained some body weight and moved to the well nourished category. About one-fifth of the children, however, remained malnourished during the post-harvest season of plenty.

Among adults of reproductive age, 56 and 45 percent of men and women were malnourished, respectively, during the pre-harvest hungry period. A few months later, during the post-harvest sea-



son, 29 percent of the men regained some body weight and had crossed over to the well nourished group, while only 10 percent of the women had done so. About one-third of the adult population was still malnourished during the post-harvest period of plenty.

**Summary of the Determinants of Human Nutrition**

Household assets (i.e., types and sizes of livestock herds, market transactions, volume and value of sales and purchases) had little, none, or a negative effect on the nutritional status of women and children under 5 years of age. The more heads of poultry a household owned the better off the children were, while the more heads of cattle, the more malnourished were the children.

Surprisingly, women's personal livestock assets also had a negative effect on the nutritional status of children, as a group, during the pre-harvest period. The sex of the child was a highly significant determinant of the child's nutritional status. Male sex was favored over female sex. Women's personal livestock assets also affected negatively the women's own nutrition; however, a woman's social status had a protective effect during the pre-harvest hungry period. Men's social class, household wealth and personal assets all had positive effects on their nutritional status during pre-harvest.

These results suggest that the one household asset that has a positive effect on the nutritional status of household members across the board during the pre-harvest period is poultry ownership. Other household and men's own personal assets are being used judiciously to supply limited nutrients to the labor force.

**Impacts**

The major impact of this work is that it suggests traditional household management and investing strategies may be falling short of meeting the needs of household members, given the current impoverished state of their environment. Investment in cattle for instance, a traditional means of wealth accumulation, is becoming a burden to the environment and negatively affecting the well-being of the household.

In the short-term, research and development programs to develop poultry production in Donsin, at the household level, hold a certain promise in breaking the cycle of the pre-harvest period of hunger. This may well improve the potential of the current workforce and the future capabilities of the people. Nutrition education programs should accompany this.

**Lessons Learned**

The lessons learned from this project echo those of some of the other projects in terms of number of partners, size of the Donsin watershed and other administrative arrangements. The principal impediment to research in this watershed, however, was the poverty. In an impoverished community such as Donsin, participatory research needs to identify research projects that will have some immediate application and provide immediate relief from the people's daily problems before more long-term research questions are to proceed. The ideal would be to have a mixture of short- and long-term research questions pursued simultaneously.



**Economics of Sustainability**

**Economic Development, Agricultural Growth and Environmental Management: What Are the Linkages in Lantapan?**

Ian Coxhead and Agnes Rola

Production, technology and investment decisions by farmers are the immediate causes of most agricultural land degradation in the uplands of developing countries. An appreciation of how farmers' decisions are reached requires a clear understanding not only of household characteristics and local institutional and geographic constraints, but also of how markets operate to create a setting conducive to, or discouraging of, soil conservation. SANREM research in Lantapan aimed to contribute to such an understanding and to suggest policy and program changes leading to more sustainable use of land resources in watersheds like the Manupali.

On-site research activities included post-production surveys monitoring crop choice, technology and resource management by 120 farmers in nine *barangays* throughout the watershed. Researchers built a four-year panel of farm-level and plot-level data for econometric analysis of technology, input use and profitability. These surveys enabled the project to (a) monitor plot-level crop changes and relate them to economic conditions and the characteristics of households, soils and other relevant variables; and (b) quantify the economic implications of alternative cropping patterns and technologies as used by farmers in the watershed. Information generated from the post-production

surveys is key to understanding the present agricultural system and how it might respond to future environmental or economic change. We have also collected farm gate and market prices of key commodities on a weekly basis since late 1994.

Researchers constructed a predictive model to explain farmers' crop choice and resource management decisions in terms of economic factors; cultural, geographic and institutional constraints; income levels; and risk preferences. This model uses data from both farm and price surveys and helps connect price changes to predicted land use and technology changes, thus relating economic phenomena to key factors affecting environmental sustainability. It can be used as a tool to predict how land use may change, for example, if relative crop prices change. Since some crops and management practices are known to be less environmentally damaging than others are, researchers are thus able to infer some environmental outcomes resulting from price policy reforms.

Four major outcomes were derived from this research:

- Economic influences on resource allocation. Statistical tests of price formation (Table 5.5) show that Lantapan vegetable prices do affect those in larger markets in the very short run (i.e., in periods of a week or less). However, the research also shows that, in the longer run, expansion of supply within the watershed can be expected to have little or no influence on prices in wholesale markets. There is no evidence that declining prices will provide a 'natural brake' on the expansion of

**Table 5.5: Summary of results of Granger causality tests for corn and vegetable prices**

| Crop                     | Test <sup>a</sup> | R <sup>2</sup> | DW <sup>b</sup> | F (N; d.f.)       | P value <sup>c</sup> | Comments          |
|--------------------------|-------------------|----------------|-----------------|-------------------|----------------------|-------------------|
| Yellow Corn              | Agora > Lantapan  | 0.80           | 2.02            | 4.61 (122;2,116)  | 0.012                | One-way Causation |
|                          | Lantapan > Agora  | 0.89           | 2.10            | 1.54 (122,2,116)  | 0.218                |                   |
| White Corn               | Agora > Lantapan  | 0.90           | 1.86            | 9.85 (122;2,116)  | 0.0001               | One-way Causation |
|                          | Lantapan > Agora  | 0.96           | 2.00            | 0.06 (122,2,116)  | 0.938                |                   |
| Avg. Potato              | Agora > Lantapan  | 0.85           | 1.95            | 6.67 (119;2,113)  | 0.002                | Two-way Causation |
|                          | Lantapan > Agora  | 0.83           | 1.98            | 16.43 (119;2,113) | 0.0001               |                   |
| Cabbage                  | Agora > Lantapan  | 0.73           | 2.00            | 8.12(121;2,115)   | 0.0005               | Two-way Causation |
|                          | Lantapan > Agora  | 0.77           | 2.04            | 11.93 (121;2,115) | 0.0001               |                   |
| Avg. Potato <sup>d</sup> | Agora > Lantapan  | 0.79           | 1.97            | 3.99 (46;2,39)    | 0.026                | One-way Causation |
|                          | Lantapan > Agora  | 0.77           | 1.99            | 1.87 (46;2,39)    | 0.168                |                   |
| Cabbage                  | Agora > Lantapan  | 0.40           | 1.97            | 2.73 (31;2,23)    | 0.086                | One-way Causation |
|                          | Lantapan > Agora  | 0.47           | 2.05            | 0.75 (31;2,23)    | 0.483                |                   |

Notes:  
<sup>a</sup> Arrows indicate the direction of causation being tested, so for example "Agora > Lantapan" indicates a test that Agora price Granger causes Lantapan price.  
<sup>b</sup> Durbin-Watson statistic  
<sup>c</sup> P < 0.01 indicates rejection of the null hypothesis (no causation) at 1% significance level; 0.01 < p < 0.05 indicates rejection at 5%; 0.05 < P , 0.1 indicates rejection at 10%  
<sup>d</sup> Biweekly data for average prices of large and medium potatoes.  
 Source: Economic Growth and natural Resource Management: Are They Compatible/Philippines, 1995 Annual Conference.





vegetable and corn cultivation in the watershed. Both narrative and quantitative evidence from farm surveys confirm the importance of relative prices and other economic factors in farmers' decisions. This type of economic connection often has been postulated for farmers on fragile lands in developing countries but never before empirically verified. Together, these findings on prices provide strong evidence that, in addition to direct, extension-related interventions directed at changing farmers' behavior, there exists scope for indirect interventions, for example through price policy reform.

