



SANREM CRSP

ABOUT SANREM CRSP

SANREM's mission is to assist in the analysis, creation and successful application of decision support methods, institutional innovations and local capacity approaches to support participatory sustainable agriculture and natural resource planning, management and policy analysis at local, municipal, provincial and national levels.

ABOUT THE AUTHOR

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SANREM CRSP RESEARCH BRIEF

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WATER SPIRITS AND CITIZENS' ACTION: COMMUNITY-BASED WATER QUALITY MONITORING IN THE PHILIPPINES

*Can local people participate in monitoring the quality of natural resources in their communities?
Can they produce information that is reliable and consistent enough to serve for environmental assessments and policy recommendations?*



Global environmental policy is promoting decentralization and devolution to the local level as a key to sustainable natural resource management. Yet rates of natural resource loss exceed the capacity of local government structures to remedy the situation without the active involvement of civil society and private sector. How to generate awareness and motivation among citizens and facilitate understanding of ecosystem linkages among decision-makers remains a challenge.

This brief describes a unique initiative in which members of a rural Philippine community participated in collecting data about water conditions that was used by local government in making decisions about water management. The initiative is part of the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP) and is directed by Auburn University scientist William Deutsch in collaboration with local communities and other international, national, and provincial institutions.

BACKGROUND

Despite the Philippines' rich water resources, the country is currently facing a crisis regarding the dwindling supply of high quality water. Water quality is threatened by high rates of soil erosion, sedimentation, nutrient runoff, and bacterial contamination. This kind of pollution (non-point pollution), which is generated from broad areas of the landscape, is far more difficult to control than pollution that results from a specific source.

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The problem is particularly acute in the Manupali watershed, which in the last 30 years has experienced a high rate of conversion of forest cover to corn and vegetable cultivation at medium and higher elevations. These crops receive heavy doses of chemical inputs and offer insufficient soil protection, especially during heavy rainfall events. They are often planted against the contour to facilitate farm work and drainage, but this also encourages soil erosion and nutrient runoff, leading to downstream sedimentation and contamination of water courses.

Farmers complain that local stream flows have become more irregular, going through cycles of flood and drought, which causes further soil erosion, crop and animal losses, and, occasionally human casualties.

Siltation has reduced the efficiency of lowland irrigation networks to 25% of normal capacity. An important hydroelectric power generation reservoir in the watershed is half-filled with sediments and siltation occurs at nearly one meter per year at the dam. Suspended solids contribute to wear-out of turbines and frequent power outages.

Pesticide and pathogen contamination of water resources affects animal and human health. Public health records show higher than average infant mortality and morbidity, with many ailments caused by waterborne pathogens.

RESEARCH METHODS

Defining a set of water quality indicators

The project adapted training methods and sampling techniques from the EPA-sponsored Alabama Water Watch, a volunteer water quality monitoring program operating in the United States. The approach centers on a minimum set of indicators that are:

- a) scientifically valid to ensure credibility;
- b) relevant to the community for their endorsement and participation;
- c) practical and inexpensive for sustainable use.



Animals like carabao (water buffalo) may become ill from pesticide runoff .

The monitoring activities began in 1994, with a baseline description of water quality conditions throughout the watershed. This initial assessment incorporated the qualitative indicators of community perception, memory and experience.

Selecting sites and sampling techniques

The monitoring sites were chosen for accessibility and ability to represent diverse portions of the landscape, including forest and farmland. Monitors used imported simple test kits and locally available materials (ropes, sticks, floats) to take measurements once or twice per month at four sites in daytime, base flow conditions. During selected intense rainfall events, samples were taken on an hourly basis. At certain sites, soil loss increased up to 1,000-fold within a two-hour period of heavy rain. To better convey this to farmers, the weight of soil lost was likened to the weight of a sack of corn approximately the size of a small desk.

