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

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IMPACTS AND LESSONS FROM THE SANREM CRSP

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Foreword

Policymakers and governments around the world have identified the interface between the growing demand for food and protec tion 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 ambi tious 10 year path to implement a comprehensive farmer par ticipatory 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 chal lenges For example the practical and ethical issues of conduct ing 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 environ mental 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 govern ment 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 formi dable 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 invalu able 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 deci sion makers and capable institutions leading to sustainable rela tionships 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 sustain ability 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 con sidered an end in itself but rather a negotiated process based on the enhanced decision making ability of all stakeholders includ ing civil society governments and international bodies

In this document we outline SANREM s approach research results impacts achieved and lessons learned from our experi ences 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 L Neely M Gladys Buenavista 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/lifescape focus To implement this approach SANREM employed a six step iterative methodology networking and team building participa tory landscape/lifescape 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 involve ment 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 bene fits primarily took place in universities non governmental orga nizations and primary and secondary schools SANREM s activi ties 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 develop ing 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/lifescape methodology pioneered by SANREM and SANREM experience abroad has been implemented domestically in terms of partici patory landscape research partnerships in water quality and a global classroom project

Results

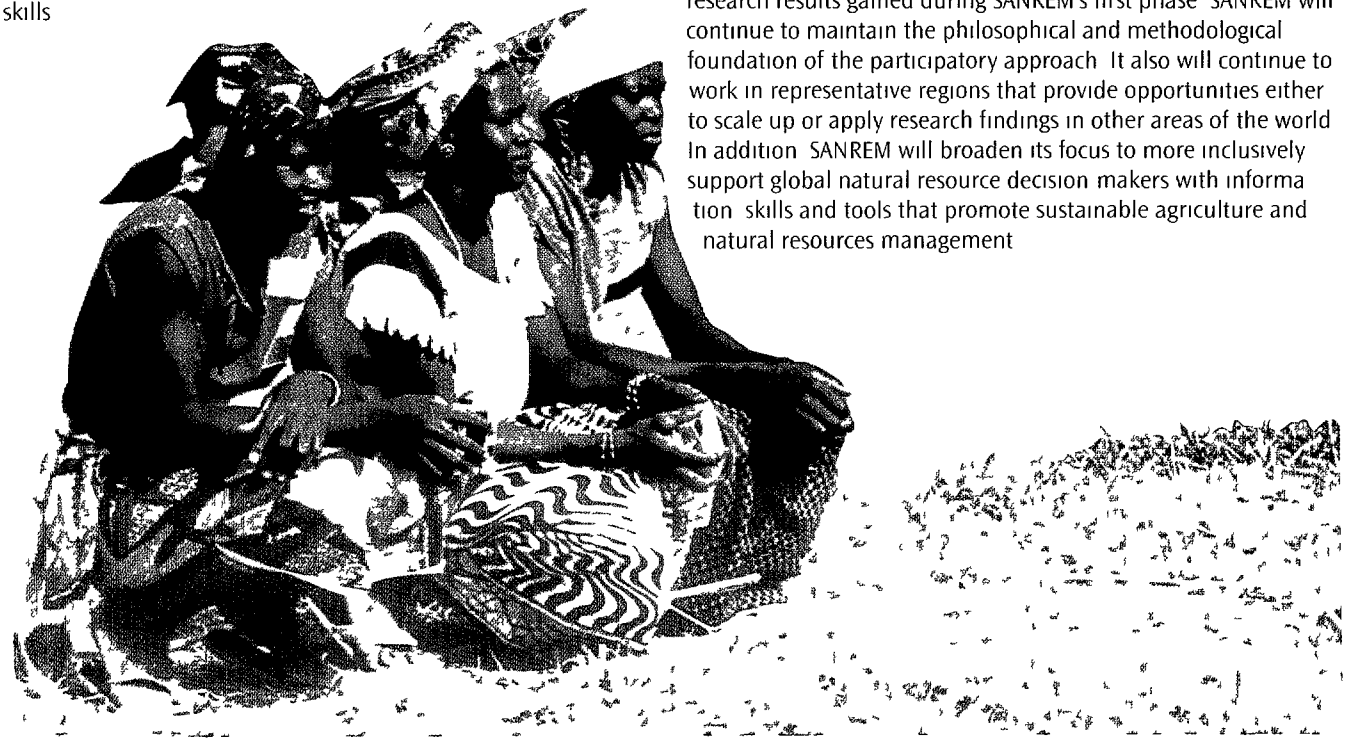
SANREM conducted intensive research for sustainable develop ment at three key sites in Burkina Faso Ecuador and the Philippines The research in these areas focused on two types of outputs characterization of the landscape/lifescape in order to enhance understanding of causal relationships and addressing sustainable natural resource management strategies Research addressed topics such as biodiversity conservation land man agement 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 land scape/lifescape 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 informa tion 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 sustain able agriculture and natural resource management in 1992 The approach emphasized the participation of all stakeholders in a collaborative research program focused on sustainable develop ment The participation of farmers along with scientists govern ment agencies private organizations and academic institutions was identified as a key factor in bringing about positive changes This participatory approach recognized the importance of includ ing 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 encour aged 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 interna tionally 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 Agricul ture 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 pres sures 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 rela tionships between humans and natural resources We have pur sued 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 mak ers to achieve wise and informed natural resource manage ment 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

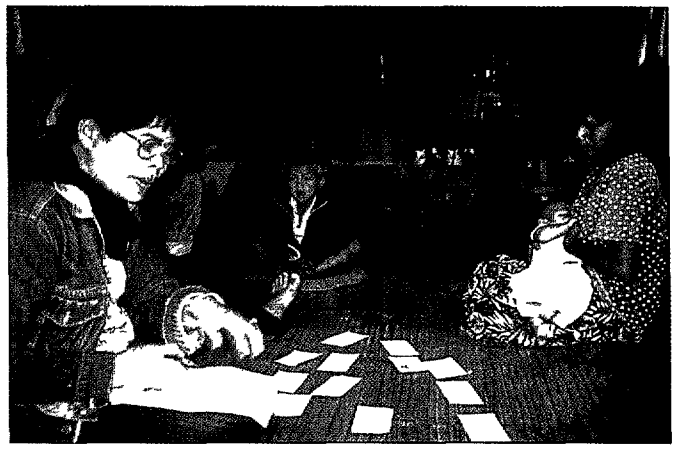
Current development theory and practice increasingly promote the sharing of lessons learned among all interested parties governmental and non governmental public and private local and global to improve research and development efforts In keeping with this trend SANREM has identified a wealth of lessons 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 pro vide 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

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 process es 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 interdiscipli nary approach that transcended the traditional boundaries among ecological agricultural and social sciences and that also encompassed a variety of con ceptual 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



In the nearly five decades since U S institutions have been involved in development work many different approaches have been tried with vary ing 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 participa tory practices SANREM embraced this lesson and employed it both as a philo sophical 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 mem bers 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 identifica tion 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

INTER-INSTITUTIONAL COLLABORATION

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 cen ters development agencies and NGOs/PVOs site specific government agencies grass roots 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

LANDSCAPE/LIFESCAPE FOCUS

The SANREM approach was based on the thesis that in order to under stand sustainability and thereby develop strate gies to achieve it we must understand the relationships and link ages in a landscape set ting The term landscape refers to a complex mosa ic of biological and physi cal 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

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 collaborat ing partners These networks included farmers communities local government and non governmental institutions universi ties and international government and non governmental orga nizations 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/lifescape 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 partici pants 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/Lifescape Appraisal

The Participatory Landscape/Lifescape 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 experi ences derived from participatory rural appraisal (PRA) rapid rural appraisal (RRA) and farming systems research What distin guishes 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 rela tionships on the landscape/lifescape 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/lifescape The PLLA process involves team build ing 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 perspec tives 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 indi viduals 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 infor mation 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 ques tions and projects Individuals representing government organi zations 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 Filippino Community

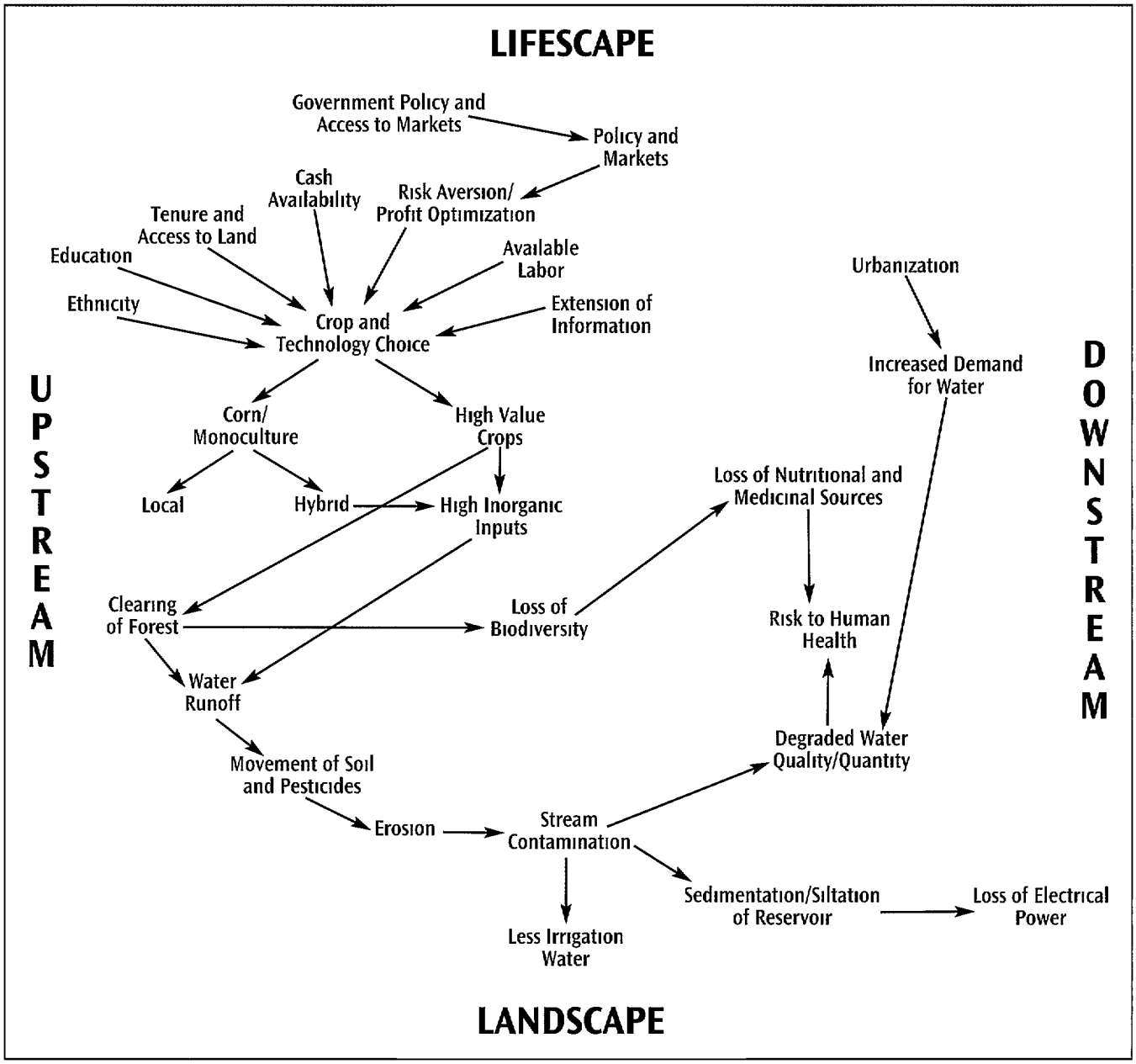


Figure 2 2 Elements of the Water Cycle in Locally Defined Agro-Ecosystems of a Philippine Landscape