- Environmental impacts of economic policies. The Philippines has long pursued policies that discriminate against exports and perennial crops in favor of annual (food) crops for the domestic market. Some of this discrimination has been a deliberate facet of development policy. In corn, for example, farm price supports were adopted with the goal of national self-sufficiency. Other policies, like the long-standing ban on potato and cabbage imports, appear to be more purely political in origin; still others (like exchange rate overvaluation that reduces the profitability of export crops) are the side-effects of policies directed at other sectors. In the upper Manupali watershed, price trends influenced by these policies – along with migration due primarily to low growth of employment opportunities in lowlands – has spurred land conversion from perennial crops (forest, pasture, coffee) to soil-eroding, input-intensive commercial corn and vegetable crops. The benefits, if any, of national self-sufficiency in corn and vegetables must be weighed against the costs, both in the form of higher consumer prices and in accelerated land degradation and possible water pollution.
- Policy reforms and economic sustainability. The Philippine government is debating major changes in agricultural trade policy that will undoubtedly lead to price changes for Lantapan farmers. To comply with the GATT, quantitative restrictions on corn imports are being abolished and replaced by a tariff. Similarly, the present ban on imports of fresh potatoes and cabbage is likely to be converted to tariffs. In the short run, these reforms could raise the farm gate price of corn and possibly that of vegetables. However, both sets of tariff rates are predicted to be reduced in subsequent years as the scope and jurisdiction of the ASEAN Free Trade Area (AFTA) is expanded.

Temperate-climate vegetable crops are of great economic significance to Lantapan farmers. If cheap imports were to become available from China, South Asia or Vietnam, a

question that immediately arises is whether potato and cabbage production in Lantapan would continue to be economically viable. Future profitability of these crops in Lantapan will depend as much or more on import regulations as on improvements in efficiency and technology at the farm level. The same applies to other Southeast Asian countries where, as GATT records reveal, similar forms of vegetable sector protection still apply.

- Research and development investment resource allocation. Most agricultural land in the watershed is planted in corn, and since erosion rates under corn are relatively high, future environmental sustainability in the watershed will depend critically on reducing erosion on land currently planted in corn without reducing net farm incomes. Erosion could be reduced by promoting investments in soil-conserving structures such as contour strips, and the potential for these may be high in some parts of the watershed. However, in one important respect research directed at these goals is “second-best,” since a large part of the problem of “too much” cultivation of corn and vegetables under inappropriate technologies is attributable to other kinds of policies, as discussed above. A redirection of some R&D resources towards other crops (such as coffee or cacao) that currently receive little attention might have a high payoff both in economic and environmental terms.

The methods used in this research and the information generated offer Philippine policy-makers valuable tools and inputs in making informed decisions related to predicting land use responses to market reforms and enhancing research and development investment resource allocation. The predictive model of farmers' land use responses to price changes is a new and very powerful analytical tool for economic and environmental policy analysis. It recognizes that not all farmers will respond in the same way to an economic “shock”; rather, their responses will depend on household wealth, education, land tenure and other characteristics, especially those relating to a household's willingness to bear risk. Researchers on the project have gathered information on these characteristics in farm surveys. The predictive model thus makes it possible to provide detailed and empirically robust answers to policy questions such as, “What will happen to land use and net farm incomes if the vegetable import ban is relaxed and vegetable prices fall?”

The SANREM team is continuing the development of this model and increasing its empirical richness as additional Lantapan data become available from the surveys. The potential impact of this exercise is not limited to Lantapan but can be applied, with suitable data, to other regions of Southeast Asia where upland agriculture in the process of commercialization and intensification creates a trade-off between economic development and environmental degradation.

## Community Capacity

### Holistic Management Decision-Making in Burkina Faso

Sam Bingham

Creating a vision for the Donsin community was an important step in establishing long-term goals for the region. This vision building was an opportunity for community members to actively engage in the decision-making processes related to the SANREM research program planned for implementation in their watershed. Utilizing a holistic management approach provides individuals, groups and communities with a systematic method for long-term decision making. This vision is defined in human, economic and environmental terms. The process enables community members to select the best available methods to achieve a collectively defined goal. The second step of the process is to monitor the effects of their choices to ensure reaching the desired goal.



To initiate the development of holistic planning, community workers were trained as facilitators. Six individuals selected from the field staff of local development and research institutions working in Donsin and the surrounding areas received training in the holistic planning approach. The first step for the facilitators was to lead discussions with Donsin residents to assess the present state of their environment. The residents could then identify causes for those conditions, learn the process of goal setting and articulate a vision for the community.

The process of goal setting required the participants to describe the forms of production and the conditions of the resource base

needed to support their desired quality of life. In this manner, a causal relationship was established. Community members gained insight into the identification of environmental and economic problems and the underlying conditions requiring resolution to accomplish their goals. The distinction of setting goals rather than stating problems had implications for relationships in the Donsin dwellers' internal politics and for their relations with the SANREM research team.

Once goals were established, villagers articulated their community vision as such:

“ We, the villagers of Donsin, seek a state of well being characterized by security in matters of food and water and of health sufficient to permit us to pursue a diversity of activities in life. Those would include caring for personal hygiene and beauty, acquiring literacy, engaging in commerce, and carrying out religious obligations. Moreover we desire a spirit of mutual aid and communal friendship and of progress such that our village will be respected beyond its borders and our young people will not be tempted to leave. We foresee that our basic production – cultivation of grain and stock raising – will improve to the level where we have surpluses to sell of grain, milk, meat, and leather. As well, an abundance of water will allow other benefits - fish, rice, and fresh vegetables in all seasons. On the side we will be able to harvest from our lands wood for cooking and building, grass for mulch, thatch, mats, etc., all the herbs of traditional medicine, and wild meat. We will have time and means for crafts of many kinds.

Landscape. The territory of Donsin will become such that a stranger who sees it for the first time will be struck by its verdure, by the great trees shading its common paths and private dwellings. The water course will flow throughout most of the year. Soil in the fields will be fertile and easy to work. The forest will come back, and in the bush will be found all the lost plants and animals known to our ancestors. Vegetation will cover all spaces and the word “zipele” [the Moré word for the bare lateritic hardpan that has spread over large areas of Donsin] will not be heard. Key to this fine vision of the future and basic to all progress toward this goal will be improvement of water resources, not only through the construction of works such as boreholes, dams, and irrigation canals, but through the restoration of the water table, streams, ponds, and springs





The process of goal setting and vision articulation identified two issues—overgrazing of pastures by domestic livestock and over-cultivation of land—as the causes of land degradation. These causes were linked to radically changed livestock management practices that occurred after the eradication of serious predators and a dispute with the neighboring village of Bonam over formerly communal grazing land. Without the existence of predators, livestock was permitted to wander unsupervised except around cropland fields during the growing season. Previously, the threat of predators caused all livestock to be herded communally and to be supervised either by villagers or by herders taking cattle on consignment.

When Bonam joined LUCODEB, an anti-desertification program active in the area, LUCODEB split the common grazing land between Bonam and Donsin. This excluded livestock from Donsin. However, Bonam villagers dissenting from the LUCODEB decision continued to graze livestock on the Donsin side.

Similarly, facilitators and residents identified population increase as the cause behind over-cultivation. An increased population led to longer cultivation periods and shorter fallow periods for cropland. Reversing this condition by using known soil conservation, management and fertilization techniques needed to be given priority. The appropriateness of a number of ideas for action is under consideration by villagers and holistic management facilitators.

The challenge for the facilitators was to help community members identify specific traditional practices and explore their sustainability and their application in current circumstances. To resolve the dispute with Bonam, two facilitators with agricultural duties in the region negotiated an agreement with the leaders of the village. It was agreed that the area would return to communal grazing land and Donsin livestock could water in Bonam. However, sections of the whole area would be opened progressively to livestock from both villages. This would allow sufficient regeneration time for grazed plants during the growing season and decrease the potential destruction of dormant season reserves.

For both villages, re-establishing herding was a primary objective. Small ruminants in the area had an extremely low fertility rate. With the disappearance of perennial grasses and the decline of herding, animals consumed the best forage early in

the dry season. Low fertility and survival rates for the young could be traced back to the lack of food sources. Lacking adequate income, community members were unable to purchase food supplements or the land and labor for forage crops. However, if herding could be re-established in the area, forage could be rationed in order to preserve a better quality food source for the dry season.