Addressing stakeholders' interests

As agriculture is the primary source of livelihood for most residents, measurements of soil loss, such as TSS (Total Suspended Solids), generated much interest among farmers. Stream velocity and discharge were also measured. Concurrent TSS and stream discharge resulted in valuable estimates of sediment yield and identification of hot spots of soil erosion throughout the landscape.

Women's groups were very involved in the monitoring and showed particular interest in biological indicators, such as *E.coli* and other bacteria, that may contaminate drinking water and affect children's health.

Integrating cultural and ritual dimensions

Particular attention was paid to reconciling scientific methods with indigenous spirituality concerning water and nature. Researchers and volunteers received permission to enter streams and sample water by the leadership of the Talaandig, the tribal group that holds ancestral claims to the area. A Ritual of Understanding was also held to ceremonially sanction the research activities. This ritual included a recognition for the Talaandig beliefs in water spirits, which need to be respected.

Building local institutional capacity

Monitors, which included teachers, students, and local government officials, became involved in other aspects of environmental activism and education. After several months of operation, they formed a group called *Tigbantay Wahig* (Water Watcher) that was incorporated and officially recognized as an NGO. Volunteers received training in water quality monitoring as well as in leadership, management, outreach, aquaculture, agro-forestry, and livestock production.

RESEARCH FINDINGS

Population and land use as key factors influencing water quality

The data showed a progressive decrease in water quality along an east to west gradient. This variability is due to a combination of cropping patterns and rainfall frequency and intensity. While more severe erosion might have been expected to occur in the western sub-watersheds, which have steeper slopes, higher TSS levels were recorded in the eastern part, where more houses, roads, and farms are found.

Farmers involved in vegetable production plow and expose large areas of bare soil for planting just prior to heavy spring (May-June) rains. Not surprisingly, measurements of sediment yield were highest during the wetter months and where forest cover was least. In eastern sub-watersheds, soil loss exceeded the maximum measured in western sub-watersheds by 10-25 times, achieving levels of 3,400 kg/h with intense rains that fell in July 1999.

Unstable stream flows threatens community well-being

Stream discharge indicators, which provide a useful early alert to watershed disruption, followed the same west-to-east pattern as TSS. The coefficient of variation in monthly flows varied from 32 to 140% among sub-watersheds. Flood and drought cycles were exacerbated by the effects of El Nino events. This instability in stream flows was becoming a serious problem for the municipality and for local people who depended upon rivers for bathing, washing clothes, and watering livestock.



A group of local water monitors gather to collect and analyze samples.

Bacterial contamination exceeds World Health Organization (WHO) standards

Bacterial contamination also increased from the western sub-watersheds to the eastern sub-watersheds, where 75% of the municipality population lives. In some eastern streams, concentration of potentially harmful bacteria reached rates that exceeded the WHO standard by 10-50 fold. Several community faucets showed presence of *E.coli* bacteria, which seeped into ruptured pipes from contaminated soils and water.

30% forest cover identified as sustainability threshold

By correlating the water degradation data with demographic and land use cover patterns from government census and remote sensing data, researchers identified a threshold of unsustainable soil erosion. Abrupt increases in TSS occurred when sub-watershed forest cover dropped below 30% and agricultural land made up more than 50%. These findings coincide with those by the International Center for Research in Agroforestry (ICRAF), which also determine a threshold of 30% minimum forest cover before severe environmental degradation affects upland tropical forests.

FROM INDICATORS TO POLICY

Important research results often go underutilized because they fail to enter the political arena. A favorable political conjuncture enabled the integration of project findings into local level processes of planning and policy making.

Findings inform local government policies

The 1986 “People Power” revolution had laid the foundations for greater involvement of civil society in decentralized governance. The 1991 Local Government Code mandates the participation of citizens’ groups and accredited NGOs in Local Government Unit (LGU) deliberations. It also devolved to municipalities the responsibility to develop natural resource management plans, which include water issues.