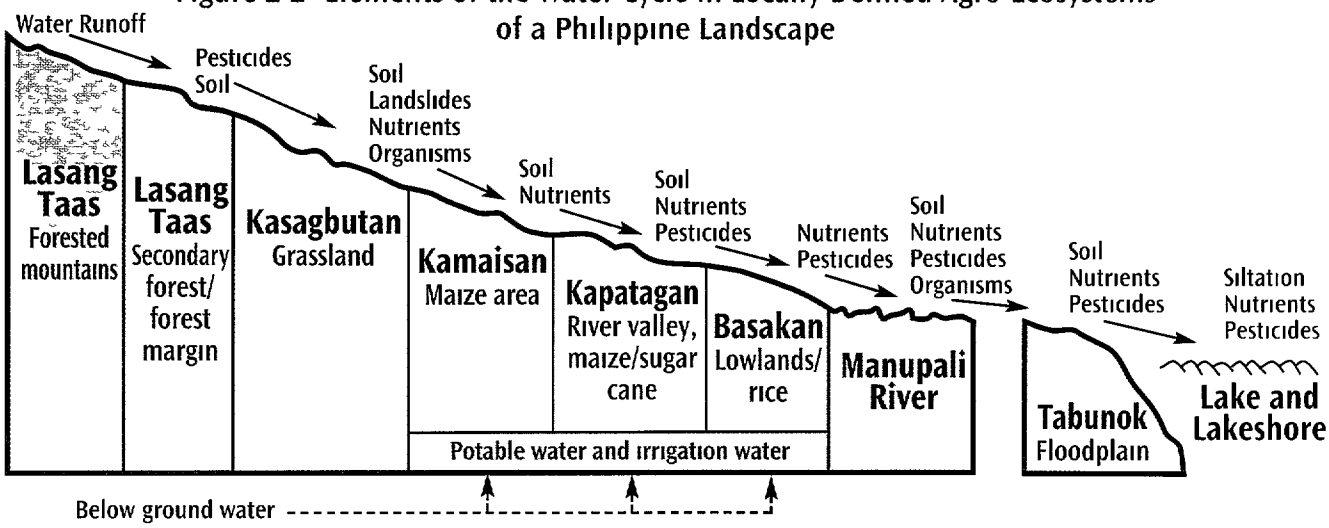
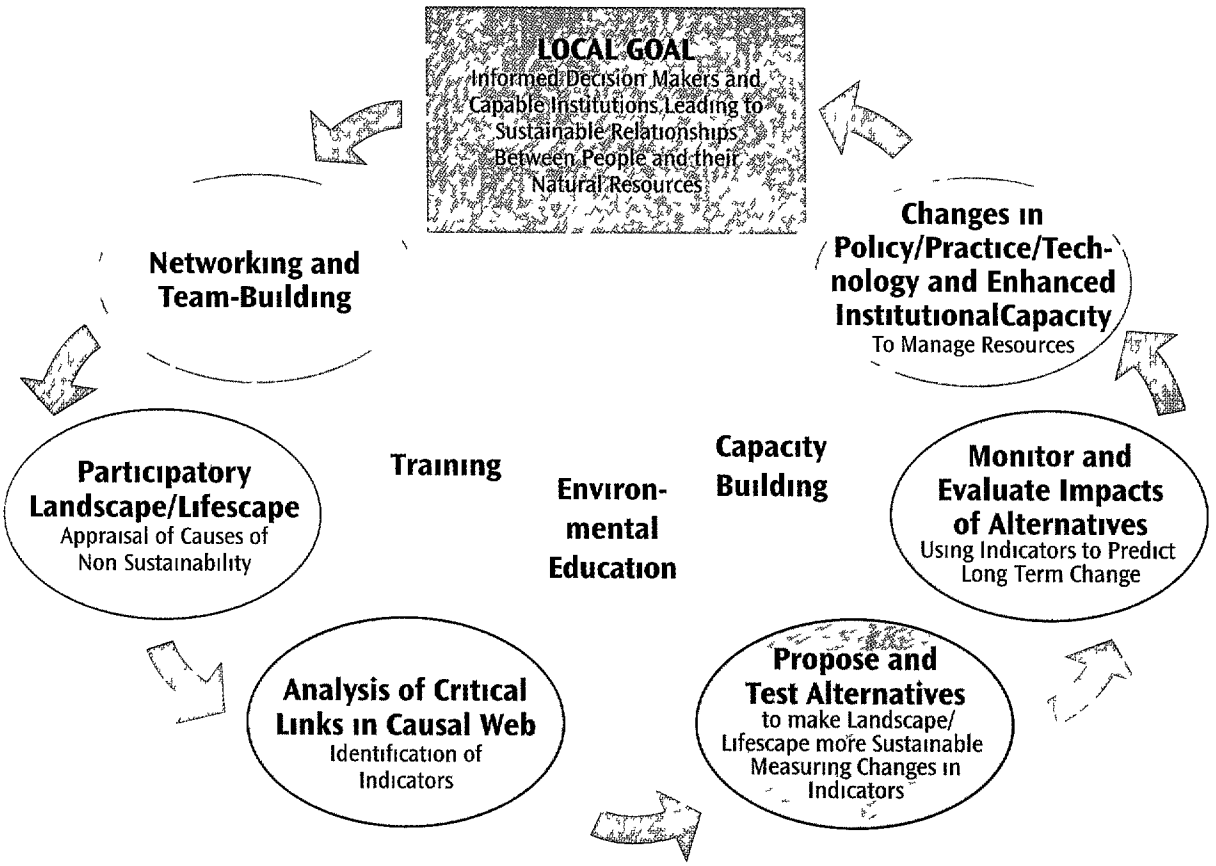


Figure 2 3 SANREM's Six Step Methodological Framework



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/lifescape and 2) designing action research experiments to address constraints to sustainabil ity 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 a vis natural resource management (see Figure 3 2 in Chapter 3) Critical to this was the use of ongoing participatory monitor ing 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 Lifescape Approaches

Along with the Participatory Landscape Lifescape Appraisal we used a number of other innovative tools to bring researchers and communities together to understand linkages between landscape and lifescape 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 social ly and environmentally sound decisions based on their values and available resources Holistic manage ment activities in Burkina Faso led to communities clearly articulating what their lifescape and landscape would look like in the future This in turn provided a basis for community relevant research

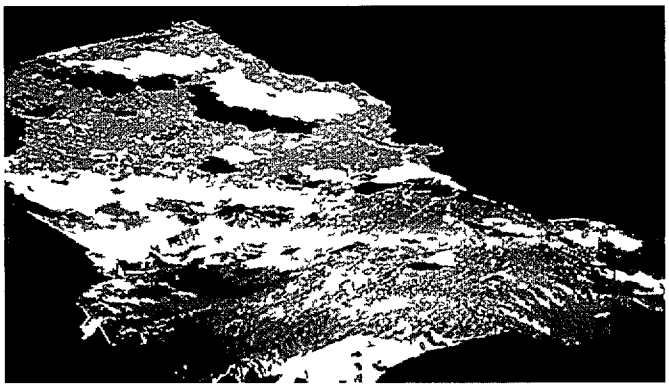
Holistic management trainees discuss local resource map

Pictures Where People Matter

Can photographs be used as a communication tool to enable minorities and mar ginal populations to convey their own views of their world and to overcome barriers of literacy? In an effort to expand the partici patory 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 partici patory 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 character ize 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



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

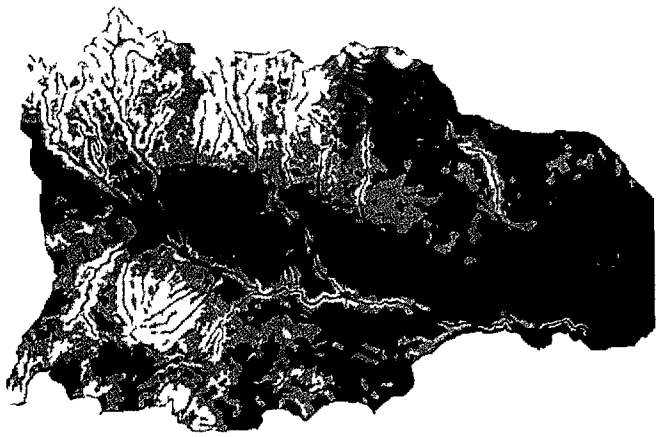
A team of researchers and NGO staff built a physical model of the Manupali Watershed of the Philippines (shown above) that has been used to depict upstream downstream relationships plan agroforestry research activities with farmers and promote environmental awareness

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

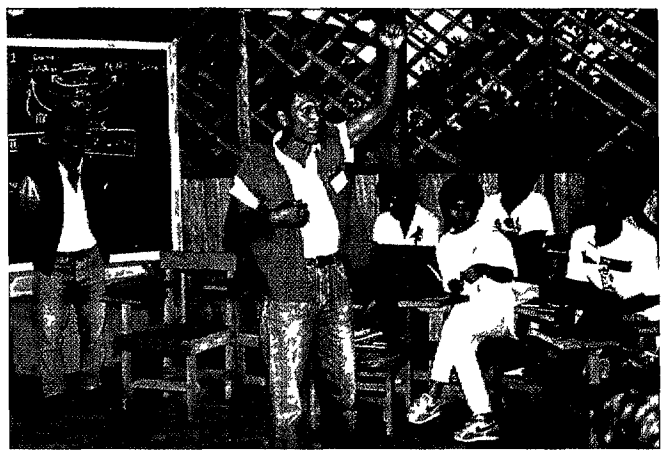
Investigators at Zamorano University in Honduras developed a set of field surveying techniques to provide basic information on the physical characteristics of a watershed determination of boundaries water flow measurements and land use planning Hand calculations and drawings require no special skills 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

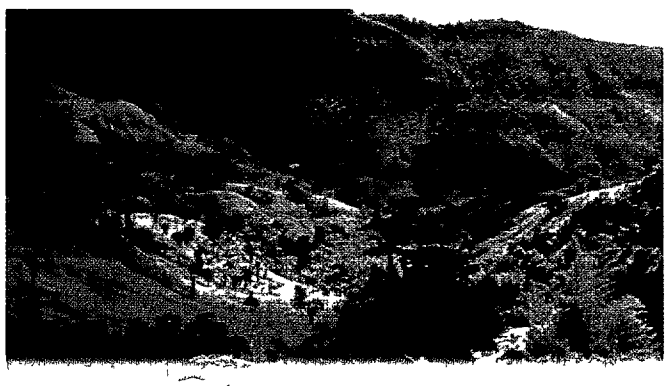
A Link That Makes A Difference The Priming Experience

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 bioreserve at the top of Mt Kitanglad to the dam that controls the Manupali



River and down to the ocean Participants also visited demon stration 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 – expo sure 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



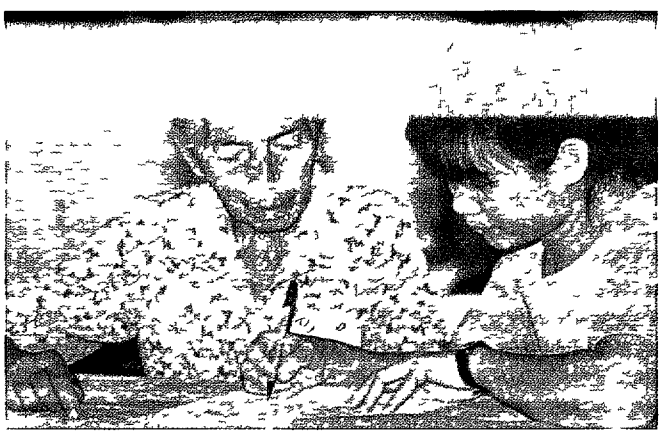
Most policies aimed at sustainable forest and land management in tropical regions of the world do not account for differences in the kinds of farmers impacting the environment Policy makers typically see migrants as individual males who settle unoccupied land by first clearing the forest before bringing 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 communi ties in Ecuador provided a platform for collective discussion and insights into the environmental history of the region While cre ating an enhanced sense of place the participatory story telling activities also revealed how the forests water soils and settlements had changed since the days of the Yumbos the earli est 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 peo ple of Nanegal realized that their environment is not as produc tive 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 gen der 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 phenome na 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 techni cal progress that raises productivity throughout the economy will have local effects through changes in crop or input prices

Looking for Indicators

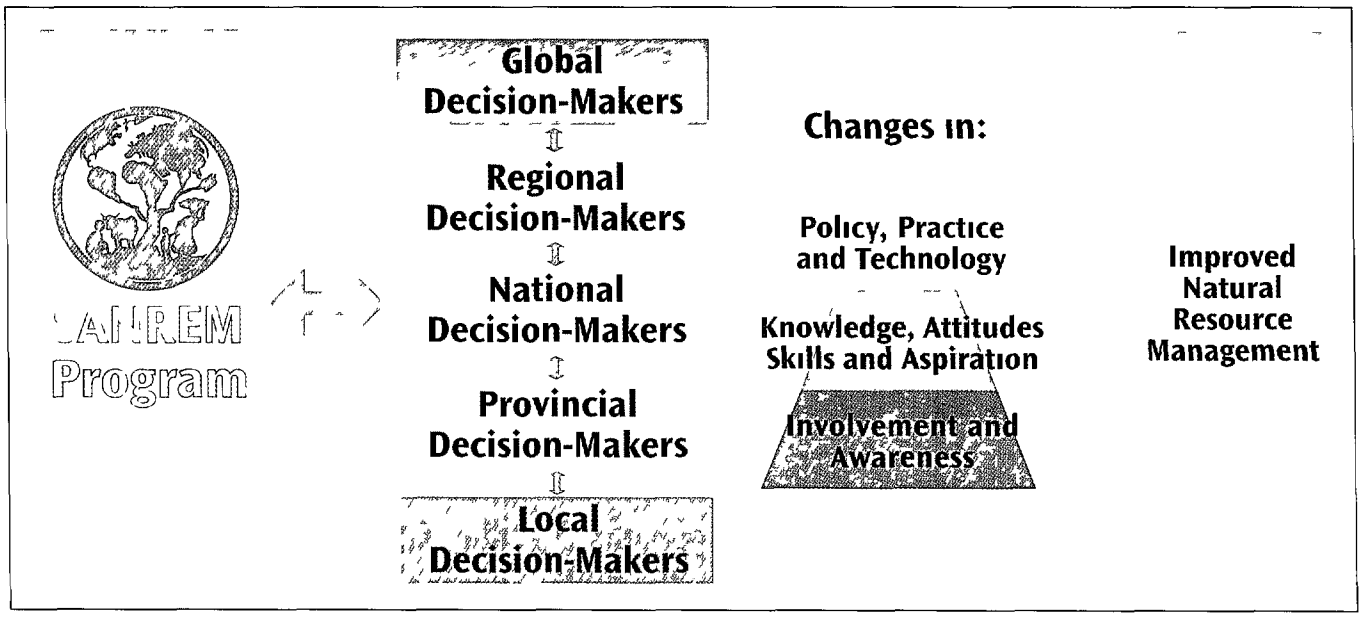
At EARTH University in Costa Rica the Participatory Landscape/Lifescape Appraisal was adapted to focus on scientific and indigenous indicators of sustainability Indicators identified through the PLLA in the La Argentina community became inte gral to student thesis project definition execution and evalua tion 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