As a way to regenerate plant growth, members of both communities agreed to park a herd briefly on fallow ground. The herd would produce manure that would enhance soil fertility. This would then be followed by a rest or controlled grazing period to ensure a ground cover for the critical rainy season.

Another provision of the agreement involved the seeding and protecting of perennial *Andropogon* grass sprouts among stone *diguettes* (semi-permeable, anti-erosion contour lines made of rocks). Farmers use the *diguettes* to slow erosion on cropland. The grass would provide material for thatch and mats, and a successful crop would allow villagers to remove the stones to another location where they could be reused. If successful, this innovation, like the introduction of the *diguettes* only a decade or two ago, could spread easily throughout the country.

The Donsin vision has continued through the Association pour la Gestion Holistique des Ressources au Burkina (AGEHOR/B) as a legally incorporated non-governmental organization (NGO) established by the facilitators. Since 1995, they have assisted villagers of Donsin and Bonam with a series of activities. They have obtained funding for a content-based adult literacy program in Moré that incorporates holistic resources management practices. AGEHOR/B is a member of the Concertation Provinciale, an organization that includes development agencies and other NGOs. The group and its work have been featured nationally in magazines and on television.

Training of local holistic management facilitators is an important part of the community development process. The holistic model used in Donsin is an innovative way to focus research on action that produces changed landscapes and lifescapes.



### Building Social Capital and Institutional Capacity in an Ecuadorian Buffer Zone

Jan L. Flora, Mary Marcia Bravo, Cornelia Butler Florá, Segundo Andrango Bonilla and Robert Rhoades

The region around Nanegal is a 40-year-old agricultural frontier located near an ecological reserve. Communities there are not tightly organized and consequently have not developed the institutional leverage to attain the level of development they desire. The lack of organizational capacity is strongly felt by community members, and there is a sense of vulnerability to outside forces such as provincial and national government, various development agencies, mining and agro-business interests and even the nearby ecological reserves.

Historically, these communities have not been legally recognized by the government, and property titles have been virtually non-existent. On one hand, the communities have been reluctant to enter the world of formal legal documentation due to fear of taxation and more government control. On the other hand, the communities recognize the benefits of being integrated into a formal political structure. The communities have also come to be aware of the relationship between their organizational capacity and the management of their natural resources.

A study conducted jointly by U.S. universities, Ecuadorian NGOs and community members examined the interaction of economic, human, social and environmental capital in the development process in the Nanegal communities of Palmitopamba, La Perla,



Chacapata and Playa Rica. The study hypothesized that entrepreneurial social infrastructure (ESI)—a form of social capital—is an essential ingredient in strengthening the organizational capacity of communities to engage in collective action such as community-wide management of natural resources for sustainability.

Participatory research tools, including focus groups of community leaders and the analysis of a census gathered by community residents themselves, were the principle methodological approaches used to assess social capital in organizations and the community as a whole. Local history workshops also played a role in information gathering. The

Table 5.6: Collective Mobilization and Organizational Capacity, Four Communities in the Nanegal Micro-Region, 1995-96 (from J. Flora, et. al., 1998).

| Form of collective action/<br>organizational capacity | Community |              |          |            |
|---|-----------|--------------|----------|------------|
|   | Chacapata | Palmitopamba | La Perla | Playa Rica |
| <b>Collective Mobilization</b>                        |           |              |          |            |
| Festivals <sup>1</sup>                                | 4         | 1            | 1        | 3          |
| Mean level of family participation in—                |           |              |          |            |
| Workdays  | 20%       | 26%          | 68%      | 14%        |
| Local organizations <sup>2</sup>                      | 32%       | 49%          | 80%      | 38%        |
| Collective Mobilization (Sum)                         | 4         | 2            | 1        | 3          |
| <b>Organizational Capacity</b>                        |           |              |          |            |
| Community Involvement Board <sup>3</sup>              | 4         | 1            | 2        | 3          |
| Community legalization <sup>4</sup>                   | 3         | 1            | 1        | 3          |
| Parents' Committee <sup>5</sup>                       | 2         | 1            | 4        | 3          |
| School (past 5-8 years) <sup>6</sup>                  | 4         | 1            | 1        | 1          |
| Organizational capacity (Sum)                         | 4         | 1            | 2        | 3          |

<sup>1</sup> Rank is based on the elaborateness and attendance of and social organization involved in putting on the community's patron saint festival (For all variables with ranks, 1 is highest and 4 is lowest).

<sup>2</sup> Includes workdays (*mingas*).

<sup>3</sup> Rank based on general efficacy of CLB, including its ability to involve citizens in affairs of the community (*poder convocatoria*), to generate funds for community activities, and to engage outside entities to assist in improvement or maintenance of community services.

<sup>4</sup> Measured by the rapidity with which community leaders obtained signatures and did paperwork for obtaining official recognition of their communities by the Ministry of Social Wellbeing in 1996-9.

<sup>5</sup> Assessment of effectiveness of the Parents' Committee, both in terms of its liking of school and community with the objective of obtaining resources for and maintaining the school, as well as its functioning as a community organization.

<sup>6</sup> This was measured by an outcome variable: % of youth 13-127 who had not completed primary school. Viewed from the individual level, this is also an indicator of human capital





participatory community census was the source of indicators of family economic capital, environmental capital and human capital, all aggregated to the community level.

Based on this work, it is anticipated that alternatives to forest destruction, soil erosion and high external-input agriculture will arise in certain kinds of communities. Communities predisposed to accept alternatives are those with diversity in leadership and alternatives for problem resolution; those whose important groups are high in organizational capacity; and those that show diversity in internal and external linkages. Among numerous findings, researchers reported that in all communities, the Community Improvements Board is considered the most important existing committee because it has historically promoted the common good. Additionally, the Parents Committee of the school functions as the most important mobilizing/integrating organization in the various communities. (See Table 5.6.)

Although the actual creation of, or changes in, social capital require considerable time, progress was realized in the two years that SANREM was working with the communities. A recent impact survey in one community showed that 60 percent of respondents felt that the census itself was instrumental in providing valuable information on community surroundings, aiding in organization and or/legalization (in the case of La Perla) and furthering development.

Residents recognize a need for change and the importance of strong community organization and social capital to improve economic and social well being. One community member remarked, "I think that we are going to come together now that we have legal status for the community. I think that we're going to start thinking about this and eventually see that it's not because we are afraid that we have to get together but because we have the responsibility to the community and a responsibility to back up the Improvement Committee that represents the people."

To strengthen the sense of history and identity within the communities, SANREM led community linking activities and oral history workshops in which community and environment issues were discussed. The histories were returned to the communities. Through these efforts and through its unique research approach, the SANREM team helped bring about an understanding among participants of the relationship between the natural landscape and a sense of belonging, or place, which has led to a strengthening of identity based on consciousness of local history. As one participant summed up: "There we learned what we once had, what we now have and what we still need."

## CHAPTER 6: LESSONS Learning from Experience

The SANREM approach is unique in its emphasis on an integration of research and development goals and activities, its extensive collaborative relationship with institutional partners and its focus on a landscape scale. Many key lessons have been learned about the effectiveness of this particular mix of methods during the first five years of project implementation. In addition to helping SANREM refine and improve its approach, these lessons also may be useful to research institutes, development organizations and donors.

### Participatory Research Lessons



SANREM is based conceptually and methodologically on a participatory approach. This approach is manifested in virtually every aspect of the project, from research team composition to field research implementation, data analysis, information sharing and evaluation. This consistent commitment to participation has resulted in both benefits and challenges for all stakeholders involved, including farmers, community members, researchers and NGO partners. The most significant lessons about participatory research have resulted from the contributions and experiences of individuals and groups at the community level.

