CAPRi

CGIAR SYSTEMWIDE PROGRAM ON
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CONCEPTUAL AND METHODOLOGICAL LESSONS FOR IMPROVING WATERSHED MANAGEMENT AND RESEARCH

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Watersheds connect land units through flows of water, nutrients, and sediment—linking farmers, fishers, and urban dwellers in intricate relationships. How these flows affect people's livelihoods depends on the biophysical attributes of the watershed as well as on the policies and institutions that shape human interactions within the watershed. Watersheds are managed at various social and spatial scales—from community management of small catchments to the transnational management of extensive river systems and lake basins.

The System-wide Program on Collective Action and Property Rights (CAPRi) convened a workshop in March 2000 to consider some of the key issues in watershed management research. The workshop was organized around the themes of: 1) collective action and property rights; 2) social-spatial scale; 3) stakeholder participation in watershed management research; and 4) assessment of the impacts of watershed management. This brief summarizes some of the insights that came out of the workshop.

COLLECTIVE ACTION AND PROPERTY RIGHTS

Even at the scale of the micro-watershed, the extensive spatial scale of watershed resources points to the need for collective action in developing and maintaining resources and resource management technologies. Watersheds may include grazing land, agricultural land, residential areas, forests, wetlands, common waterways, and water-storage structures, each of which may be used by a variety of resource users. Lateral flows of water, soil, and nutrients between source and destination areas may link those resource users to other stakeholders, some of whom live outside the watershed. Effective watershed management requires coordination in the way that various stakeholders use and invest in these resources. Research into collective management of watershed resources offers these findings:

- Robust collective management is likely to depend on the level of existing community organization and social capital, that is, the strength of the norms and social relations that enable people to work together to achieve their goals.
- Existing community organizations rarely incorporate all of the stakeholders with interests in watershed management. New types of organizations may play key roles in bridging gaps between local community organizations. However, new organizations should try to build on existing structures rather than duplicate them.
- Attempts to organize collective action along strict hydrological boundaries generally fail. It is more important to begin with social and administrative boundaries, then consider how to bridge the social and communication gaps that separate groups within the biophysical boundaries of a watershed. Watershed projects organized along social lines can strengthen collective action, but administrative boundaries have practical benefits—for example, channeling financial resources or otherwise linking with local government.
- The size and social structure of communities sharing the watershed are likely to be important. Smaller and less spatially dispersed groups are often more unified than larger ones in supporting effective collective action within the group. Effective management of larger watersheds requires some collective action among groups.
- Market forces can weaken community cohesiveness and lower incentives to act collectively, but they can also increase the value of tradable natural resource products and thus provide additional incentives for managing those resources.
- Insecure property rights to cropland can reduce incentives to invest in land improvements and conservation structures, particularly those that generate returns over longer periods (e.g. terraces, trees). Frequently more important, however, are insecure and contested property rights to other types of land, especially riverine areas, forests, footpaths and grazing areas. Rights to land, water, or other benefits need not be exclusive to be secure; they can be held in common or overlap with different resource users.
- Watershed systems are highly complex. Resources frequently have many uses and users; resources and the institutions that manage them span multiple scales; and lateral movements of water, sediment, nutrients, and other substances such as pesticide and fertilizer chemicals mean that the actions of a few can have far-reaching effects. As a result, forums for negotiation and mechanisms for conflict resolution among stakeholders are necessary. Rules for sharing resources comprise property rights, which are often useful in resolving conflicts and creating incentives for investing in watershed development. Institutions for collective action, which may be embodied in formal organizations or in informal means of cooperation, help ensure that property rights are respected, and contribute to the community's goals.

In Kenya, collective management of watershed resources has been fostered by the focal area approach adopted by the Conservation Branch of the Ministry of Agriculture and Rural Development. A focal area is a land area of 200 to 300 hectares with 100 to 300 households, defined largely along social and administrative boundaries. Within each focal area, community members form catchment committees for managing landscape resources, with the Ministry of Agriculture and Rural Development providing technical and organizational support. This cost-effective approach results in a high uptake of technology: about 100,000 new farms are reached each year, with 20 to 70 percent of farmers adopting some of the technologies that are recommended. The success of the focal area approach in Kenya is partly due to perceptions of tenure security; adoption rates tend to be relatively high in areas and for households with high tenure security. Size is another important factor: people often prefer to work on small, sub-village units and build on to these if necessary. The Kenyan Ministry of Agriculture and Rural Development is now working with the International Centre for Research on Agroforestry (ICRAF) to determine how the focal area approach can be 'scaled up' to better deal with interactions between communities sharing common watershed areas.