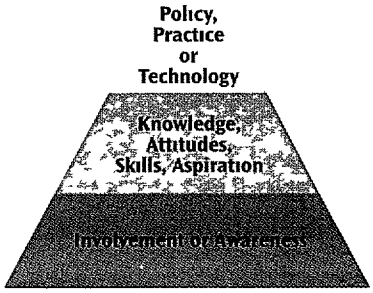


Using the evaluative criteria of SANREM an impact judged to be of long term significance must cause measurable changes – in practice technology or policy – by any of various types of decision makers in government civil society the private sector or communities related to sustainable agriculture and natural 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 institu tion strengthening processes that enhance the ability of organi zations 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 trans fer 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 endur ing 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 evalu ate 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 provid ed 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 mak ing SANREM also developed local government capacity enabling local governments to assess community needs formulate devel opment 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 train ing 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 aware ness or involvement to knowledge and skills to policy and prac tice 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
	Change in Policy, Practice or Technology
LOCAL	
Community Decision Makers	More than 1 250 farmers from Burkina Faso Ecuador and the Philippines apply sustainable management practices on their farms Community committees host natural resource management debates and proactively plan development activities (Burkina Faso the Philippines and Ecuador)
Government	The SANREM approach of science and participation based research is integrated in development of the municipal Natural Resources Management Development Plan (NRMDP) (The Philippines) 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) Research and development committees are created in local government councils (*Barangay*) (The Philippines) Local governments seek and use SANREM research outputs in policy and decision making regarding water quality and environmental issues
Civil Society	Local environmental NGOs form at variety of sites as participants acquire specialized skills from participating in SANREM research – Tigbantay Wahig – The Philippines – AGEHOR (Association for Holistic Resource Management) – Burkina Faso – Cape Verde Farmers Association – Cape Verde Local organizations engage in entrepreneurial activities complementing their involvement with SANREM ATSAL (Agroforestry Tree Seed Association of Lantapan) (The Philippines)
PROVINCIAL	
Government	Provincial Planning and Development Office adopts policies promoting participatory approaches in natural resource management planning (The Philippines) Provincial governor cites influence of SANREM in design of environmental policies (The Philippines)
Civil Society	Plan International (an international NGO) uses SANREM research results in development strategies (Burkina Faso)
NATIONAL	
Research and Education	Participatory and Collaborative research approaches are adopted at partner institutions (Burkina Faso The Philippines Ecuador Honduras Costa Rica and Cape Verde)
Government	A national government uses a SANREM supported plan in the formulation of National Watershed Management Strategy (The Philippines)
Civil Society	The intellectual property rights national policy was influenced by SANREM activities A position on trade secrets was taken to protect local community knowledge (Ecuador) New NGOs are developed (Burkina Faso) and there is increased networking and cooperation among NGOs for joint NRM efforts (Ecuador) NGOs operating in Ecuador are using the SANREM methodology in other natural resource management projects
REGIONAL	
Researchers	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)
Government	The intellectual property rights policy and trade secrets model developed in Ecuador is being promoted throughout Latin America
GLOBAL	
Civil Society	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)

LEVEL OF CHANGE	IMPACT
	Change in Knowledge, Attitudes, Skills or Aspiration
GLOBAL, REGIONAL, NATIONAL, PROVINCIAL & LOCAL	Capacity is enhanced among participants through training information exchange and participation in research activities (Burkina Faso Ecuador and The Philippines) Skills of researchers graduate students and undergraduate students are upgraded through involvement in training and research activities (all sites) Graduate and undergraduate students receive formal training The quality of environmental science education in the United States and host country schools improved International workshops are convened by SANREM focusing on providing skills in GIS participatory research and indicators of sustainability
	Change in Involvement or Awareness
GLOBAL, REGIONAL, NATIONAL, PROVINCIAL & LOCAL	Awareness of sustainability in project areas is heightened and new partnerships are developed PLLAs are performed at all sites PLLA results are subsequently used by a variety of decision makers International partnerships are mobilized SANREM institutes a staff exchange with FAO (United Nations Food and Agriculture Organization) Land and Water Division Department of Agriculture SANREM methodology was introduced

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 con cerns expressed regarding World Bank funded Urban Water and Sanitation Project for local governments

- Provincial Planning and Development Office adoption of spe cific 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 par ticipatory process

Formulation of local policies and programs regarding sustain able 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 facili tation 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 participa tion 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 environ mental 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)

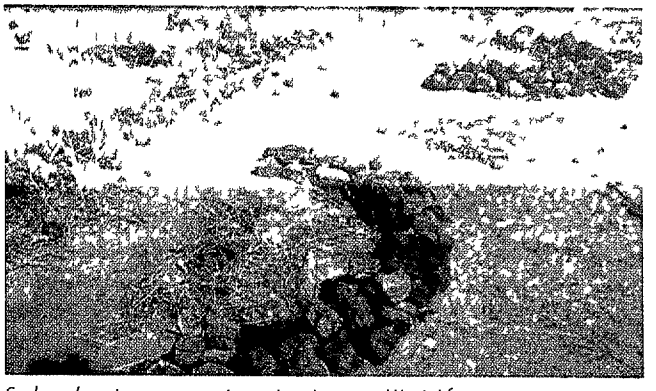
- Participatory Landscape Lifescape Appraisals (PLLAs) performed (Bukidnon the Philippines)
- Introductory meetings with various representatives from community groups individual farmers and government regarding SANREM project goals philosophy and methodology (Philippines and United States)

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

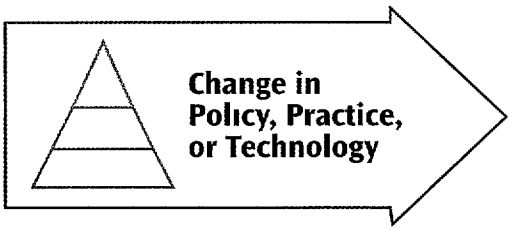
Participatory community discussions held to assess state of the environment
Identified and analyzed cause and effect relationships regard ing environmental and economic problems
Identified underlying conditions requiring resolution in order to reach community identified natural resource management goals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

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

Community meeting in Donsin



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

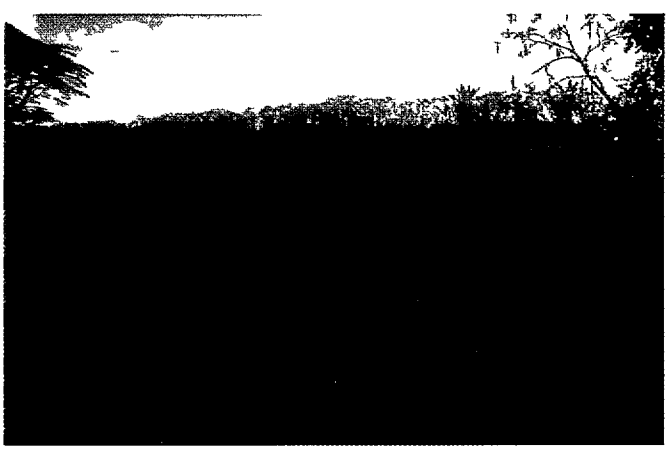
Community Decision Makers

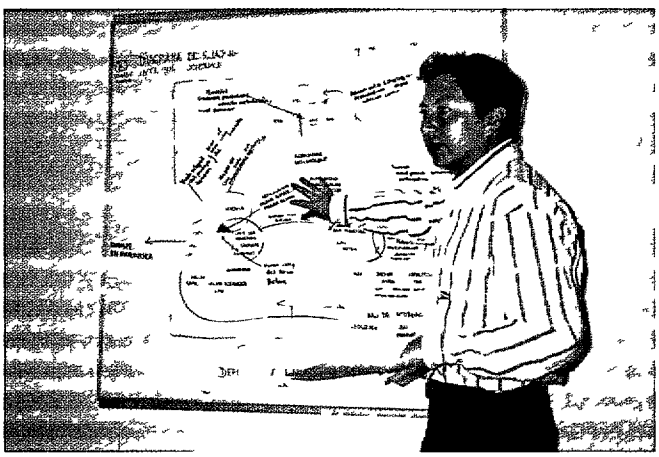
Extension and Adoption of On Farm Practices for Sustainable Agriculture and Natural Resources Management

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/ Training/ Seminar/ Field Trip	Attended Barangay Meetings	Conversation/ Seminar/ Others	Know/ Not Involved	Don't Know
Contour plowing	85 7 (72)	100 0 (15)	88 9 (8)	80 0 (32)	75 0 (6)	100 0 (4)	87 5 (7)
Integrated Pest Management (IPM)	22 3 (23)	68 8 (11)	23 0 (3)	9 8 (5)	30 0 (3)	25 0 (1)	0 0 (0)
Contour strips/ hedgerows	68 4 (52)	92 9 (13)	57 1 (4)	58 3 (21)	42 9 (3)	100 0 (3)	88 9 (8)
Plant trees or grasses on border	95 2 (100)	100 0 (17)	100 0 (13)	94 3 (50)	100 0 (8)	100 0 (5)	77 8 (7)
Regular fallowing	56 9 (62)	58 8 (10)	50 0 (7)	57 4 (31)	60 0 (6)	80 0 (4)	44 4 (4)
Regular crop rotation	67 0 (71)	80 0 (12)	57 1 (8)	71 2 (37)	54 6 (6)	100 0 (4)	40 0 (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 autodiagnostico 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 (NRMC) 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

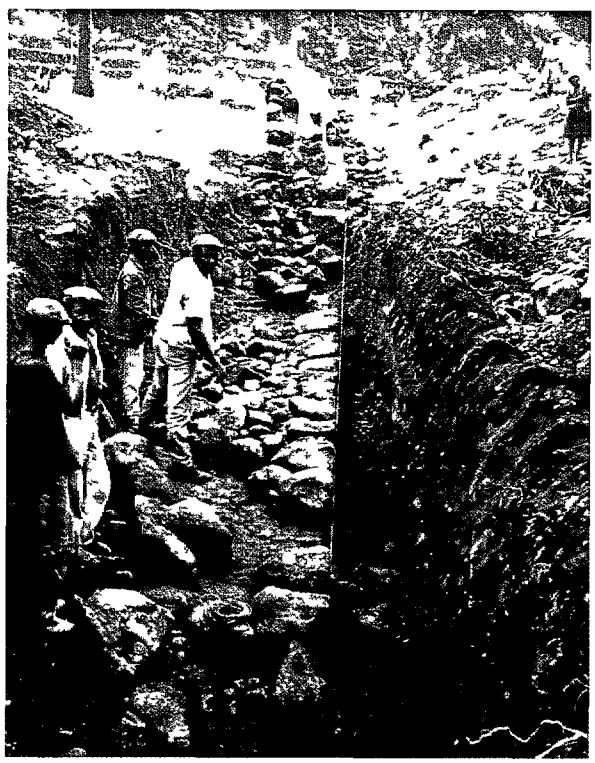
Active participation in SANREM activities by members of civil society has enlivened the formation of community based organizations responsive to local resource management issues While these organizations have developed to become strong advocates of environmental conservation and protection they also 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

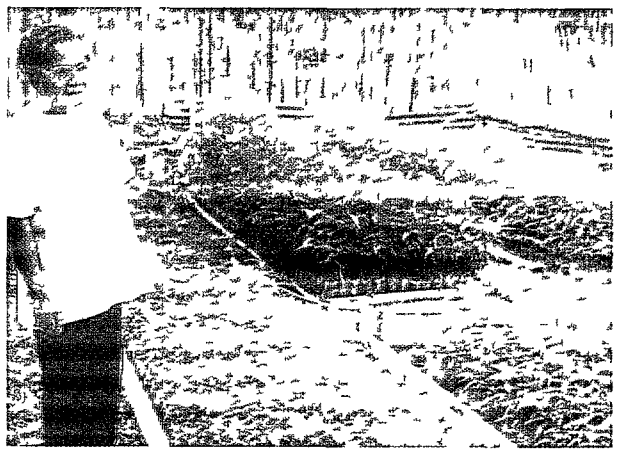
L Association pour la Gestion Holistique des Ressources (AGEHOR)
In Burkina Faso the Association for Holistic Resources Management (Association pour la Gestion Holistique des Resources) was founded in Boulsa as a result of SANREM sponsored holistic resource management training Its goals are to provide 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 Programs (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

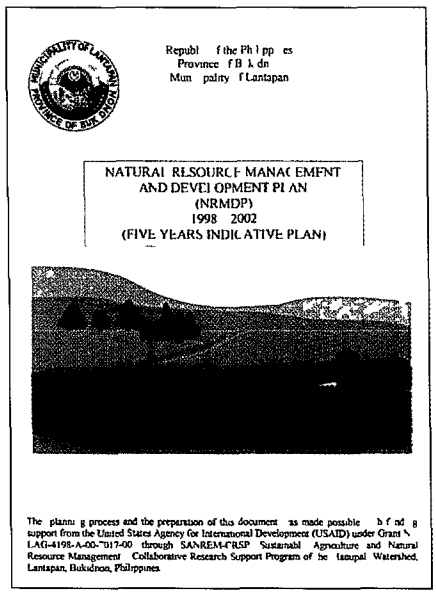
In addition to impacts at the local level in a variety of sectors SANREM also has had impacts at higher administrative levels such as provincial and national

Government Decision-Makers

In the Philippines specific policies promoting sustainable devel opment were adopted by the Provincial Planning and Development Office SANREM research has been cited as con tributing 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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NATURAL RESOURCE MANAGEMENT
AND DEVELOPMENT PLAN
(NRMDP)
1998 2002
(FIVE YEARS INDICATIVE PLAN)

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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 col laborative 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 collabora tion 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 facilitat ed 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 mecha nism (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 inte grated research and development program to include compo nents 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 manage ment 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 nation al government of the Philippines has employed the SANREM sup ported 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 SAN REM supported plan was cited as a model demand driven munic ipal 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 envi ronmental advocacy

National NGO Initiatives

Ecuador
A new alliance to address landscape ecology issues has been formed in Ecuador Several NGOs that had collaborated with SAN REM are now working together to expand protection of the near by 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 valu able medicinal plants The trade secret model is being promoted throughout out Latin America

Burkina Faso
SANREM was the model for the Sustainable Development Council a non profit organization established by Dr Salibo Some (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 col lect and demonstrate strategies for restoring and maintaining biodiversity to create opportunities for experience and informa tion exchange in sustainable agriculture natural resource man agement 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

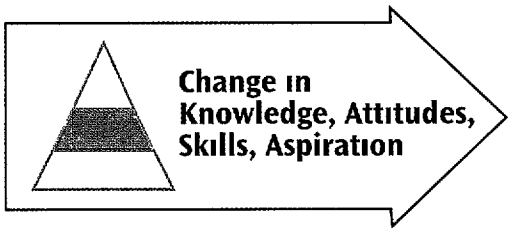
Researcher Decision-Makers

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 edu cation 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 lev els 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 environ mentally 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 con tributed 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 governmen tal 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 provid ing 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 sustain able natural resource management The participants have brought their knowledge and understanding to the classrooms research institutes development organizations and advisory pan els 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 includ ing indicators of sustainability geographic information sys tems 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 imple ment 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 capac ity 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 evalu ated 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 fol lowing 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 dis cuss 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 devel op indicators of sustainability It became clear for example that indicators must be developed within a framework linking a hier archy 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 disci plines perspectives and affiliations Workshop sessions focused on translating the concepts and experiences into workable

approaches for use in SANREM research activities The proceed ings 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 fur Technische Zusammenarbeit) led workshop which resulted in a field workbook on Indicators of Sustainable Land Management