#### Stakeholder Participation, Ownership and Understanding Are Crucial

One of the critical lessons learned during Phase I of SANREM was that it is crucial to elicit participation, ownership and understanding of the research process among farmers and community members. Direct and active involvement of these stakeholders in establishing research priorities created an understanding of biophysical and socio-economic constraints to sustainability, identified how the constraints could be addressed, and heightened awareness of the landscape and related sustainability issues.

#### The Expectations of Stakeholders Must Be Realistic

Research or development organizations often inadvertently create expectations for a tangible development intervention in the communities in which they work. SANREM's experience confirmed this pattern. The community participation process, the public articulation of issues and the arrival of outsiders combine

to create high expectations. Often, an effort to identify and discuss problems, constraints and needs leads to the community belief that the problems will be solved by outside intervention. In addition, for people living in vulnerable areas, time and resources spent away from food production or procurement activities may jeopardize their food security. Therefore, in some instances, participants anticipate remuneration for time spent away from these activities.

Any given research or community development endeavor must be grounded in a clear understanding of its goals and expectations for community involvement and for potential community benefits. Agreements and commitments made at each level need to be fully understood by all groups of individuals and organizations implicated in them. Short-term development returns that address immediate needs in the community can encourage participation in the longer-term research process. International and local NGOs can help significantly to build environmental awareness and community organizational capacity at the onset of the program, before beginning the research activities.

#### Powerful Stakeholders Must Be Included

SANREM's Phase I emphasis on including groups traditionally marginalized on the basis of gender, race, status or culture sometimes inadvertently excluded the most influential stakeholders from the process. For instance, a large-scale tomato producing company that moved into a Philippines site played a major role in affecting local land use and agricultural production patterns. Because the company took an interest in research related to sustainable tomato production, they were able to promote more sustainable practices on a very large scale.

#### Existing Networks Play an Important Role

Recognizing the role existing networks and institutions play in the social arena is essential in avoiding the reinforcement of existing social inequalities. SANREM has learned that the most effective mechanisms for engaging existing networks and institutions in the participatory process can vary widely and are always context-specific. Modes of intervention need to be sensitive to these realities.





### Experiential Learning Heightens Understanding

Practical, experiential involvement in data collection relevant to the local environment and quality of life enhances the sense of ownership and understanding of the research process. For example, the hands-on activity of environmental monitoring using simple equipment and techniques is a tremendous motivation for participation. Once the mystique of “only the professionals can do it” is removed, citizens are usually eager to become involved. They take pride in knowing that the information they gather is important and can improve the management of their land and water.

### Dialogue among Partners Is Essential

Frequent and candid dialogue is critical for developing solid partnerships. Using the most commonly spoken languages of the area and using culturally appropriate forms of discussion, negotiation and decision-making will help to establish good communication and a willingness to engage in dialogue. Suitable venue selection also is important in facilitating communication and establishing an ongoing, productive dialogue.



### Lessons about Inter-Institutional Partnerships

An inter-institutional approach recognizes that any local natural resource management issue necessarily involves a variety of institutional players. SANREM sought to ensure the effectiveness and appropriateness of the research process by involving key actors and decision-makers from the outset and succeeded in bringing together diverse partners. The inter-institutional collaboration encompassed members of the private sector (individual farmers), the government (local, provincial and national), research scientists (national and international), and non-governmental development organizations (grassroots, national and/or international). SANREM researchers also gained a heightened appreciation for the importance of strategic collaboration, lead-



ership issues, mutually understood expectations and nuances in participation.

### Win-Win Partnerships Are Based on Strategic Collaboration

Based on its experience in facilitating inter-institutional collaboration, SANREM has adopted the concept of strategic partnerships. This concept recognizes the comparative advantages, complementary competencies, and the timing and duration of each potential collaborator's involvement. A thorough analysis of the strengths, weaknesses, capabilities and priorities of potential partner institutions is an important prerequisite for the research process. The roles of participating organizations must be well defined and based on respective institutional strengths. Different levels and types of participation will be needed at various stages.

### Inclusiveness Requires High Transaction Costs

One important “side effect” of strategic collaboration is a high transaction cost. SANREM's research process assumes that identification and inclusion of all stakeholders in a given area will yield richer results and be cost-effective in the long run, but this approach requires substantial short-term transaction costs in terms of human and financial resources, particularly in the areas of communication, coordination, negotiation, management, conflict resolution and time.

Therefore, issues of quality and quantity are essential in the identification of strategic partnerships. That is, the value each partner adds to the research process needs to be balanced with the transaction costs of organization and coordination. One of the major challenges in managing inclusiveness and diversity is to avoid conflicts in priorities and agendas, delays in decision-making, ambiguous accountability and a lack of overall cohesive management.



### Institutional Analysis Should Identify Complementary Strengths

Different institutions bring differing competencies, agendas and constituencies to the process. The identification of existing networks and institutions as well as a strategic analysis of competencies should be conducted prior to undertaking the research endeavor. If this step is neglected, misunderstandings may occur regarding roles, responsibilities and expectations.

### Different Areas of Expertise Enrich the Process

The partnerships between local and international NGOs and researchers yielded a wealth of benefits and many lessons. Research scientists contributed expertise in scientific biophysical and sociological processes. Their focus was not only to under-

stand local landscape/lifescape relationships, but also to develop general principles and appropriate technologies that could be applied elsewhere. The development professionals from NGOs contributed a practical focus based on extensive experience with community groups and the social, political, cultural and environmental factors in a given setting.

Competing interests among the partners did sometimes arise, and negotiation was needed to clarify appropriate roles and responsibilities. But when SANREM expanded its focus from strict research to a broader mission of research for development, the conflicting perspectives became more compatible. The development partners provided an invaluable link to the communities, facilitated implementation and communication and were instrumental in scaling results horizontally. In the best cases, the expertise of researchers and development professionals provided complementary skills that enriched the process.



### Government Participation Is Key for Policy Changes and Impacts

Without the engagement of key local decision-makers, the probability of research discoveries finding their way into meaningful policy decisions is slight. Government partnerships in the SANREM program included ministry representatives, field support technicians, and local and provincial policy makers. Community/local government engagement was found to be crucial if research results were to inform local policy. It proved equally important to have national and provincial level decision-makers involved in the planning stages, especially when it was time to scale up the impact of the research results. Keeping political decision-makers involved at all stages ensures relevancy and places information quickly with the decision-makers who need it.

### Lessons about Research Relevance

#### A Practical Approach Serves Communities Best

One of the main strengths of SANREM's approach is that participatory research, information dissemination and community action occur simultaneously. SANREM has learned to engage the community and the research teams together through existing networks and structures to feed back information and generate action. This stands in contrast to the traditional linear model of conducting research in isolation from the local community, and later extending technologies and/or findings. The SANREM strategy has implications for natural resource management planning. Policy-makers often can benefit from science-based information that does not meet all the requirements of the scientific community for precision and rigor. This is especially true in watersheds



that are degrading rapidly, with irreversible consequences. In these situations, application of partly understood conservation practices, with full community involvement, may be far better than waiting for a “complete” scientific understanding.

### Policy and Political Support Is Critical

The adoption of sustainable natural resource management strategies and participatory planning and research approaches requires strong advocacy in political and other institutional structures. Actively involving key members of the community as well as institutional figures in site management has been an effective method for spreading SANREM impacts beyond the farm level. When political leaders invest resources to support activities, and when governments are committed to new approaches, the impacts in communities are more widespread and timely. In the Philippines site, for example, the active participation of local government leaders significantly influenced the municipality to take a proactive stance in integrating environmental and resource conservation issues into its development agenda.

### All Research Is Local

A relevant research agenda requires sensitivity and flexibility in adapting to the political and economic context in which the research will be implemented. In the Philippines, the Local Government Code of 1991 – which devolved power and authority from national to provincial and municipal governments – made it necessary to modify SANREM's research activities in order to focus on the immediate decision-making needs of local leaders pertaining to natural resource management issues.