Municipal leaders were generally receptive to initiatives that helped inform and mobilize the community and offered cost-effective ways to obtain information to guide decisions. Research findings from water quality monitoring activities were provided to the LGU, with recommendations for priority areas and feasible interventions.

Project impacts extended beyond the municipality. The Provincial Planning and Development Office organized a forum to present the project and key indicators to policy makers and planners in the 15 other municipalities that constitute the province.

Indicators used in making community decisions

Indicators of soil loss and water contamination have proved to be key decision support tools. For instance:

- stream discharge measures indicated that a eastern sub-watershed was particularly prone to seasonal flooding. This finding coincided with the occurrence of destructive floods and the decision by the municipality to build new culverts to prevent washout and blockage of access roads.
- a village leader requested the services of water monitors to test bacterial levels in a spring that was to be used for drinking water. The analysis showed that the water was contaminated, so that an alternative source was chosen.

Monitoring promotes environmental awareness

Community-based indicators were effective in helping people to understand the consequences of land use decisions on a landscape scale. The variance among sub-watersheds was used in the course of community presentations to simulate “a walk through time”. A watershed resident could look west and see how their environment was in the past, and look east and see how it would be in the future if land use changes were not made.

Involvement in water quality monitoring by teachers also ensured a greater emphasis on water quality and environmental conservation issues in the curriculum. Children were able to learn which rivers were clean and which were polluted. Schools also started restoration activities, such as tree planting on riverbanks to prevent erosion.

Application of partly understood conservation practices with full community involvement may be better than waiting for a thorough scientific analysis to be completed, especially in the case of rapidly degrading watersheds.

LESSONS LEARNED

Community indicators are effective tools for:

- a) *Priority setting*: to identify “hot spots” of soil erosion and water pollutions or weak links in the public water system in need of repair;
- b) *Environmental assessment*: to quantify baseline conditions, to evaluate impacts of development, and track progress of restoration activities;
- c) *Awareness raising*: to illustrate ecosystem linkages and landscape effects of farmers’ resource management decisions;
- d) *Advocacy and resource mobilization*: to document need and make stronger cases in grant proposals for federal or foreign aid;

Hands-on activities stimulate awareness and action

Citizens were directly involved in producing information and knew that their efforts mattered because the data was used in improving land and water conditions. The community’s receptivity was due to the fact that the project responded to a widely perceived need and sense of urgency, which was shared by local govern-

Policy making calls for “good-enough” research

Information needed by policy makers must be science-based but need not necessarily meet the most stringent scientific standards with regard to methodology. Community monitoring may forego some precision and accept possible bias for the sake of cost-effectiveness, feasibility, and relevance. Application of partly understood conservation practices with full community involvement may be better than waiting for a thorough scientific analysis to be completed, especially in the case of rapidly degrading watersheds.

CHALLENGES

Political turnover

Effective environmental monitoring needs continuity to capitalize on capacity building and regular data collection activities. Yet administrative shifts and political instability at the national level may induce changes in local government leadership and resource management agendas. An informed, organized, and active community can play a key role in sustaining monitoring efforts throughout LGU changes.

Development priorities

The devolution of responsibilities for public services to the local level may result in pressures on local government to generate revenues. Economic development, such as building new roads and attracting agribusiness, may take precedence over conservation goals. But the development of a municipal natural resource management plan, informed by SANREM research findings, is a positive step toward reaching a balance between economic growth and environmental sustainability.

Transaction costs

The startup of a collaborative process that involves community members and diverse stakeholders is relatively slow and costly, but results indicate that the benefits and potential for sustainability are much higher than if implemented in isolation.

This brief draws from articles by William Deutsch et al. in: *Seeking Sustainability: challenges of agricultural development and environmental management in a Philippine watershed*. Edited by I. Coxhead and G. Buenavista. PCARRD, Los Banos, Laguna, 2001. PDF versions of individual articles can be downloaded from: <http://www.aae.wisc.edu/sanrem-sea>

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