Table 3 2 SANREM Phase I National, Regional and Global Trainings

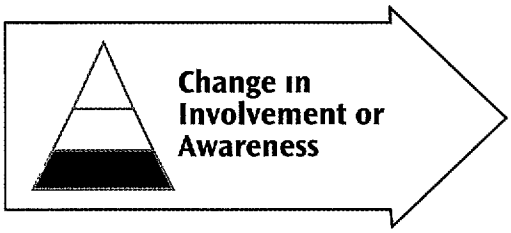
Topic	Participants	Scale and Location
Innovative Research Approaches to Sustainability	• 42 Consortium Scientists and Graduate Students • 35 Consortium Member Scientists and Graduate Students • 20 Members of the National Research Council	Global Athens GA Global Blacksburg VA Global Atlanta GA
Indicators of Sustainability	• 235 Scientists from 35 Countries • 100 Scientists and Development Workers • 25 Representatives of International Development and Research Organizations	Global Electronic Conference Global Washington DC Global Athens GA
Participatory Research Methodologies	• 73 Participants from 31 organizations and 17 countries	Global Tuskegee AL
Participatory Monitoring and Evaluation	• 30 Principal Investigators • 85 Researchers Development Workers and Community Members • 40 Researchers and Extension Agents • 20 Partner Institution Representatives and Community Members	Global Little Rock AR National Ouagadougou Burkina Faso National Cape Verde National Ecuador
GIS (Geographic Information Systems) • Role of Geographic Information Systems in Developing and Transferring Sustainable Agriculture Technologies in the Tropics • Teledetection and the Use of GIS	• 28 Researchers and Government Leaders from 12 SE Asian Countries • 13 EARTH Professors and Students	Regional Bangkok Thailand National Costa Rica
Buffer Zone Management and Agroforestry	• 70 Researchers Development Workers and Local Government Leaders	National Mindanao Philippines
Participatory Appraisal (at secondary sites)	• 32 Researchers Extension Agents and Community Members • 30 SANREM Site Scientists and Costa Rican Community Members	National Cape Verde Global Costa Rica
Proposal Writing	25 Researchers Extension Agents NGO and GO Professionals	National Cape Verde
Experimental Design and Statistical Analysis	30 Researchers and Extension Agents	National Cape Verde
Planning and Administering Programs in Sustainable Agriculture and Natural Resource Management	10 Researchers	National for Cape Verde held in US

Table 3 3 SANREM Phase I Training for Community, Government and NGO Participants

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	
4 Workshops on Holistic Management	12 Extension Workers and Community Members	**Burkina Faso**
Zai Tool Making	4 Community Blacksmiths	
Photographic Technique	18 Farmers	
Practical Literacy in More	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	
Water Quality Monitoring	30 Students Staff and Community Members	**Ecuador**
Agriculture and Livestock Registers	16 Farm Families	
Census Taking	16 Community Members	
Medicinal Plant Drying	Community Members	**Costa Rica**

Summary – Changes in Knowledge, Attitudes, Skills and Aspirations

Phase I of SANREM was responsible for a rich variety of substan tive changes in people s knowledge attitudes skills and aspira tions 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 autodiagnostico 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

International research experiences shared at U S workshop

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 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

U S graduate student at field site in the Philippines

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

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/lifescape 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 con cepts developed within SANREM for participatory research par ticipatory 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 spe cific site or system says Dr Steiner Partners are now exploring a possible participatory landscape lifescape 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 mech anism for exchanging lessons between developed and develop ing countries

Partnerships in Water Quality Monitoring

Rural Philippines and Alabama conduct similar water quality monitoring activities and continue to share approaches method ologies 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 sedi mentation 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

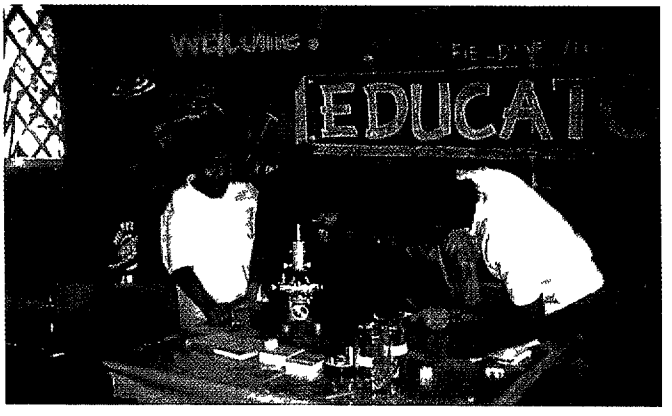
The Philippines water quality monitoring initiative is a compo nent of SANREM research activities in the Manupali watershed and is largely modeled after the Alabama Water Watch (AWW) AWW is a volunteer water quality monitoring program funded by the U S Environmental Protection Agency (EPA) and the Alabama Department of Environmental Management in response to citi zen interest in participating in statewide water issues The over all goal of both projects is to foster the development of commu nity 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 environmen tal awareness For example in the Philippines a protocol for bac terial 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 mem bers educators and local policy makers by both citizen monitors and program managers

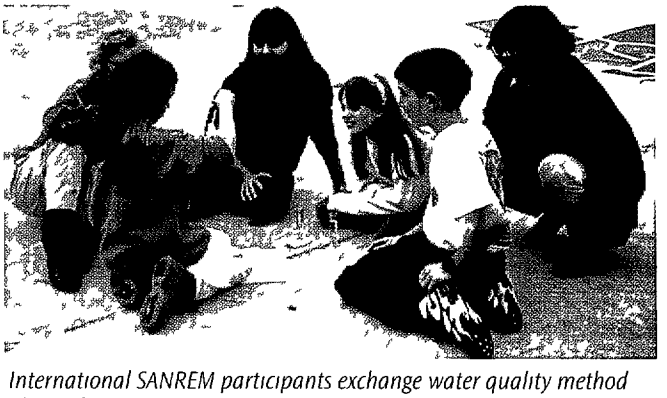
Parallel yet complementary efforts in water quality monitoring in rural Philippines and Alabama demonstrate vital lessons in link ing global communities and citizen organizations in research Although implemented in different environments and cultures the synergy and global focus of the SANREM/Philippines 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

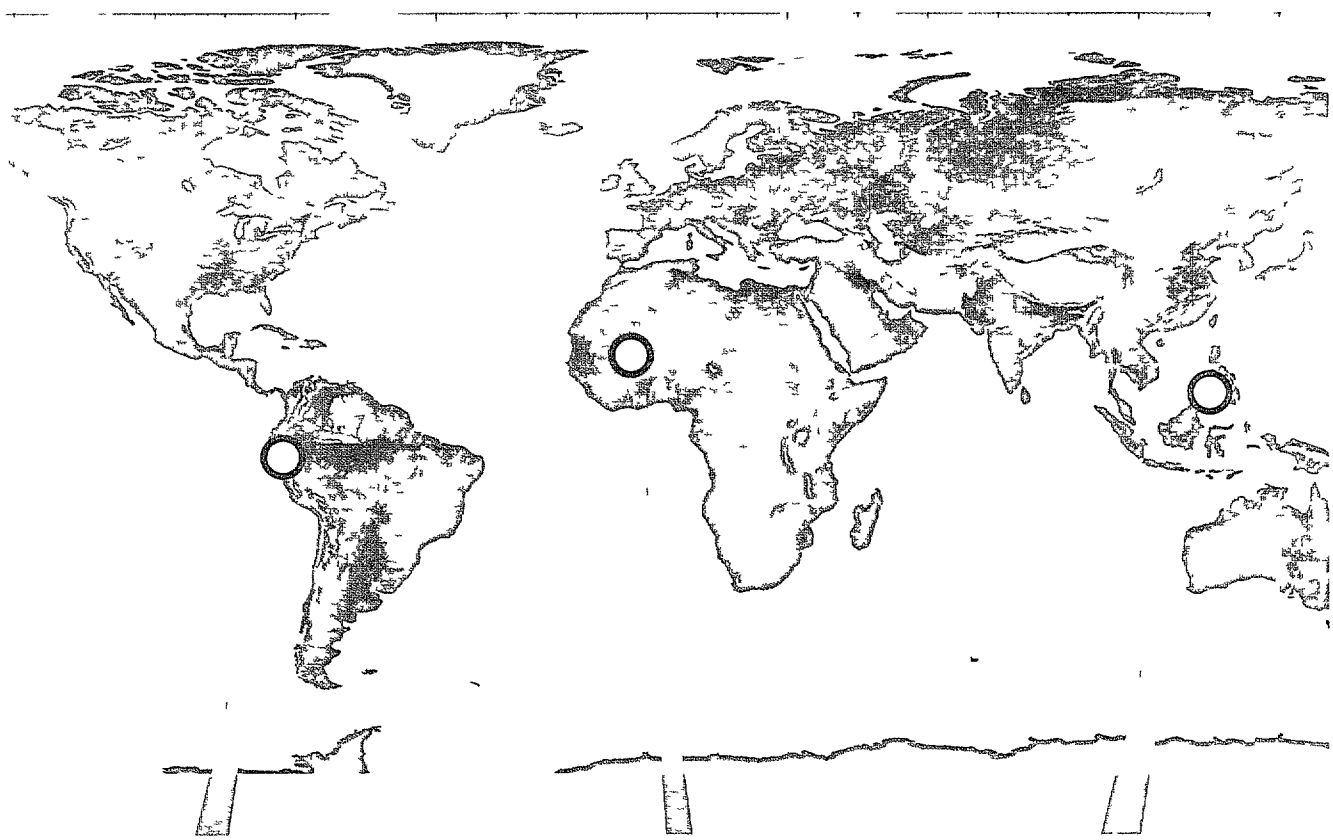


International SANREM participants exchange water quality method ologies for use in primary school curricula in Alabama

CHAPTER 5: Research Results Investigating Sustainability

Site Descriptions

SANREM research activities focused on three core sites The Philippines Burkina Faso and Ecuador initiated in a time pro gression 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 sedimenta tion significant downstream impacts zones of human migra tion 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 rain fall 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 Malabalay 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

Lifescape

Lantapan is home to tribal groups indigenous to Bukidnon pri marily 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 econo my most farms are smaller than 5 hectares and most families live close to subsistence level Low altitude flatlands where irri gation 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 ani mals As the first SANREM research site the Philippines program began in November 1992

Interactions

The key problems affecting the landscape/lifescape identified by land users and community members were deforestation declin ing 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 exam ple of landscape lifescape 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 mea surements 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 nat ural 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 water shed surrounding the village of Donsin located about 100 kilo meters northeast of the capital Ouagadougou This semi arid region has among the highest rates of environmental degrada tion in the country It covers about 6 400 hectares and is sur rounded 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 produc tion Rainfall occurs during a period of three to four months (from June to September) mostly in the form of heavy down pours 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

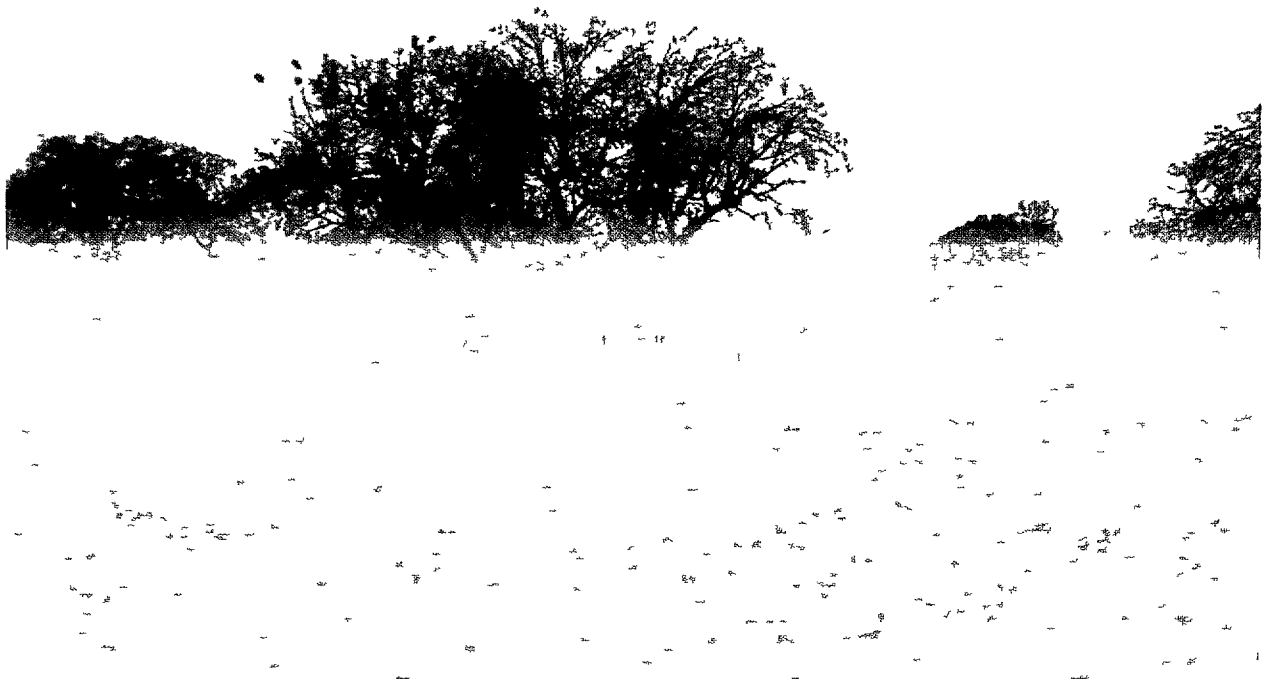
Lifescape

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 fami ly 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 lifescape were iden tified at the Burkina Faso research site These linkages were man ifested 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 pro ductivity 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 pro duced 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 house holds 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 rumi nant grazing A high percentage of households (60 70 percent) are unable to meet their food needs through on farm produc tion 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