### Sustained Impacts Require Institutional Commitment

To sustain the impact of SANREM's research at the community level, multi-sector commitment is essential but difficult to establish. Legislation that institutionalizes new approaches may not survive if it has no political support, and changes in political





leadership may constrain continuity. Macroeconomic policies and institutional structures also constrain support for sustainable agriculture and collaborative relationships. Initiatives that begin as networks to address specific issues and evolve into organizations – such as water-quality monitoring or community agroforestry associations – hold some promise of helping to sustain field level accomplishments. These initiatives might be strengthened by capacity-building and inter-organization collaboration.

### Local Development Concerns Are the Beginning and the End

Participatory research cannot be implemented separately from the community's development concerns. In order to appreciate the need to conduct research, local people have to understand the "development benefits" of research; they have to see the value of research at a personal and a community level. The urgency of ensuring this relevance mandated that SANREM design research activities that would ultimately support development activities. One such activity that has made an impact at the community level and beyond is the practice of information exchange and regular feedback of research results. This practice enables farmers and policy-makers to apply information generated from research and helps develop confidence in the value of research at individual and community levels.

### Lessons Learned from the Landscape/Lifescap Focus

SANREM set out to conduct research in the context of landscape and lifescap interactions. The landscape or watershed level of focus is becoming increasingly widespread among research centers and non-governmental development organizations. Water has emerged as an excellent integrator for both social and biophysical phenomena.

#### Landscapes Are Dynamic

SANREM began each of its research efforts with a Participatory Landscape/Lifescap Appraisal (PLLA). This tool was extremely useful to indicate a "snapshot in time" of the landscape and lifescap and to understand the linkages currently taking place.



However, landscapes and lifescapes are dynamic. They can change drastically in the time frame of a research or development program. After two years of work in the Philippines, for example, the "snapshot" needed to be updated. As economies change, different crops become economically feasible or there are shifts in labor availability. Roads are built, opening access to

the forest, and soil erosion increases. A company comes in and rents thousands of hectares to grow only one crop, changing the landscape dramatically. People move and make changes in their lives. New information reflecting such changes needs to be integrated on a regular basis. The PLLA, used annually, provides a tool for keeping the "snapshot" current.

#### Agreeing on Scale Is Critical

A great deal of confusion in the discussion of watershed and landscape research occurs when researchers neglect to clearly define their scale, in both spatial and socio-demographic terms.



When conducting participatory landscape-level research, scale and hierarchy theory are two significant components all research scientists should understand and agree upon. Further, to understand landscape-lifescap linkages, it is important for researchers to gather information at scales relevant to the overall system. This broad perspective is particularly important for gathering base-line data, as well as information that will be used to model the landscape or watershed. Although information might be required from household to watershed level and beyond, it must be clear in advance how the information will be integrated or aggregated to achieve the desired results. It is equally important to be aware of the fact that people do not organize themselves around watersheds, and that lifescapes extend beyond the communities in which people live.

#### It Is Not Easy to Identify Indicators

During the first phase of SANREM, we tried to identify a comprehensive set of landscape level indicators of sustainability. The expectation was to identify a minimum data set and on-point measurements of key indicators. However, attempts fell short of providing a flexible, multifaceted view of changes in sustainability. Given the wide range of possible comprehensive indicators and the steps required to test and evaluate them, a small set of integrative indicators was identified during Phase I:

- social relations and resource distribution within the community;
- community physical health;
- diversity of sources of income and opportunities;
- income stability and access to resources;
- water quality; and
- land quality and supply.

Months of community-based testing in the Philippines during Phase I identified soil erosion, stream flow disruption and bacterial contamination as the most useful indicators of water quality.

#### You Cannot Have Too Many Tools

Because of its diversity of actors and their experiences, SANREM used numerous tools to describe the landscape and lifescap indigenously and exogenously. These tools ranged from oral environmental histories and social maps to holistic goal-setting to articulate the future landscape; from backyard wooden landscape models to GIS; and from simple field water-quality test kits to SWAT models. A wide array of tools is available. Research teams must evaluate their comparative advantages and determine which ones are most appropriate for the task, depending on project scale, objectives of the work and the final user of the information.



#### Raising Awareness Is Always the First Step in the Paradigm Shift

Landscapes and watersheds lend themselves to understanding linkages of upstream and downstream impacts. In the Philippines, SANREM organized a field trip for farm families and other partners that took them from the highest point in the landscape, Mt. Kitanglad at 2,000 meters, to the sea - which most of the participants saw for the first time. The trip helped give people a sense of their place within a larger place; they saw how activities in the upper reaches of the watershed influence the lives of people downstream. Workshops, training and cross-site exchanges also proved effective in developing an appreciation for the landscape scale. SANREM workers learned that an understanding of watershed connections helps participants understand the urgency to respond to environmental issues at the community level.



#### Lessons about Lessons

The majority of SANREM's lessons were acquired at the level of the research process. To the extent that this process has been participatory and in many ways parallel to community development theory and practice, these lessons also are relevant in the development field. Approaches that are participatory, cross-institutional, interdisciplinary and occur at the landscape level have many strengths. However, they also entail challenges.

This chapter has presented some of the lessons SANREM has learned during the first phase of its work, with the intention of assisting other organizations involved in similar participatory endeavors, particularly inter-institutional partnerships. If there is one overarching lesson from SANREM's first phase, it is that sustainability is a negotiated process.

In addition to the research results and institutional impacts, the first phase of the SANREM project has had a profound impact on the design of Phase II. The participatory approach at all levels will be included. Also, the grassroots, bottom-up approach at the landscape/lifescap level will be included. Inter-institutional and inter-disciplinary collaboration will continue to be cornerstones of the SANREM approach. Phase II will work to build up from a grassroots approach, while simultaneously reaching down from the global level to provide more support to natural resource management decision-makers, with the overall goal of enhancing sustainability.

The same factors that prompted the creation of SANREM in the early 1990s continue to have a profound impact on the world's natural resources. Research or development organizations can no longer work in isolation with one limited group of natural resource decision-makers. This observation is increasingly true as the global population increases, arable land decreases and other features of the environment are eroded. The participatory, local-to-global decision-maker support approach of SANREM, modified and strengthened by the lessons learned in Phase I, continues to be a promising approach that provides hope for a more sustainable future on earth.



## CHAPTER 7: PHASE II Looking to the Future

SANREM Phase I (1992 - 1997) was initiated when its partners agreed to build the program upon four cornerstones: participatory, landscape-scale, interdisciplinary, and inter-sectoral research. While these cornerstones remain the foundation for SANREM Phase II (1998 - 2003), the second phase also builds upon a wealth of common experience. Local farmers, non-governmental organizations (NGOs) and community-level organizations have joined national research and development institutions and United States-based universities and NGOs to create a unique program.

Two forces shaped the design of SANREM Phase II: an analysis of the lessons learned from Phase I and an analysis of the future needs of natural resource managers. These analyses led to organizational changes and to an evolution in the focus of the SANREM research program.

### Building on Organizational Lessons

Lessons learned about participation, landscape scale research, inter-institutional partnerships and other aspects of SANREM's approach have been shared in this report in the spirit of helping other research teams with similar missions to build upon SANREM's experience. However, the design of SANREM Phase II also has benefited from other lessons regarding organizational structures and research management, which have not yet been described because they are less relevant to other research programs. For example, an analysis of management issues and the difficulties associated with integrating interdisciplinary research led to decisions for SANREM to set up regional projects instead of having research sites in different countries; to have regional projects coordinated by a lead institution instead of by a lead scientist; and to ask one person to be responsible for both financial and program decisions instead of having these responsibilities in the hands of two people in different institutions.