Experiences from Southeast Asia illustrate the problems that arise when property rights are ill-defined. In Thailand, ethnic groups have occupied the upland catchment areas of the Mae Chaem watershed for generations. They are allowed only weak rights to land and resources because their land use is perceived to be at odds with the management plans of the Royal Forest Department. In the Sumber Jaya catchment area of Indonesia, the management of upper watershed areas is still dominated by the state, with the Forest Department managing 70 percent of the land where local people, classified as illegal squatters, live. Conflict over property rights provides incentives for farmers to clear primary forest land and adopt farming practices that generate short-term rather than long-term returns. ICRAF is now working with the forest departments in Thailand and Indonesia to determine how land use affects watershed protection and the tradeoffs between farmers' needs and public goals of watershed protection.

THE ELEMENT OF SCALE

Watershed-management research projects must consider social-spatial scale and adopt landscape approaches in order to derive a more holistic picture of the system. It is usually necessary to conduct research at various scales, from the plot to the entire watershed, in order to fully account for the diversity of landscapes and land uses that exist in a watershed, the lateral flows of water and other resources that link different parts of the landscape, human interactions within and between communities, and the social mechanisms that condition those interactions.

Geographic information systems provide tools for combining spatial data on land use, topography and hydrology with individual or household data on economics, information flows, technology adoption and social organization. For example, spatial data layers can be used to categorize a watershed into different land types, then household or individual surveys can be used to collect geo-referenced household or individual data on household economics, resource allocation or social organization for each land type.

Effective watershed management requires reconciling socially defined boundaries like villages with physically defined boundaries and catchments. Although there are technical reasons for using catchments as natural units for applying a watershed approach to natural resource management, social and administrative boundaries may limit the appropriateness of catchments. The hydrological features of watersheds or subwatersheds rarely correspond to the village, the district, or other social or administrative unit. Whereas rivers and streams often form social and administrative boundaries because they are visible and relatively fixed in space and time, they are the natural centers of catchment areas, so that often the hydrological units do not coincide with administrative or social units. The best solution to this con- tradiction may be to work within social boundaries, applying a watershed approach. The focal area approach used in Kenya gives preference to social, rather than hydrological boundaries, making it easier to get collective action for managing the resources. Furthermore, the scale at which the physical environment is optimally managed may not correspond to any single decisionmaking body in a community. In that case, collective action within existing institutions, or through the creation of new institutions, becomes critical for managing watershed resources. Decisionmaking does not have to be embedded in only one body at one level, but different management responsibilities can be devolved to different bodies. These options vary according to the size of the watershed, the populations occupying the watershed, and how the scale and interaction of resource flows affect people.

Lateral flows of materials such as water, soil, and nutrients across a landscape can spread the results of decisions about resource use beyond the level of the decisionmaker. Some lateral flows produce positive outcomes; for example, soil erosion deposits can move fertile soil from a place where it is underused to another place where it will be intensively used. One way to offset or mitigate negative outcomes is by establishing filters. A filter is a biophysical technology that checks, diverts, or stops a lateral flow of water, soil, nutrients or chemicals, thereby shielding others from their effects. Filters can be spatially limited (for ex-ample, vegetative strips) or very large (for example, wetlands). Filters also can have multiple uses, such as marking boundaries, supporting biodiversity, and providing wild foods. However, unclear property rights over barrier strips may cause problems with their maintenance—for example, along riverbanks.

PARTICIPATION

The extensive nature of resources and the interdependency of users at the watershed level underscore the need for all stakeholders to participate in the development and implementation of watershed management technologies and practices.

If all stakeholders do not have an opportunity to participate, more powerful stakeholders are likely to control watershed resources and undertake use practices without regard for their impact on less powerful individuals. For example, women and pastoralist households may bear the costs of restrictions on grazing and collecting firewood in riverine areas, while owners of downstream cropland may reap the benefits of improved water and reduced sediment flows. Including women and pastoralists could lead researchers or policy makers to consider alternative land use and conservation strategies that would minimize negative impacts on these stakeholders. Excluding them could undermine the effectiveness of policies if adversely affected groups fail to comply.

Socially optimal resource management calls for collective action in negotiation, decisionmaking, management, and conflict resolution among all watershed stakeholders. Effective democratic forums can help to provide poor and marginalized members of the community with greater voice in these processes. Where such forums are weak, efforts to organize the poor and less enfranchised groups can help them assert their interests.