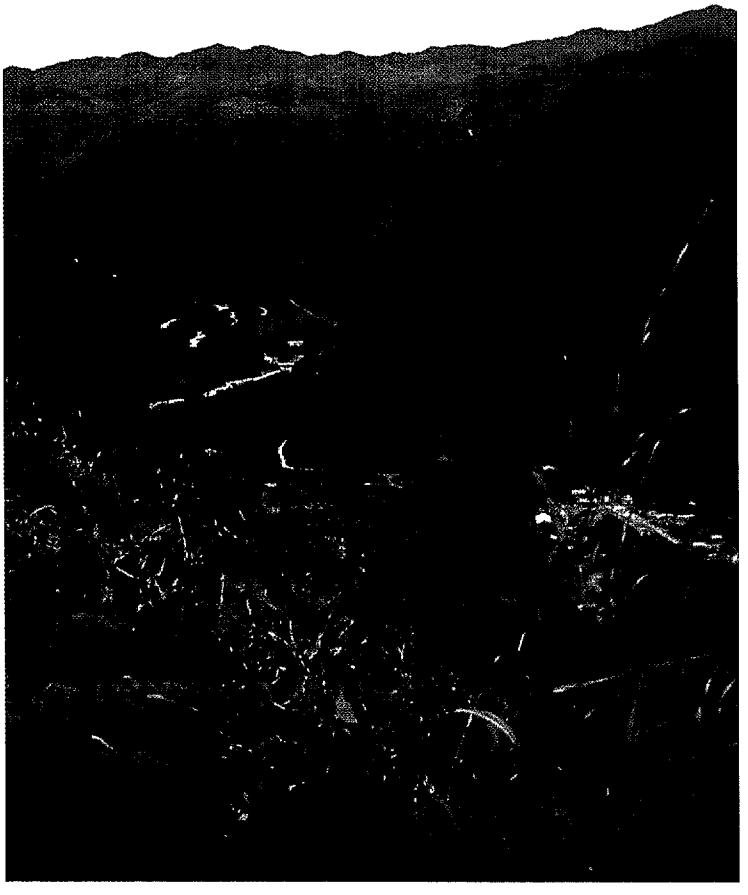
Ecuador

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 Guaylla bamba 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

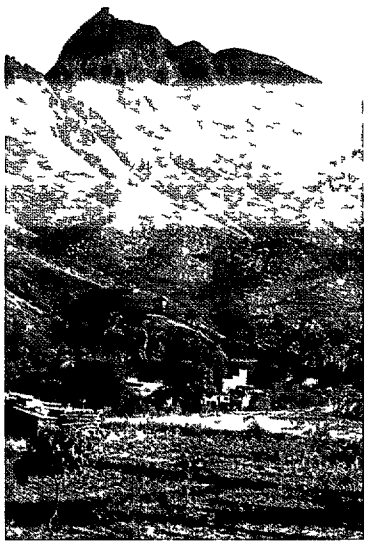
In Ecuador the causal linkages associated with the communities in which SANREM worked can be described in several steps Migrating rural populations place pressure on marginal areas (frontier forests and hill lands) where land is still available and land prices are relatively low The migrating populations 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 pas ture 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 set tled and highly fragmented becomes increasingly defor ested 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 environ ment is exacerbated by structural inequities in returns to farmers investment (labor and capital) forcing a contin ued invasion of relatively poor lands for agriculture Many farmers seek temporary work in nearby commercial ven tures such as cane alcohol production thus contributing to a growing landless or near landless population of float ing migrants Due to rapid changes in all farming systems and socio cultural patterns scientific and indigenous knowledge alike becomes inadequate to meet local farm ers 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 sus tainable 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 [illegible] 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 Agricola 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 water shed 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 com munity relations and human health were more important for females This reflects a gender based differentiation in percep tions 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 commer cialization The Talaandigs may at this point be too burdened with the hardships of life to pay too much attention to the beau ty 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 fur ther 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 con trol 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 responsbility	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 Indigninous 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 Marcel 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 bioreserve 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 intergenerational 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 partic ipation 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 gen erally poor and likely to cause genetically inferior seed Using such seed would cause increased seed waste and poor plant per formance 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 ATSAL members have been trained in seed handling

In less than a year ATSAL seed strategies have been scaled up to municipal provincial national and international levels In 1997 1998 ATSAL supplied seed to the European Union Agrarian Reform Support Programme s tree farming projects targeting thousands of Philippine smallholders ATSAL also has marketed seedlings of a variety of agroforestry species cultured by small holders 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 ATSAL

With ATSAL 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 ATSAL 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 commu nity based (decentralized) nurseries While larger centralized nurseries would offer smallholders only opportunities as labor ers they could play a larger role in managing decentralized nurs eries We noted four reasons why community based nurseries are more appropriate to our work than centralized types

Distribution efficiency Because our immediate clients (small holders) 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 produc tion 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 solu tions 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 envi ronmental issues in Lantapan This positive response at least from smallholders will eventually cause decreased land degra dation and increased productivity A concrete example of this change is seen in the establishment of community based nurs eries and small scale tree plantations which foster local involve ment Once one community deems a conservation strategy suc cessful 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

Fabian 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 Some

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 zai (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 zai and manure zai 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 zai 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

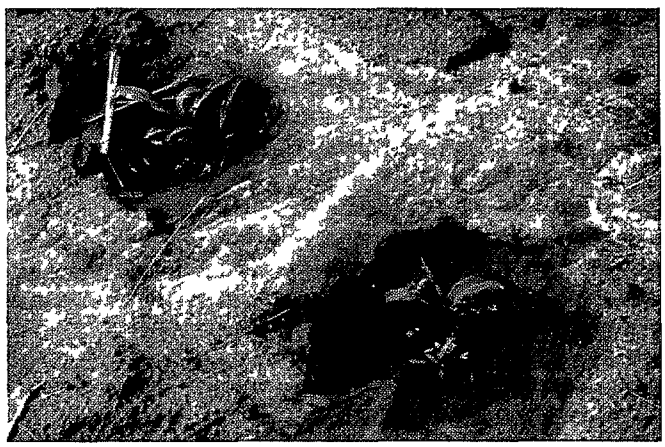
Local farmer examines water retention capacity of zai technology

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 zai method has increased with more than 28 percent of the producers using zai 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 zai

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 zai 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 iden tify production technologies that can reduce soil erosion and increase income potential The farmers and researchers quanti fied the benefits and disadvantages of several different sustain able 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 agricul ture 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 veg etables 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 farmer managed plots were established at the wish of the farm ers 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 effec tiveness of various agronomic practices in reducing erosion and enhancing income

Table 5 4 Effects of erosion control measures on cumulative soil loss, runoff and nitrate loss through runoff, averages per cropping season

	Soil Loss t/ha	Runoff 1000's l/ha	Nitrate 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

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 prob ably from increased acidification Most crops showed net eco nomic 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) opti mized returns to labor were higher under timber intercropping Vegetable farmers are often more limited bv labor than land which is another reason timber farming is enjoying increasing popularity In order to optimize returns farmers need to under stand when declines in vegetable yield (as a result of competi tion mainly for light) outweigh the benefits of residual tree fer tilization 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

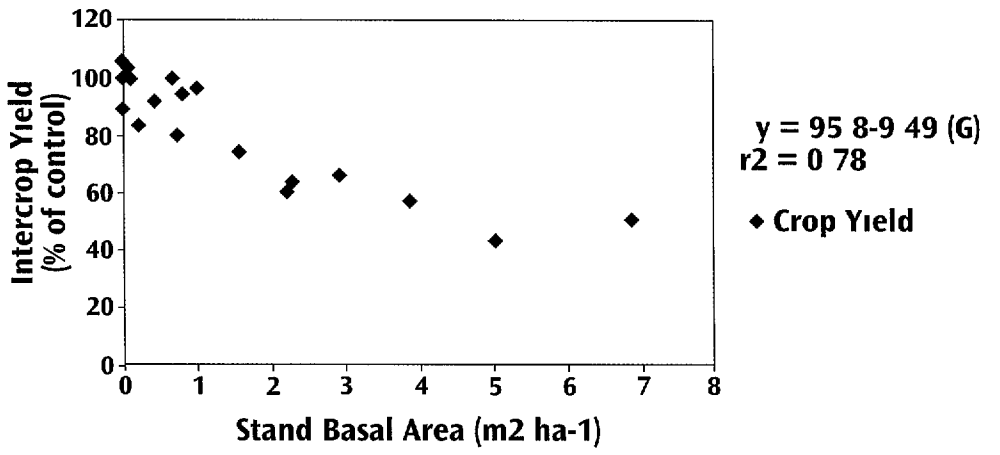
Farmer Participation and Potential Benefits

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 compo nent 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 *Eucaluptus 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 Orprecio 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 partic ipatory 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 munic ipality 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 environmen tal 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 pro ject researchers and volunteer water monitors selected 16 sam pling sites on four main tributaries of the Manupali River repre sentative 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 environ mental indicators to improve program management and exten sion 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 ero sion 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 conta minants as well as soil erosion and stream and canal sedimenta tion 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

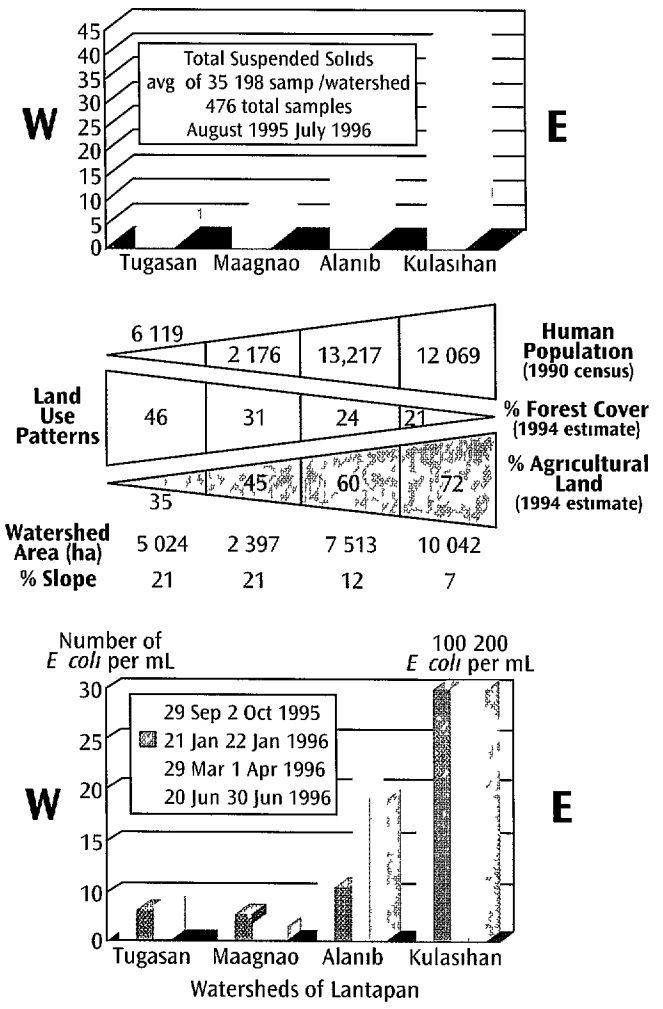
Indicator #2 Eroded Soils in Streams
Erosion is of particular concern in agricultural Lantapan where farmers understand that soil loss means less production Measurements of suspended solids in streams showed degrada tion far beyond simple observation of clear or muddy streams Increases in suspended solids increased from west to east in the river valley correlating with increased agricultural use and urbanization Heavy rains coinciding with the plowing sea son 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 indica tor 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 bac terial 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 Kabore Daniel Taylor Marie Claire Sorgho Laraba Illy Mamounata Belem and William L Hargrove

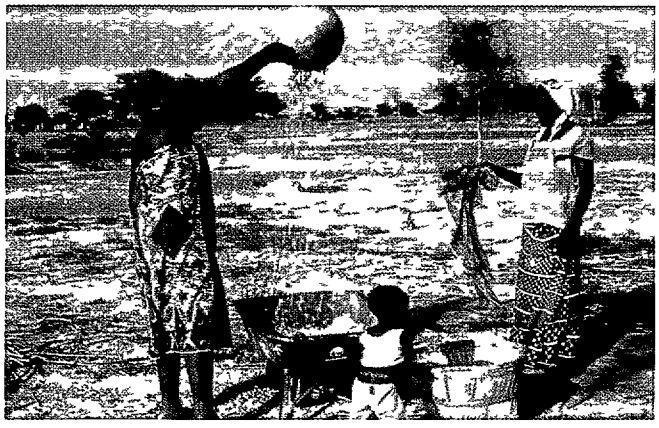
In the Sahel complex interrelated environmental and anthropogenic factors have created a rural milieu impoverished in moisture biomass soil nutrients and plant and animal biodiversity This impoverishment is reflected in the quality of life of the people who depend almost totally on this system for their 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 child hood 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 imme diate causes are underlying causes that are social political eco nomic 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 ele ments of food insecurity seasonal transitory and chronic The Donsin watershed may experience all three but especially sea sonal 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 neigh borhood 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 resort ed 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 owner ship 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 cre ate 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 prof itability 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 vari ables 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 con straints 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 environ mental 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 declin ing 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[a]	R^2	DW[b]	F (N, d f)	P value	Comments
	Weekly Data					
Yellow Corn	Agora > Lantapan	0 80	2 02	4 61 (122 2 116)	0 012	One way
	Lantapan > Agora	0 89	2 10	1 54 (122 2 116)	0 218	Causation
White Corn	Agora > Lantapan	0 90	1 86	9 85 (122 2 116)	0 0001	One way
	Lantapan > Agora	0 96	2 00	0 06 (122 2 116)	0 938	Causation
Avg Potato	Agora > Lantapan	0 85	1 95	6 67 (119 2 113)	0 002	Two way
	Lantapan > Agora	0 83	1 98	16 43 (119 2 113)	0 0001	Causation
Cabbage	Agora > Lantapan	0 73	2 00	8 12(121 2 115)	0 0005	Two way
	Lantapan > Agora	0 77	2 04	11 93 (121 2 115)	0 0001	Causation
	Monthly Data					
Avg Potato[d]	Agora > Lantapan	0 79	1 97	3 99 (46 2 39)	0 026	One way
	Lantapan > Agora	0 77	1 99	1 87 (46 2 39)	0 168	Causation
Cabbage	Agora > Lantapan	0 40	1 97	2 73 (31 2 23)	0 086	One way
	Lantapan > Agora	0 47	2 05	0 75 (31 2 23)	0 483	Causation