The SANREM program is implemented through three regional projects (Southeast Asia, Andes and West Africa) and a global project. The program is coordinated by the Management Entity,



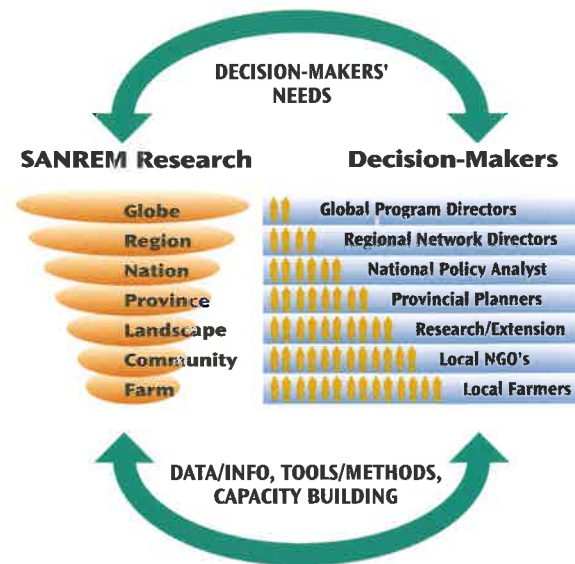
The SANREM Management Entity staff members, pictured left to right: Gina Thomas, Finance Officer; Constance Neely, Deputy Program Director; Robert Hart, Program Director; Brandie Pentecost, Administrative Assistant; Julia Earl, Communications Manager; David Stewart, Database Manager; and Ed Kanemasu, Director, Office of International Agriculture, University of Georgia.

which is supported by a technical committee, a monitoring and evaluation panel and the SANREM Board of Directors.

### Building on Decision-Makers' Needs

The design of SANREM Phase II also was influenced by the increasing effect of global issues on local natural resource managers. Agenda 21 issues, such as climate change, desertification and loss of biodiversity, are influencing national policy decisions and increasingly influencing provincial and municipal decisions, especially in countries where power is being devolved from national to local governments. As a global program, SANREM can contribute to local partnerships with farmers, local NGOs and other decision-makers by expanding its participatory approach to include decision-makers from the provincial-to-global scale to ensure that the benefits from the Agenda 21 conventions reach local farmers.

Figure 7.1 SANREM Phase II Strategy:  
Research to Support NRM Decision-Makers



SANREM's Phase II research, networking and training activities respond to the needs of natural resource decision-makers at local, community, landscape, provincial, national and global levels. These decision-makers are asking complex and difficult questions, such as:

- How can I as a farmer find new technologies that will help me provide for my family in the short run without degrading my land in the long run?
- How can I as a community leader find ways to encourage people who live downstream to share the cost of reducing upstream erosion?
- How can I as a policy analyst identify policy changes that will have a positive impact on my country's economy and at the same time encourage more sustainable land-use?
- How can I as an agricultural researcher identify appropriate technologies, practices and policies that will lead to more sustainable natural resource management?

### Phase II Strategy

SANREM's Phase II strategy is based on the assumption that decisions by local natural resource managers (farmers, ranchers, foresters and others) are influenced by decision-makers at "higher" levels, from the local municipality up to managers of global multilateral institutions. The strategy also assumes that successful decision-makers have access to information, appropriate tools to analyze that information, and the individual and institutional capacity to use those tools. SANREM's mission is to support natural resource management decision-makers in order to promote sustainable agriculture and sound natural resources management.

SANREM's strategy begins and ends with decision-makers. The strategy will be implemented by providing natural resource management decision-makers with information, tools and training that address three programmatic objectives:

- To develop methods, tools, and institutional capacity to support sustainable agriculture and natural resource management policy design, issues analysis, planning, and implementation at the landscape-lifescap scale by local governments and communities.
- To develop improved methods to assist global, regional, and national decision-makers on broader issues related to sustainable agriculture and natural resource management.
- To develop improved methods to facilitate sustainable agriculture and natural resource management information and knowledge exchange within and across multiple scales.

To meet these objectives, the SANREM Program for Phase II is being implemented through integrated global and regional projects including Southeast Asia, the Andes and West Africa.

### SANREM Global Project

SANREM's global project implements four initiatives with different objectives. (See Figure 7.2.)

#### Decision-Maker Needs Assessment

This initiative is coordinated by the SANREM Management Entity and is implemented in collaboration with FAO and the three SANREM regional projects described below. Its objective is to identify difficult decisions of decision-makers at different levels to ensure that SANREM research responds to these needs.

#### Decision-Support System

This initiative is coordinated by the SANREM Management Entity and implemented in collaboration with Texas A&M University, FAO and the three SANREM regional projects described below. Its objective is to develop a suite of decision-support tools and methods to assist natural resource management decision-makers.

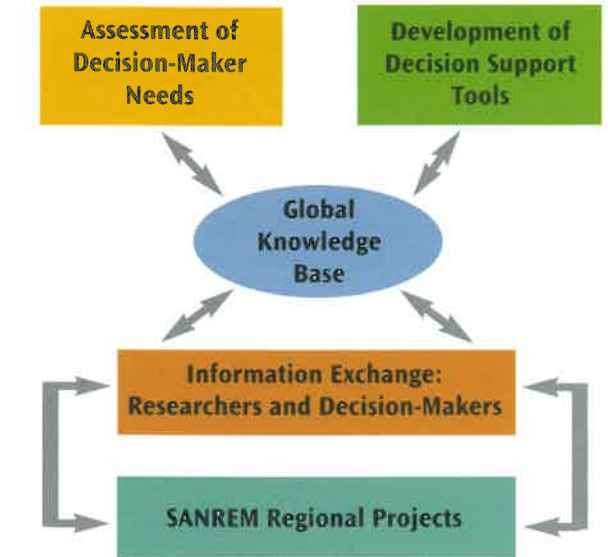
#### Knowledge Base

This initiative is coordinated by the SANREM Management Entity. Its objective is to capture research results from regional and global projects and to make this knowledge available to decision-makers.

#### Information Exchange

This initiative is coordinated by the SANREM Management Entity. Its objective is to facilitate exchange of experiences among decision-makers and researchers.

Figure 7.2 SANREM Program Regional and Global Activities



### SANREM Regional Projects

SANREM's regional projects conduct research, networking and training in response to the needs of decision-makers in different circumstances that are representative of a region but also common globally. All of SANREM's regional projects work at three levels: local farm-to-landscape scales, provincial-to-national scales and national-to-regional scales. Emphasis at the local level is on research to provide decision-makers (farmers, local NGOs, municipalities and others) with appropriate information, tools and training. The focus of provincial and national level activities varies by region but usually is directed toward policy-related issues. All regional projects are actively involved with regional networks and associations exploring ways to ensure that the benefits of local research are disseminated widely.

#### West Africa Project

The West Africa Project, coordinated by Virginia Polytechnic and State University, provides SANREM with a unique opportunity to enhance understanding about how to support decision-makers in circumstances where there is stakeholder conflict over access and use of natural resources exacerbated by weather variability/climate change. The West Africa Project will examine the following areas:

- conflict prevention and resolution in agro-pastoral systems resulting from climate change in northern Mali;
- regional monitoring and prediction tools for improved agro-pastoral management; and
- modeling community socioeconomic linkages and growth.

#### Southeast Asia Project

The SANREM Southeast Asia Project, coordinated by the University of Wisconsin, helps SANREM learn how to support decision-makers in circumstances where global and regional markets strongly influence local natural resource management options. The project is engaged in three types of activities:

- creating outreach and policy support based on the collection and analysis of environmental, social and economic data;



- building a network of collaborative links to other groups and individuals engaged in similar activities elsewhere in Southeast Asia (particularly Thailand, Indonesia and the countries of Indochina); and
- linking work on local, national and regional issues to the concerns of global institutions and agendas through education and information exchange.

#### The Andes Project

SANREM's Andean Regional Program, coordinated by the University of Georgia, provides research and methodological support to local, regional and global decision-makers concerned with sustainable mountain development in regions characterized by fragile highland-lowland interactive landscapes. The Andean program will examine the following areas:

- ecological consequences of land-use changes;
- water resource management and environmental education;
- comparative ethnoecology of fragile lands in the Andes;
- integrated institutional management; and
- regional coordination and outreach.