Recent evidence suggests that participatory watershed development projects are more successful than externally managed top-down projects. Although incorporating farmer participation may increase research or project costs in the short run because time is spent consulting stakeholders and making joint decisions, costs are likely to go down in the long run because the technologies and policies are more appropriate and therefore more widely adopted.

Stakeholders who participate in watershed management may also reap rewards in terms of human and social capital. By working closely with researchers, farmers can strengthen both their technical knowledge about agriculture and natural resource management as well as their analytical capacities for evaluating different technologies. If they work as a group, they can improve their organizational capacity. As they gain the confidence to interact with researchers, extension agents, and others, participating farmers become empowered to address their own problems, seeking out appropriate information or advice. Given the dynamic and long-term nature of watershed management, empowering local communities to take a leading role is essential.

In the Colombia, Honduras and Nicaragua, the International Center for Tropical Agriculture (CIAT) has adopted a participatory methodology designed to identify and integrate a broad range of stakeholder interests and activities within its watershed research sites. Watershed stakeholders are a diverse group including farmers and other resource users, government agencies, development organizations, policy makers, scientists, and many others whose multiple interests can be both complementary and competing. By facilitating a joint process of problem identification and planning, CIAT researchers can better understand the issues, constraints, and dynamics within the watershed. They can also help improve the overall efficiency of all watershed activities through the sharing of ideas, information, and resources among stakeholders. In Southeast Asia, ICRAF serves as an information broker on technical, institutional, and policy matters in partnerships that include the local government for policy formulation and local resource-user groups for planning and implementing watershed programs. Such partnerships assist communities located on state forest lands to develop coherent land management programs while also strengthening communities' capacity to negotiate agreements with forest departments.

ASSESSING THE IMPACT OF WATERSHED MANAGEMENT RESEARCH

Evaluating the impact of watershed-management research projects is especially challenging because they include social and institutional as well as economic and biophysical components. Not only must a wide range of economic and ecological changes be recognized and documented, but indicators also must be identified to measure and value social outcomes, such as the capacity of community groups to work collectively in managing sustainable resources.

Even when a project accurately assesses changes that have occurred in a pilot study area, it must determine to what extent the project contributed to those changes and the extent to which the pilot study area represents other areas of interest. In many cases, the variables that are used to select a community for a pilot project influence the project's success. This is the case, for example, when an intervention requiring collective action is successful in a community that was selected for its existing high level of cooperation. Successful outcomes cannot necessarily be attributed to the project since the same project may well have had different results if it were implemented in a community with low levels of cooperation.

Caution must be used in attributing impact to watershed-management research projects. Questions of causality and representativeness are usually addressed through replication and controls. Although control sites ideally should be comparable to study sites, this is rarely possible in a dynamic environment with complex human and ecological interactions. The results, therefore, must take into account an array of possible direct and indirect causes, including those unrelated to project interventions. A combination of quantitative and qualitative measures is appropriate for understanding the processes of collective action and the various dimensions of natural resource management. CIAT has developed a methodology for

assessing human, social, environmental, and economic impact of its integrated natural resources management work in its watershed reference sites using a combination of qualitative and quantitative data collected using both conventional and participatory group techniques. The goal of the impact assessment, which is underway in Central America with plans for expansion to Asia, is to document and understand observed and perceived changes in the watershed and their relation to project activities.

CONCLUSIONS

The complex resources and the maze of human interactions within watersheds call for special methodologies for undertaking research and programs at the landscape level. Property rights shape incentives for managing resources and investing in watershed development. The strength of collective-action institutions often determines the quality of watershed resource management. Issues of scale have implications for research and for understanding the biophysical and social dynamics of watersheds. Finally, participatory approaches to watershed research not only ensure the development of appropriate technologies, but also can strengthen the capacity and self-determination of watershed residents.

Research designed to evaluate the impact of watershed projects is critical to understanding the outcomes of various interventions. By building in impact assessment from the beginning and applying methods that account for the complexities of watersheds (while still acknowledging methodological shortcomings), watershed research and development can continuously improve.

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The CGIAR System-wide Program on Collective Action and Property Rights (CAPRi) is an initiative of the 16 centers that belong to the Consultative Group on International Agricultural Research. The initiative promotes comparative research on the role played by property rights and collective action institutions in shaping the efficiency, sustainability, and equity of natural resource systems.

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