Notes
Arrows indicate the direction of causation being tested so for example Agora > Lantapan indicates a test that Agora price Granger causes Lantapan price
[b] Durbin Watson statistic
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%
[d] 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 sup ports were adopted with the goal of national self sufficiency Other policies like the long standing ban on potato and cab bage imports appear to be more purely political in origin still others (like exchange rate overvaluation that reduces the prof itability 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 pri marily 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 accel erated land degradation and possible water pollution

Policy reforms and economic sustainability The Philippine gov ernment is debating major changes in agricultural trade policy that will undoubtedly lead to price changes for Lantapan farm ers 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 veg etables 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 envi ronmental 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 pro moting investments in soil conserving structures such as con tour 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 veg etables 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 generat ed 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 devel opment 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 willing ness to bear risk Researchers on the project have gathered infor mation 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 suit able data to other regions of Southeast Asia where upland agri culture in the process of commercialization and intensification creates a trade off between economic development and environ mental 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 facilita tors 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 eco nomic problems and the underlying conditions requiring resolu tion 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 com merce 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 – cul tivation 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 abun dance 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 ani mals known to our ancestors Vegetation will cover all spaces and the word zipele [the More 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 bore holes 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 conserva tion 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 manage ment facilitators

The challenge for the facilitators was to help community mem bers identify specific traditional practices and explore their sustainability and their application in current circumstances To resolve the dispute with Bonan 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 commu nal grazing land and Donsin livestock could water in Bonam However sections of the whole area would be opened progres sively 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

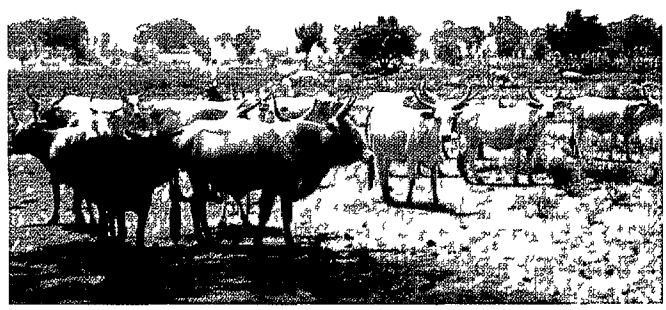
For both villages re establishing herding was a primary objec tive Small ruminants in the area had an extremely low fertility rate With the disappearance of perennial grasses and the decline of herding animals consumed the best forage early in the dry season Low fertility and survival rates for the young could be traced back to the lack of food sources Lacking ade quate 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 commu nities 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 suc cessful crop would allow villagers to remove the stones to anoth er location where they could be reused If successful this innova tion 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 vil lagers of Donsin and Bonan with a series of activities They have obtained funding for a content based adult literacy program in More that incorporates holistic resources management practices AGEHOR/B is a member of the Concertation Provinciale an orga nization that includes development agencies and other NGOs The group and its work have been featured nationally in maga zines 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 Flora 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 econom ic 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 entrepre neurial 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 communi ty 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/ organizational capacity	Community: Chacapata	Palmito pamba	La Perla	Playa Rica
Collective Mobilization				
Festivals[1]	4	1	1	3
Mean level of family participation in –				
Workdays	20%	26%	68%	14%
Local organizations[2]	32%	49%	80%	38%
Collective Mobilization (Sum)	4	2	1	3
Organizational Capacity				
Community Involvement Board[3]	4	1	2	3
Community legalization[4]	3	1	1	3
Parents Committee[5]	2	1	4	3
School (past 5 8 years)[6]	4	1	1	1
Organizational capacity (Sum)	4	1	2	3

[1] 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)
[2] Includes workdays (*mingas*)
[3] Rank based on general efficacy of CIB 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
[4] 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
[5] 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
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 impor tant 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 contribu tions 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 under standing of the research process among farmers and community members Direct and active involvement of these stakeholders in establishing research priorities created an understanding of bio physical and socio economic constraints to sustainability identi fied 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 cre ate expectations for a tangible development intervention in the communities in which they work SANREM s experience con firmed 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 dis cuss 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 expecta tions 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 organiza tions implicated in them Short term development returns that address immediate needs in the community can encourage par ticipation in the longer term research process International and local NGOs can help significantly to build environmental aware ness 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 some times 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 sus tainable 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 institu tions 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 exam ple 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 negoti ation and decision making will help to establish good communi cation 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

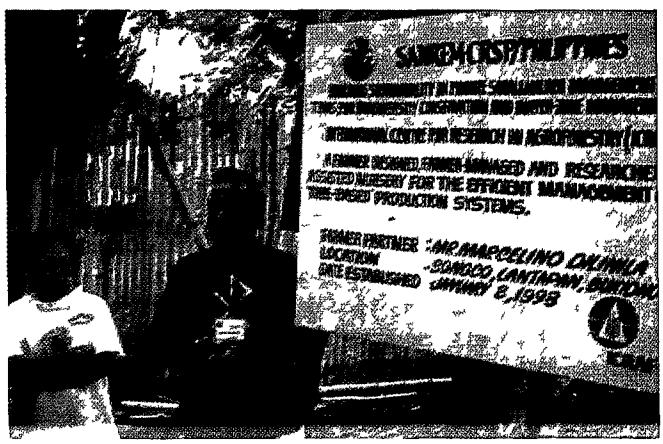
An inter institutional approach recognizes that any local natural resource management issue necessarily involves a variety of institutional players SANREM sought to ensure the effectiveness and appropriateness of the research process by involving key actors and decision makers from the outset and succeeded in bringing together diverse partners The inter institutional collab oration encompassed members of the private sector (individual farmers) the government (local provincial and national) research scientists (national and international) and non govern mental 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 collabo ration SANREM has adopted the concept of strategic partner ships This concept recognizes the comparative advantages com plementary 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 identi fication 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 net works and institutions as well as a strategic analysis of compe tencies 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 organiza tions – such as water quality monitoring or community agro forestry associations – hold some promise of helping to sustain field level accomplishments These initiatives might be strength ened 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 develop ment 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 generat ed from research and helps develop confidence in the value of research at individual and community levels

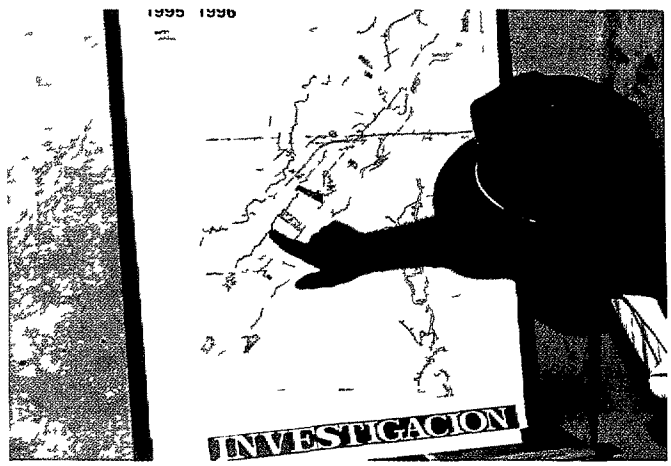
Lessons Learned from the Landscape/Lifescape Focus

SANREM set out to conduct research in the context of landscape and lifescape 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/Lifescape Appraisal (PLLA) This tool was extremely useful to indicate a snapshot in time of the landscape and lifescape 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 develop ment 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 inte grated 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 under stand landscape lifescape 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 com munities in which people live

It Is Not Easy to Identify Indicators
During the first phase of SANREM we tried to identify a compre hensive 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 sustainabili ty 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 bacte rial 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 lifescape 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/lifescape 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 participa tory 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 gov ernmental organizations (NGOs) and community level organiza tions have joined national research and development institutions and United States based universities and NGOs to created 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 orga nizational changes and to an evolution in the focus of the SAN REM 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 pro grams 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 pro jects coordinated by a lead institution instead of by a lead scien tist 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 which is supported by a technical committee a monitoring and evaluation panel and the SANREM Board of Directors

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

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 man agers 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 man agement 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

- 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 agricul ture 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)

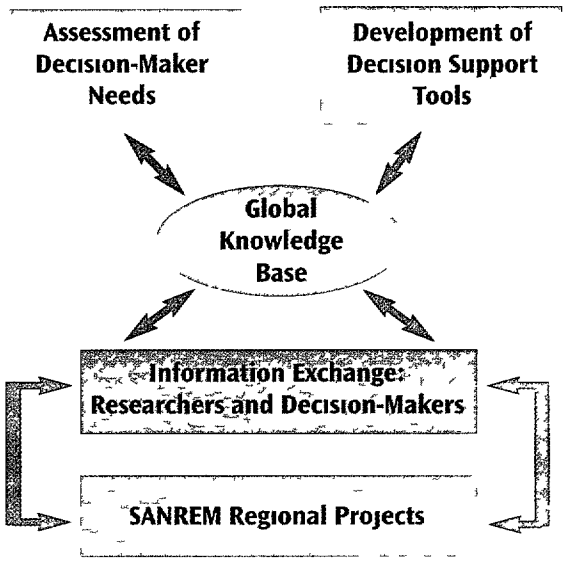
Decision Maker Needs Assessment
This initiative is coordinated by the SANREM Management Entity and is implemented in collaboration with FAO and the three SANREM regional projects described below Its objective is to identify difficult decisions of decision makers at different levels to ensure that SANREM 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 deci sion 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 com mon globally All of SANREM s regional projects work at three lev els 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 munic ipalities 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 con cerns 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 water shed research program supports farmers soil and water conser vation districts local state and federal action and regulatory decision makers The program focuses on

- solving problems of natural resource management at a land scape 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 mul tiple 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

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REFERENCES

Bennett C and Rockwell K 1995 Targeting Outcomes of Programs (TOP) An Integrated Approach to Planning and Evaluation Draft USDA CREES PAS

Boyle T J B and Sayer J A 1995 Measuring monitoring and conserving biodiversity in managed tropical forests Commonwealth Forestry Review 74 20 25

Buenavista G I Coxhead and K Kim 1998 Assessing SANREM s impacts in Lantapan results of a survey Manuscript University of Wisconsin (http //aae wisc edu/coxhead/sanrem/tdd)

Burley J 1986 Global needs and problems of the collection storage and distribution of multipurpose tree germplasm Science and Practice of Agroforestry ICRAF Nairobi Kenya

Cardy W F G 1993 Desertification Global program for action Ecoforum 17 21 23

Carranza Barona C M Andrade Echeverria and B Cartagena Navarro 1998 Evaluation of the Impact of the SANREM Project in the Alambi Micro Basin Consultants Report SANREM Andes Quito Ecuador

Chambers R Pacey A and Thrupp L A (eds) 1989 Farmer First Farmer Innovation and Agricultural Research Intermediate Technology Publications London

Clarke J 1991 Participatory technology development in agro forestry Methods from pilot project in Zimbabwe Agroforestry Systems 15 217 228

Conway G R 1985 Agroecosystem Analysis Agricultural Administration 20 31 55

DENR 1990 Master Plan for Forestry Development Main Report Department of Environment and Natural Resources Manila Philippines

Garrity D P and Mercado A R 1994 Reforestation through agro forestry Smallholders market driven timber production in the frontier In Raintree J B and R Francisco H A (eds) Marketing of Multipurpose Tree Products in Asia Pp 265 268 Proceedings of an International Workshop 6 9 December 1994 Baguio City Philippines

Koffa S N and Garrity D P 1996 A user sensitive approach to planning and establishing a timber tree production systems ini tiative for smallholders in Lantapan ICRAF SANREM Occasional Paper No 1 8pp

Koffa S N and Roshetko J M 1997 Farmer managed germplasm production diffusion pathways in Lantapan Philippines Paper presented at the Domestication of Agroforestry Trees Workshop Yogyakarta Central Java Indonesia 4 7 November 1997

Pasicolan P N 1995 Tree growing on different grounds An analysis of local participation in contract reforestation in the Philippines Doctoral Dissertation Centre of Environmental Science Leiden University The Netherlands

Rhoades R E 1984 Breaking new ground Agricultural Anthropology International Potato Center Lima Peru

Toward Sustainability A plan for collaborative research on Agriculture and Natural Resource Management 1991 National Research Council National Academy Press Washington D C

World Conservation Monitoring Center (WCMC) 1991 Green Notes Cambridge United Kingdom

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GLOSSARY – ACRONYMS

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

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

TERMS

Agenda 21	Global action plan regarding environmen tal issues that grew out of the United Nations 1992 Earth Summit held in Rio de Janeiro Brazil
Autodiagnostico	A process of community led self diagnosis
Barangay	The smallest political subdivision or unit of government in the Philippines It serves as the primary planning and imple menting arm of government programs projects and activities
Ha	Hectare 2 47 acres 10 000 square meters
Hacienda	A farm ranch or plantation
Hacendados	Large scale land owners
Paratechnico	A technical extension agent
Quartier	Neighborhood
Sangguniang Bayan	The legislative body of a municipality in the Philippines The Sangguniang Bayan enacts ordinances approves resolutions and appropriate funds for the general wel fare of the municipality and its citizenry
Tigbantay Wahig	A water quality monitoring non govern mental organization formed by local citi zens following participation in SANREM research activities in the Philippines Tigbantay Wahig means water watchers in the Binukid language The Philippine Water Watch group
Water Watch	A U S citizen environmental advocacy group and SANREM participant Active in Alabama U S
Zai	Hand dug shallow holes for moisture and nutrient retention in agricultural fields (Burkina Faso)
Zipele	Local term for hard pan lateritic soils found in Burkina Faso