#### Southern Piedmont Project

In addition, SANREM will collaborate with the USDA-ARS J. Phil Campbell Sr. Natural Resource Conservation Center in the Southern Piedmont of the United States. This integrated watershed research program supports farmers; soil and water conservation districts; local, state and federal action; and regulatory decision-makers. The program focuses on:

- solving problems of natural resource management at a landscape scale in the Southern Piedmont using participatory, stakeholder-based research;
- understanding processes and linkages in soil-plant-animal-atmosphere systems;
- applying state-of-the-art understanding to develop efficient, economical and socially acceptable agroecosystems; and
- developing outcomes-based accountability for natural resource managers.

This program is funded and coordinated by the USDA-ARS yet will be considered as a regional project for SANREM for collaborative research, information and knowledge sharing within the global program and across other regional projects.

#### Summary: Looking to the Landscape and Beyond

SANREM's Phase II strategy has clearly built upon valuable lessons learned from Phase I. This is exemplified in particular by maintaining a participatory, landscape-lifescape research focus while integrating natural resource management decision-maker support from local to global levels. Phase II efforts will maintain a focus on critical representative regions of the world including Southeast Asia, West Africa and the Andes. Cross border lessons will continue to be exchanged and applied in the Southern Piedmont of the United States as well. We are enthusiastic about engaging natural resource management decision-makers at multiple scales; promoting a lively exchange of insights, information and visions; and enhancing capacity to make better decisions in our efforts to pursue sustainability.

SANREM and its partners have made considerable progress addressing the elements of sustainable agriculture and natural resource management. We hope that our lessons learned from Phase I will be helpful to others engaged in development efforts. During Phase II, we will continue to learn from and join with others who share a common vision of sustainability.

For those interested in learning more about SANREM's ongoing activities and progress, please refer to our contact information.

#### SANREM Contact Information

SANREM CRSP  
1422 Experiment Station Rd.  
Watkinsville, GA 30677  
U.S.A.  
Telephone 706-769-3792  
Fax 706-769-1471  
E-mail: sanrem@uga.edu  
Web site: <http://www.sanrem.uga.edu>



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## AUTHOR AFFILIATIONS – CASE EXAMPLES

|   |  |
|---|--|
| David J. Midmore<br>Central Queensland University<br>Australia                            | Sam Bingham<br>Center for Holistic Management<br>USA   |
| Daniel Kaboré, Marie-Claire Sorgho, Laraba Illy, Mamounata Belem<br>INERA<br>Burkina Faso | Ian Coxhead<br>University of Wisconsin,<br>USA   |
| Salibo Somé<br>ASUDEC<br>Burkina Faso   | William G. Deutsch, Allison L. Busby<br>Auburn University<br>USA   |
| Mary Marcia Bravo, Segundo Andrango Bonilla<br>COMUNIDEC<br>Ecuador                       | Jan L. Flora, Cornelia Flora<br>Iowa State University<br>USA   |
| Fabian Calispa, Marco Castillo<br>TERRANUEVA<br>Ecuador                                   | William L. Hargrove<br>Kansas State University<br>USA  |
| Sam Koffa and Dennis Garrity<br>ICRAF<br>Indonesia  | Virginia Nazarea, Robert Rhoades, Maricel Piniero, Erla Bontoyon, Gabriela Flora<br>University of Georgia<br>USA |
| Linda Burton, Lourdes Baoncayao<br>Xavier University<br>Philippines                       | Todd M. Nissen<br>University of Illinois<br>USA  |
| Estela Y. Cequina<br>Central Mindanao University<br>Philippines                           | Durga D. Poudel<br>University of California, Davis<br>USA  |
| Jim L. Orprecio, Janeth P. Bago<br>Heifer Project International<br>Philippines            | Irma Silva-Barbeau<br>Silva Associates<br>USA  |
| Agnes Rola<br>University of the Philippines at Los Banos<br>Philippines                   | Daniel Taylor<br>Virginia Polytechnic Institute and State University<br>USA                                      |
| Romualdo del Rosario<br>Philippine National Museum<br>Philippines                         |  |

## GLOSSARY – ACRONYMS

|                   |  |                    |   |
|-------------------|--|--------------------|---|
| <b>ACIAR</b>      | Australian Center for International Agriculture Research   | <b>GIS</b>         | Geographic Information Systems  |
| <b>AFTA</b>       | ASEAN Free Trade Area  | <b>GTZ</b>         | Gesellschaft für Technische Zusammenarbeit (German Ministry for Technical Co-operation)   |
| <b>AGEHOR</b>     | L'Association Pour la Gestion Holistique des Ressources (The Association for Holistic Resources Management), Burkina Faso            | <b>HPI</b>         | Heifer Project International  |
| <b>ATSAL</b>      | Agroforestry Tree Seed Association of Lantapan   | <b>IARC</b>        | International Agricultural Research Centers   |
| <b>AVRDC</b>      | Asian Vegetable Resources & Development Center   | <b>IBSRAM</b>      | International Board for Soils Research and Management   |
| <b>AWW</b>        | Alabama Water Watch  | <b>ICRAF</b>       | International Centre for Research in Agroforestry   |
| <b>BRCI</b>       | Bukidnon Resources Company, Inc.   | <b>ICRISAT</b>     | International Crops Research Institute for Semi-Arid Tropics  |
| <b>CDC</b>        | Centro de Datos para la Conservación (Center for Conservation Data)  | <b>IDR</b>         | Institute for Rural Development, Burkina Faso   |
| <b>CNRST</b>      | Centre National de Recherche Scientifique et Technologique (National Center for Scientific and Technological Research), Burkina Faso | <b>INERA</b>       | Institute for Agricultural Research and Study, Burkina Faso   |
| <b>DA</b>         | Department of Agriculture, The Philippines   | <b>INERF</b>       | National Institute for Rural Engineering and Forestry, Cape Verde   |
| <b>DAR</b>        | Department of Agrarian Reform, The Philippines   | <b>INIDA</b>       | Instituto Nacional de Investigacao e Desenvolvimento Agraria (National Institute for Agricultural Research & Development), Cape Verde |
| <b>DENR</b>       | Department of Environment & Natural Resources, The Philippines   | <b>INRA-SETTAT</b> | Institut National Pour la Recherche Agricole (National Institute for Agricultural Research), Morocco                                  |
| <b>DGASP</b>      | Directorate General of Agriculture, Silviculture and Animal Husbandry (Cape Verde)   | <b>IRBET</b>       | Institute for Tropical Ecology and Biology Research, Burkina Faso   |
| <b>EAP</b>        | Escuela Agrícola Panamericana, (The Pan-American Agricultural School), Zamorano, Honduras  | <b>IRRI</b>        | International Rice Research Institute   |
| <b>EARTH</b>      | Escuela de Agricultura de la Región Tropical Húmeda, (School of Agriculture for the Humid Tropics Region), Costa Rica                | <b>KNP</b>         | Kitanglad Nature Park, The Philippines  |
| <b>ENA-Meknes</b> | Ecole Nationale d'Agriculture de Meknes, (National School of Agriculture-Meknes), Morocco  | <b>LGU</b>         | Local Government Unit   |
| <b>EPA</b>        | The United States Environmental Protection Agency  | <b>LUCODEB</b>     | Lutte Contre la Desertification au Burkina (The Fight Against Desertification in Burkina Faso), an anti-desertification program       |
| <b>ESI</b>        | Entrepreneurial Social Infrastructure  | <b>NARS</b>        | National Agriculture Research Systems   |
| <b>EU-ARSP</b>    | European Union-Agrarian Reform Support Program   | <b>NASA</b>        | United States National Aeronautics & Space Administration   |
| <b>FAO</b>        | United Nations Food & Agriculture Organization   | <b>NGO</b>         | Non Governmental Organization   |
| <b>FLACSO</b>     | Facultad Latinoamericana de Ciencias Sociales (Latin American Faculty for Social Sciences)   | <b>NRM</b>         | Natural Resources Management  |
| <b>GATT</b>       | General Agreements on Tariffs and Trade  | <b>NRMC</b>        | Natural Resources Management Council, The Philippines   |
| <b>GEF</b>        | Global Environment Facility (United Nations Environment Program and World Bank Program)  | <b>NRMDP</b>       | Natural Resources Management and Development Plan, The Philippines  |
|                   |  | <b>PAMB</b>        | Protected Area Management Board   |