PUBLICATIONS

Books and Book Chapters

Boerboom L G J I D Flitcroft and E T Kanemasu 1996 Interdisciplinary tool for optimizing agricultural production and erosion (ITOPE) A conceptual model *In* P S Teng et al (ed) Systems approaches for agricultural develop ment Applications of systems approaches at the farm and regional level Kluwer Series on Systems Approaches for Sustainable Agricultural Development London

Buenavista G and C B Flora 1994 Participatory methodologies for analyz ing household activities resources and benefits p 36 44 *And* Using focus groups with rural women p 62 65 *In* H S Feldstein and J Jiggins (ed) Tools for the field Methodologies handbook for gender analysis in agriculture Kumarian Press West Hartford CT

Flora Cornelia Butler 1998 Sustainable production and consumption pat terns Community capitals p 115 122 *In* G B Softing G Benneh K Hindar L Walloe and A Wijkman (ed) The Brundtland Commission s Report – Ten Years Scandinavian University Press Oslo

Flora C B and J L Flora 1996 The past and future Social contract social policy and social capital p 53 64 *In* S A Halbrook and C E Merry (ed) Farm foundation Increasing understanding of public problems and policies 1995 Farm Foundation Oak Brook IL

Garrity D P A R Mercado Jr and M Stark 1998 Building the smallholder into successful resource management at the watershed scale *In* De Vries P W T Frits F Agus and J Kerr (ed) Soil erosion at multiple scales Principles and methods for assessing causes and impacts CABI and IBSRAM CABI Publishing Wallingford UK

Hargrove W L J W Bonner E T Kanemasu C L Neely and W Dar 1994 The SANREM CRSP A framework for integration of systems analysis methods in a sustainable agriculture and natural resource management research and development agenda p 223 246 *In* P Goldworthy and Fritz Penning DeVries (ed) Opportunities use and transfer of systems research methods in agricul ture to developing countries Kluwer Academic Publishers London

Nazarea V 1998 Cultural memory and biodiversity University of Arizona Press Tucson AZ 189 pp

Nazarea Virginia E Tison M Piniero and Robert E Rhoades 1997 Yesterday s ways tomorrow s treasures Heirloom plants and memory bank ing Kendall/Hunt Publishing Co Dubuque IA 33 pp

Nazarea Virginia D and Sunita George 1997 Diversity in the shadows Incorporating gender sensitive approaches into plant genetic resources use and conservation International Plant Genetic Resources Institute Food and Agriculture Organization and Ethnoecology/Biodiversity Laboratory Rome and Athens 162 pp

Nazarea Virginia D and Robert E Rhoades (ed) 1995 Ethnoecology of the Manupali watershed A research monograph Sustainable Agriculture and Natural Resources Collaborative Research Support Program Athens GA 315 pp

Nazarea Virginia D 1996 Memory banking of indigenous technology of local farmers Focus on sweet potatoes *In* Pei Shengji Su Yong ge Long Chun lin Ken Marr and Darrell Posey (ed) The challenges of ethnobiology in the 21st century Yunan Science and Technology Press Kunming

Nazarea V 1995 Indigenous agricultural decision making criteria as a reflec tion of socioeconomic status and gender in the Philippines p 49 63 *In* M D Warren E Brokensha and L J Slikkerveer (ed) Indigenous knowledge sys tems The cultural dimension of development Intermediate Technology Press London

Nazarea Sandoval Virginia 1995 Local knowledge and agricultural decision making in the Philippines Gender class and resistance Cornell University Press Ithaca and London 226 pp

Nazarea Sandoval Virginia D 1994 Memory banking protocol A guide for documenting indigenous knowledge associated with traditional crop vari eties p 102 122 *In* G D Prain and C P Bagalanon (ed) Local knowledge global science and plant genetic resources User s Perspective with Agricultural Research and Development Los Banos Laguna

Nazarea Sandoval Virginia D 1994 Memory banking The conservation of cultural and genetic diversity in sweet potato production p 23 55 *In* G D Prain and C P Bagalanon (ed) Local knowledge global science and plant genetic resources User s Perspective with Agricultural Research and Development Los Baños Laguna

Nazarea V and R Rhoades 1994 Rice reason and resistance A compara tive study of farmers versus scientists perceptions and strategies p 559 576 *In* R S Zeigler S Leong and P Teng (ed) Rice blast disease CAB International Wallingford UK

Piniero M 1995 Perception of environmental problems in the Broad River watershed *In* R Rhoades and S Talawar (ed) A river runs through it Human dimensions of natural resources management in the Broad River watershed Research Paper 1 Department of Anthropology University of Georgia

Prain G and M Piniero 1994 Methodologies for documenting users indige nous knowledge on sweet potato varieties and conservation of root crop genetic resources *In* The role of indigenous knowledge in plant genetic resources conservation CIP UPWARD Los Baños Laguna Philippines

Prain G V Nazarea and R Rhoades 1993 Networking for low external input and sustainable agriculture p 215 228 *In* C Alders B Haverkort and L van Veldhuizen (ed) Linking with farmers Intermediate Technology Publications London

Rhoades Robert 1997 Pathways toward sustainable mountain agriculture in the 21st Century International Centre for Integrated Mountain Development Kathmandu

Rhoades Robert 1995 Tailoring soil water and nutrient management to farmer needs p 59 65 *In* The Zschortau plan DSE/IBSRAM Zschortau Germany

Rhoades Robert 1994 Farmer participation in priority setting p 65 76 *In* J Douwe Meindertsma (ed) Setting research priority Toward effective farmer oriented research Royal Tropical Institute Netherlands

Rhoades Robert 1992 The Farmers agenda in sustainable agricultural development Is it destructive or creative? p 15 26 *In* Sustainable agricultural development in Asia and the Pacific Region Asian Development Bank and Winrock International Manila Philippines

Rhoades Robert 1992 Farmer back to farmer Ten years later p 17 27 *In* Participatory on farm research and education for agricultural sustainability Illinois Agricultural Experiment Station Urbana IL

Rhoades Robert 1992 A Framework for sustainable agricultural develop ment Synthesis of workshop discussions p 107 20 *In* Sustainable agricultur al development in Asia and the Pacific Region Asian Development Bank and Winrock International Manila Philippines

Rhoades Robert 1992 Thinking globally acting locally Technology for sus tainable mountain agriculture p 253 72 *In* N S Jodha M Banskota and T Purtap (ed) Sustainable mountain development Oxford and IBH Publishing New Delhi

Rhoades R E and V Nazarea 1998 Local management of biodiversity in tra ditional agroecosystems A neglected resource p 215 236 *In* Wanda Collins and Calvin Qualset Importance of biodiversity in agroecosystems CRC Press Boca Raton FL

Rhoades Robert J Ives and B Messerli 1997 Agenda for sustainable moun tain development p 455 66 *In* B Messerli and J D Ives (ed) Mountains of the world A global priority The Parthenon Publishing Group New York and London

Rhoades R and T Bebbington 1995 Farmers who experiment An untapped resource for agricultural research and development *In* M D Warren E Brokensha and L J Slikkerveer (ed) Indigenous knowledge systems The cul tural dimension of development Intermediate Technology Press London

Rhoades Robert and Joyce Mock (ed) 1992 Diversity farmer knowledge and sustainability Cornell University Press Ithaca NY

Shields M D C B Flora B Thomas Slayter and G Buenavista 1996 Developing and dismantling social capital gender and resource management in the Philippines p 155 179 *In* Dianne Rocheleau Barbara Thomas Slayer and Esther Wangari (ed) Feminist political ecology Global perspectives and local experience Routledge London

Articles

Coxhead I 1997 Induced innovation and land degradation in developing country agriculture Australian Journal of Agricultural and Resource Economics 41(3) 305 332

Deutsch W G and C L Neely 1997 Water spirits and Philippines watershed education International Journal of Watershed Education 1 2 4

Flora C B F Larrea F Guerrero S Chancay M Ordonez S Baez F Guerrero and J L Flora 1997 Negotiating sustainable natural resource research Participatory action research in the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program Practicing Anthropology 19(3) 20 25

Flora C B F Larrea C Ehrhart M Ordonez S Baez F Guerrero S Chancay J L Flora 1997 Negotiating participatory action research in an Ecuadorian sustainable agriculture and natural resource management program Practicing Anthropology 19(3) 20 25

Flora C B 1998 Human diversity and sustainable agricultural communities Minnesota Department of Agriculture Greenbook 98 A diversity of tools 2 3

Flora C B 1995 Sociological methodologies for ecological agriculture Forskningsnytt om oekologisk landbruk i Norden Nr juli augusti 4

Hargrove W L C B Flora K McSweeney and C L Neely 1997 Sustainable agriculture and natural resource management Uniting landscape and lifescape J Soil and Water Conservation 52 296 7

Hargrove W L C L Neely and I Silva Barbeau 1997 Participatory land scape/lifescape appraisal A technique for rapid watershed assessment and social appraisal J Soil and Water Conservation 52 299 300

Nazarea V 1996 Fields of memories as everyday resistance Cultural Survival Quarterly 20(1)61 66

Nazarea V 1995 Fieldwork Philosophy and practice Diliman Review 42 32 35

Nazarea V 1994 Women s participation qualitative vs quantitative International Ag Sieve VI(5) 3

Nazarea V R E Rhoades E Bontoyan and G Flora 1998 Defining indica tors which make sense to local people Intracultural variation in perceptions of natural resources Human Organization 57(2) 159 170

Nazarea Sandoval Virginia D and Robert E Rhoades 1992 UPSIDE DOWN! ILEIA Newsletter for Low External Input and Sustainable Agriculture 8(4/92) 27 28

Poudel D D D J Midmore and W L Hargrove 1998 An analysis of commer cial vegetable farms in relation to sustainability in the uplands of Southeast Asia Agric Syst 58(1) 107 128

Rhoades Robert 1998 Participatory watershed research and management Where the shadow falls Gatekeeper Series London IIED

Rhoades Robert 1998 Un planteamiento de ecologia del paisaje para la sus tentabilidad en las tierras altas tropicales La experiencia de SANREM CRSP en Ecuador Centro Panamericano de Estudio E Investigaciones Geograficas (CEPEIGE) Quito Ecuador Special Journal for III International Conference of Sustainable Mountain Development in the Andes

Rhoades R 1995 The questionnaire syndrome Diliman Review 42(2) 37 43

Rhoades R 1994 Indigenous people and the preservation of biodiversity Hortscience 29(11) 1222 1225

Rhoades Robert 1994 Rapid Rural Appraisal Analyzing the project situation from the main agent s perspective Rome FAO Tool N 4

Rhoades Robert 1993 The world s food supply at risk Biodiversity 4(1) 4 11 21

Rhoades R and V Nazarea 1996 Local global (dis)articulations in plant genetic conservation Diversity 12(2)5 6

Rhoades Robert J Worstell V Huston and D Debertin 1996 Southern Futures A report on the state of the south project Frankfurt Kentucky Community Farm Alliance

Rhoades Robert D Greenland G Bowen H Eswaran and C Valentin 1994 Soil water and nutrient management A new agenda IBSRAM Position Paper International Board for Soil Research and Management Bangkok Thailand

Rola A and E Tagarino 1996 Productivity analysis of upland corn systems The case of Lantapan Bukidnon Philippines The Philippine Agriculturist October 1996

Rola A 1997 Water and food security Policy Forum Center for Policy and Development Studies University of the Philippines Los Banos 12(4) 5 7

Roncoli C and M Sendze 1997 How farmers participate through photogra phy A case from Burkina Faso Practicing Anthropology19(3)

Some S and K McSweeney 1996 Assessing sustainability in Burkina Faso Information Centre for Low External Input and Sustainable Agriculture ILEIA Newsletter 12(3)

Talawar S and R E Rhoades 1998 Scientific and local classification and management of soils Agriculture and Human Values 15 3 14

Tison Eleanor 1995 Ethnoecology Different takes Bifurcation 2(3) 1 2

Tison Eleanor 1995 Ethnoecology training workshop Bifurcation 2(3) 7

Proceedings

Bellows B 1995 Participatory and interdisciplinary indicators of sustainabil ity Where do we go from here? *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability Conference SANREM CRSP August 1994 Arlington Virginia

Boerboom L I Flitcroft and E Kanemasu 1995 ITOPE an interdisciplinary tool for optimization of agricultural production and erosion Proceedings of the Systems Analysis in Agriculture and Development (SAAD) Symposium Dec 6 8 1995 IRRI Philippines

Deutsch W G Tan J Oprecio and C Neely 1995 Return of the water spirits The role of environmental education in cultural and ecological sustainability *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability SANREM CRSP August 1994 Arlington VA

Flitcroft I D and E T Kanemasu (ed) 1995 Proceedings of the GIS/Remote Sensing Workshop Feb Mar 1995 Bangkok Thailand

Flora C M Kroma and A Meares 1995 Indicators of sustainability Community and gender *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability SANREM CRSP August 1994 Arlington VA

Hargrove W L and C L Neely 1997 Lessons learned from implementing a participatory watershed scale project The experience of the SANREM CRSP *In* J L Steiner A J Franzluebbers C B Flora and R Janke (ed) Interactions Investigating ecosystem dynamics at a watershed level Proceedings Apr 13 16 1997 Athens GA

Johnson J E And O J Delgado 1996 Agroforestry systems in the Agua de Gato watershed Cape Verde *In* R Beck (ed) Approaches to extension in forestry – Experiences and future developments Proceedings of IUFRO Extension Working Party Symposium Ludwig Maximiliams University Munich Germany

Midmore D J D D Poudel and T M Nissen 1997 Inducing change among vegetable farmers in environmentally sensitive ecosystems The process and some practice in the Philippines *In* John D Smith Memorial Colloquium – Processes of Community Change Oct 31 Nov 1 1996 Queensland Australia

Nazarea Sandoval Virginia D 1994 Memories and varieties in plant genetic resources conservation *In* Proceedings of the International Workshop on the Human Socio economic and Cultural Aspects of Plant Genetic Resources International Plant Genetic Resources Institute Rome

Neely C L R D Hart M G Buenavista P Koohafkan and A Sumbalan 1998 Real time demand Participatory research for local to global decision making Proceedings Association of Farming Systems Research and Extension Pretoria South Africa

Ouadba J S Some M Belem D Kabore A Nitiema J Ilboudo and Z Mantoro 1995 Some key indicators of sustainability in Burkina Faso *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability SANREM CRSP August 1994 Arlington VA

Piniero M and G Prain 1994 Approaches to community based PGR conser vation *In* Taking root Proceedings of the third UPWARD review and planning workshop UPWARD Los Banos Laguna Philippines

Poudel D (ed) 1995 Proceedings of Farmers Workshop and Follow up on commercial vegetable production in Lantapan Bukidnon The Philippines April May 1995 Northern Mindanao Integrated Agricultural Research Center Dalwangan Philippines

Prain G and M Piniero 1994 Community curatorship of plant genetic resources in southern Philippines Preliminary findings *In* G Prain and Bagalanon C P (ed) Local knowledge global science and plant genetic resources Towards a partnership Proceedings of the International Workshop on Genetic Resources CIP UPWARD Los Banos Laguna Philippines

Rhoades Robert 1995 Cultural indicators of sustainability *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability SANREM CRSP August 1994 Arlington Virginia

Rhoades Robert E and Virginia Nazarea Sandoval 1995 Culturally relevant indicators of sustainability *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability SANREM CRSP August 1994 Arlington Virginia

Rhoades Robert 1992 Coming revolution in rural development research *In* Rapid assessment methodologies for planning and evaluation of health related programs Proceedings of RAP Conference Nov 12 15 1990 Washington DC

Rola A C 1996 Production marketing linkages Implications for integrated pest management (IPM) in vegetable research and development Proceedings of the Symposium on IPM in Rice/Vegetable Systems Status Constraints and Prospects Oct 1996 Philrice Maligaya Nueva Ecija Philippines

Recharte J H Ballestreros J Chang and X Silva 1995 Indicators of sustain ability at the Guayllabamba watershed Northestern Ecuador A preliminary assessment framework *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability SANREM CRSP August 1994 Arlington VA

Roncoli C (ed) 1996 Bits of wisdom and more to learn Summaries and synthesis from a workshop on participatory collaborative research method ologies SANREM CRSP Tuskegee AL

Ticsay Ruscoe M R Alvarez R Banayal G Buenavista R Serrano and A Sumbalan 1995 Search for indicators of sustainability for Philippine upland Focus on Manupali watershed *In* B Bellows (ed) Proceedings of the Conference on Indicators of Sustainability SANREM CRSP August 1994 Arlington VA

West L T K S Lawrence A A Dayot L M Thomas and R D Yeck 1996 Micromorphology and soil development as indicators of Ash Age on Mindanao The Philippines Proceedings of the 10th International Working Meeting on Soil Micromorphology Moscow

Forthcoming Books and Book Chapters

Coxhead I 1999 Economic modeling of agricultural land degradation *In* A Jakeman M MacAleer and S Mahendrarajah (ed) Modeling change in eco nomic and environmental systems Pergamon New York

Coxhead I and associates (ed) 1999 Proceedings of the SANREM CRSP/Southeast Asia Conference Economic growth and sustainable develop ment Are they compatible? May 18 21 1998 Malaybalay Philippines

Flora C B and M Kroma 1997 Gender and sustainability Sustainability in agriculture and rural development G E D Souza and I G Gebremedhin (ed) Dartmouth Publishing Hampshire England

Flora Cornelia Butler Public policy and women in agricultural production A comparative and historical analysis *In* Andrzej Kaleta (ed) Rural sociology in the contemporary world Nicolaus Copernicus University Press (in Polish) North America and Torun Poland

Hargrove W D P Garrity R E Rhoades and C L Neely 1998 A landscape/lifescape approach to sustainability in the tropics The experience of the SANREM CRSP at 3 sites *In* R Lal (ed) Integrated watershed manage ment in the global ecosystem Journal of Soil and Water Conservation CRC Press Boca Raton FL (in press)

Nazarea V (ed) 1999 Ethnoecology Situated knowledge/located lives University of Arizona Press Tucson AZ 300 pp

Nazarea Virginia D 1999 A View from a point Ethnoecology as situated knowledge and Lenses and latitudes in landscapes and lifescapes *In* V D Nazarea (ed) Ethnoecology Situated knowledge/located lives University of Arizona Press Tucson AZ

Rhoades R E The participatory multipurpose watershed project Nature s sal vation or Schumacher s nightmare? *In* R Lal (ed) Integrated watershed man agement in the global ecosystem Journal of Soil and Water Conservation CRC Press Boca Raton FL (in press)

Rhoades R E (ed) Bridging human and ecological landscapes in Northwest Ecuador Four years of participatory research in SANREM Kendall/Hunt Publishing Co Dubuque IA (in press)

Rola A C and I Coxhead 1999 Sustainable resource management strategies and agricultural labor in commercial highlands of the Philippines A case study in Lantapan Bukidnon *In* I Coxhead and associates (ed) Proceedings of the SANREM CRSP/Southeast Asia Conference Economic growth and sus tainable development Are they compatible? May 18 21 1998 Malaybalay Philippines

In Process Articles

Buenavista G I Coxhead and K Kim 1998 Assessing SANREM s impacts in Lantapan Results of a survey Manuscript University of Wisconsin (http //aae wisc edu/coxhead/sanrem/tdd)

Coxhead I 1998 Consequences of a food self sufficiency strategy for eco nomic welfare income distribution and land degradation The Philippine case Department of Agriculture and Applied Economics University of Wisconsin Madison WI Staff Paper Series No 396 revised (in review at World Development)

Coxhead I and G Shively 1999 Measuring the environmental impacts of economic change The case of land degradation in Philippine agriculture Journal of Agricultural Economics and Development (in press)

Coxhead I and G Buenavista 1998 Seeking sustainability A synthesis of research in Phase I of SANREM CRSP Southeast Asia 1993 1998 Manuscript University of Wisconsin (http //aae wisc edu/coxhead/sanrem/tdd)

Coxhead I A C Rola and K Kim 1998 Do national markets influence farm gate prices in upland agriculture? Evidence from a Philippine watershed Manuscript in preparation Univ of Wisconsin

Coxhead I G Shively and X Shuai 1998 How do prices affect land use? Evidence from a sample of upland farms in Lantapan Bukidnon Philippines Manuscript University of Wisconsin

Nissen T M and D J Midmore 1998 Aboveground and below ground com petition between intercropped cabbage and young *Eucalyptus torreliana* Agroforestry Systems (submitted)

Poudel D D T M Nissen and D J Midmore 1998 Sustainable commercial vegetable production under fallow systems in the uplands of Southeast Asia Mount Res Devel (submitted)

Poudel D D and D J Midmore 1998 Erosion and productivity of vegetable systems on sloping volcanic ash derived soils in the Philippines Soil Sci Soc Am J (in press)

Poudel D D D J Midmore and L T West 1998 Cropping sequence to mini mize erosion on steepland vegetable system Evaluation and application of EPIC model J Soil and Water Cons (submitted)

Poudel D D and L T West 1998 Soil development and fertility characteris tics of a volcanic slop in Mindanao the Philippines J Soil Sci Soc Am (sub mitted)

Rhoades R E and J Harlan 1999 The future of ethnoecology *In* V Nazarea (ed) Ethnoecology Situated knowledge/located lives University of Arizona Press Tucson AZ

Rule Lita Cornelia Butler Flora and Sandra Hodge 1998 Social aspects of agroforestry *In* Agroforestry Madison American Society of Agronomy

Silva Barbeau I C L Neely D del Castillo W L Hargrove 1999 The short and long term impact of a participatory approach to sustainable agriculture research A SANREM CRSP experience in the Republic of Cape Verde Islands (To be submitted Journal of Environmental Management)

Silva Barbeau I D Kabore M C Sorgho F Ouattara M Belem A Nitiema D Taylor and W L Hargrove 1999 The use of participatory farmer first methodologies in the study of nutrition and food security in Burkina Faso (To be submitted Journal of Ecology of Food and Nutrition)

Silva Barbeau I D Kabore L Illy D Taylor M C Sorgho M Belem and W L Hargrove 1999 The Determinants and the effects of an unstable food supply in Burkina Faso The experience of SANREM CRSP (To be submitted April 1999 Journal of Development Economics)

Other SANREM CRSP Publications

Alarcon R M Burbano and L Trujillo 1998 Comparative Analysis of Plants and Space between Three Local Groups in the Cotacachi Cayapas Ecological Reserve Buffer Zone Developed for SANREM in cooperation with CARE Ecuador and EdoCiencia

Alarcon R M Burbano and L Trujillo 1998 Management of the Panama Hat Plantation (Carludovica palmata R & P) in the Chaci Community Loma Linda Buffer Zone of the Cotaccachi Cayapas Ecological Reserve Ecuador Developed for SANREM in cooperation with CARE Ecuador and EcoCiencia

Amit S 1995 Database on multi purpose fruit timber trees and other species true to Philippines (endemic and non endemic) J Lumdang (ed) Developed for SANREM CRSP in collaboration with ICRAF

Bellows B G Buenavista and M Ticsay Ruscoe 1995 Participatory land scape/lifescape appraisal Vol 1 The Manupali Watershed Province of Bukidnon The Philippines SANREM Research Report 2 95

Benitez J V 1998 Border Effect on the Predation of Seeds in San Antonio Cuellaje Ecuador Developed for SANREM in cooperation with CARE Ecuador and EcoCiencia

Bin L 1995 The impact assessment of land use in the watershed area using remote sensing and GIS School of Environment Resources and Development Asian Institute of Technology Bangkok Thailand

Bingham S 1995 Introduction a la gestion holistique des ressources International Center for Holistic Management

Bognounou Q 1996 Indigenous knowledge and herbal medicine in Burkina Faso *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Bognounou Q and H Ye 1996 Ethnoecology The growing concern of Mossi farmers over scarcity of woody vegetation in the Donsin experimental site (SANREM CRSP Burkina Faso) *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assess ment University of Georgia Press Athens Georgia

Burns A 1996 Visual anthropology *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assess ment University of Georgia Press Athens Georgia

Burton L 1996 Understanding the Manupali watershed through ethnoecolo gy *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Costello M 1996 Ethnoecology of the Manupali watershed Insights from an evolving research work plan *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Coxhead I 1995 The agricultural economy of Lantapan municipality Bukidnon Philippines Results of a baseline survey The University of Wisconsin Social Science Group Working Paper Series No 95/1 1995

Coxhead I 1995 Soil erosion in the Philippines Do government policies matter? The University of Wisconsin Social Science Group Working Paper Series No 95/2

Coxhead I 1995 Modeling the economics of agricultural land degradation Agricultural Economics Staff Paper No 385 University of Wisconsin Madison Wisconsin 1995

Del Castillo D T and J G Levy 1994 Avaliacao participativa da paisagem ecologica/paisagem humana (PLLA) da bacia hidrografica de Agua de Gaton em Cabo Verde SANREM CRSP with INIDA

Deutsch W G and S S Ruiz Cardova 1994 Water quality monitoring work shop Principles and techniques for chemical and biological assessment of streams SANREM CRSP in collaboration with SUBIR

EARTH/SANREM CRSP 1996 Techniques and tools for the identification of sus tainability indicators using PLLA

Elazegui D 1995 Technology in transition Lesson from Lantapan University of the Philippines Socioeconomic Group Working Paper Series No 95/4

Flora C C L Neely and I Silva Barbeau 1996 Identifying indicators of sus tainability for the design of research in sustainable agriculture and natural resource management Participatory Landscape/Lifescape Appraisal

Hill Rojas M and I Silva Barbeau 1995 Integrating gender and social vari ables in sustainable agriculture and natural resource management A resource guide SANREM CRSP 1995

ICRAF 1996 Brochures on seed propagation and seedling management of *Eucalyptus deglupta* Blume *Eucalyptus robusta* Blume *Swietenia macrophylla* King *Acacia mangium* Benth and *Gmelina arborea* Roxb in both English and the Cebuano dialect

ICRAF/SANREM CRSP 1996 Conservation farming guide #1 How to make and use the A frame

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Munoz J P 1997 SANREM CRSP Ecuador and ethnoecological methodologies *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Nazarea V 1996 Mapping and ethnosemantic games *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Nazarea V and R Rhoades 1996 Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Paunlagui M 1995 Population dynamics in Lantapan University of the Philippines Socio Economic Group Working Paper Series No 95/3

Prain G and M Piniero 1996 Participatory research methodologies A SANREM CRSP Philippines experience *In* V Nazarea and R Rhoades (eds) Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Rechkemmer P and D Thelaner 1995 Gendered knowledge An annotated bibliography CIKARD Documentation Unit Iowa State University Ames Iowa 1995

Rhoades R 1996 Methods in agricultural anthropology *In* V Nazarea and R Rhoades (ed) Ethnoecology methods manual Interdisciplinary natural resource assessment University of Georgia Press Athens Georgia

Rola A 1995 Profitability and sustainability of agricultural production systems in the Lantapan watershed University of the Philippines Socioeconomic Group Working Paper Series No 95/5

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Roncoli C and M Sendze 1995 Pictures where people matter A report on photography as a tool in farmer centered participatory research and information exchange Lessons from the field Donsin Village Namantenga Province Burkina Faso

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Roncoli C and M Sendze 1995 Our world ourselves A photographic essay by the farmers of Donsin Burkina Faso Jun 1995 PE 95/2

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West L et al 1995 Soil survey results 13 pedons for Lantapan municipality SANREM CRSP Philippines

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Student Theses

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Training Manuals

Deutsch W 1994 A field and laboratory manual for a community based water quality monitoring program in Bukidnon Philippines (in English and Spanish) International Center for Aquaculture and Aquatic Environments Auburn University Auburn Alabama

Rhoades Robert and Virginia Nazarea 1997 Research methods modules for ethnoecology Comparative Ethnoecology Project Ecuador SANREM Quito

Silva Barbeau I and M C Sorgho 1996 Integrating gender and other social variables in sustainable agriculture and natural resource management SANREM CRSP Burkina Faso

Video Productions

SANREM CRSP/Philippines 1995 Cornerstones of Sustainability SANREM CRSP

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U S Institutions	Regional Institutions
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