|                    |  |                 |  |
|--------------------|--|-----------------|--|
| <b>PCARRD</b>      | Philippine Council for Agriculture, Forestry & Natural Resources Research and Development    | <b>SWAT</b>     | Soil Water Assessment Tool   |
| <b>PLLA</b>        | Participatory Landscape/Lifescape Appraisal  | <b>TAT</b>      | Thematic Apperception Test   |
| <b>PPI</b>         | Plan International (NGO)   | <b>TN</b>       | Terra Nueva  |
| <b>PRA</b>         | Participatory Rural Appraisal  | <b>UGA</b>      | The University of Georgia  |
| <b>PVO</b>         | Private Voluntary Organization   | <b>USAID</b>    | United States Agency for International Development                     |
| <b>R&amp;D</b>     | Research & Development   | <b>USDA-ARS</b> | United States Department of Agriculture Agricultural Research Services |
| <b>RRA</b>         | Rapid Rural Appraisal  | <b>USFQ</b>     | Universidad San Francisco de Quito                                     |
| <b>RRSA</b>        | Rapid Rural System Appraisal   | <b>WARD</b>     | Watershed and Applied Research and Development Project, Cape Verde     |
| <b>SANREM CRSP</b> | Sustainable Agriculture & Natural Resource Management Collaborative Research Support Program | <b>WRS</b>      | Water Resources Sustainability   |
| <b>SARE</b>        | Sustainable Agriculture Research and Education   |                 |  |
| <b>SHAISI</b>      | San Herminigildo Agro Industrial School Foundation, The Philippines                          |                 |  |
| <b>SUBIR</b>       | Sustainable Use of Bio-Resources Project   |                 |  |

## TERMS

|                           |   |                         |   |
|---------------------------|---|-------------------------|---|
| <b>Agenda 21:</b>         | Global action plan regarding environmental issues that grew out of the United Nations 1992 Earth Summit held in Rio de Janeiro, Brazil.   | <b>Tigbantay Wahig:</b> | A water quality monitoring non-governmental organization formed by local citizens following participation in SANREM research activities in the Philippines. "Tigbantay Wahig" means water watchers in the Binukid language. The Philippine Water Watch group. |
| <b>Autodiagnóstico:</b>   | A process of community-led self-diagnosis.  | <b>Water Watch:</b>     | A U.S. citizen environmental advocacy group and SANREM participant. Active in Alabama, U.S.   |
| <b>Barangay :</b>         | The smallest political subdivision or unit of government in the Philippines. It serves as the primary planning and implementing arm of government programs, projects, and activities.                         | <b>Zai:</b>             | Hand-dug shallow holes for moisture and nutrient retention in agricultural fields. (Burkina Faso).  |
| <b>Ha:</b>                | Hectare, 2.47 acres, 10,000 square meters.  | <b>Zipele:</b>          | Local term for hard-pan lateritic soils found in Burkina Faso.  |
| <b>Hacienda:</b>          | A farm, ranch or plantation.  |                         |   |
| <b>Hacendados:</b>        | Large-scale land-owners.  |                         |   |
| <b>Paratechnico:</b>      | A technical extension agent.  |                         |   |
| <b>Quartier:</b>          | Neighborhood  |                         |   |
| <b>Sangguniang Bayan:</b> | The legislative body of a municipality in the Philippines. The Sangguniang Bayan enacts ordinances, approves resolutions and appropriate funds for the general welfare of the municipality and its citizenry. |                         |   |

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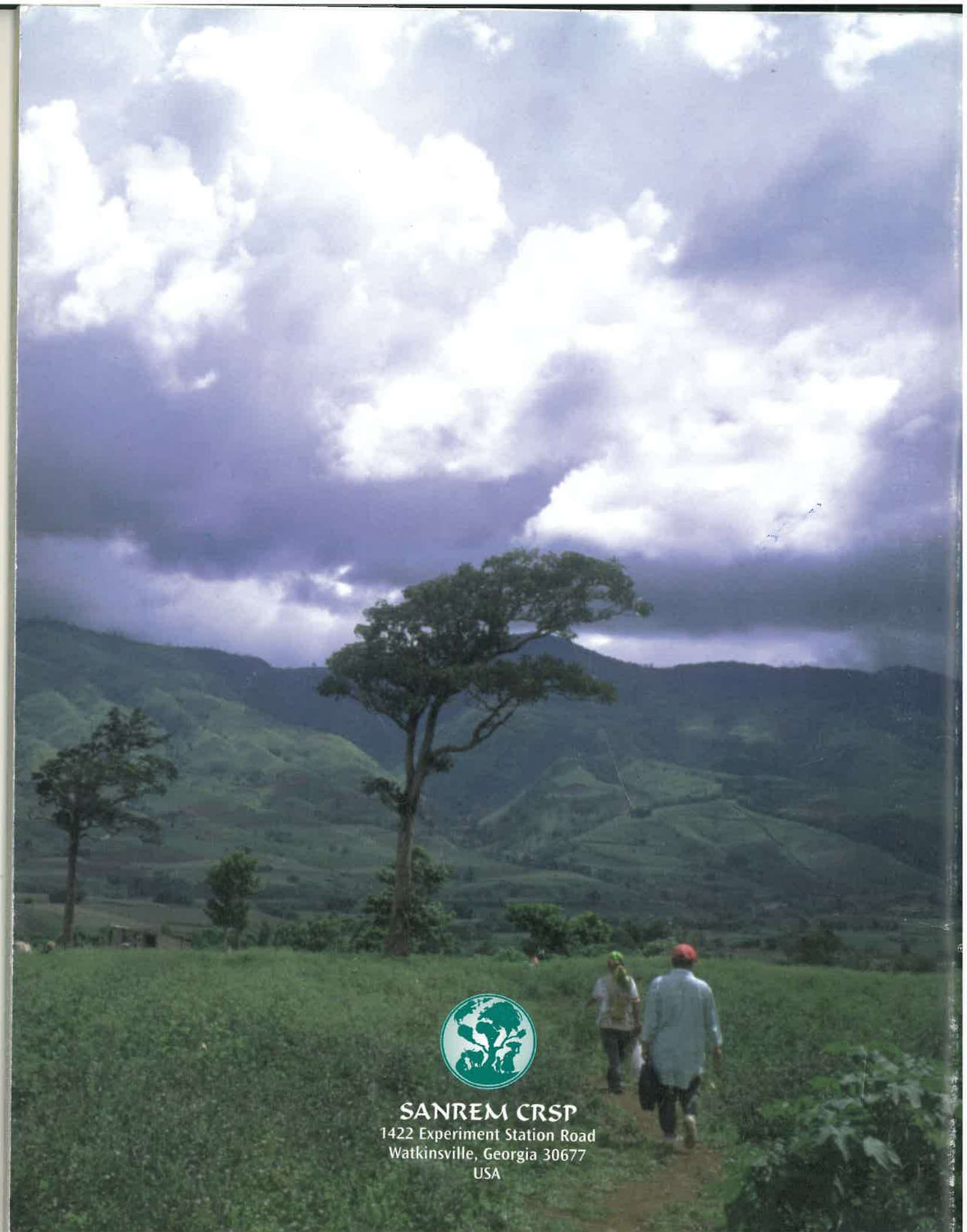
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**SANREM CRSP**  
1422 Experiment Station Road  
Watkinsville, Georgia 30677  
USA