CHAPTER 2
REVIEW AND ASSESSMENT OF WATERSHED MANAGEMENT STRATEGIES AND APPROACHES

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The importance of multiple economic, social and environmental benefits derived from land-based resources has increased in recent years. Sound management of these resources is therefore prerequisite to sustainable resource-based production systems. Watershed management, which in essence is the application of land resource management systems, is considered by many to be the most appropriate approach to ensuring the preservation, conservation and sustainability of all land-based resources and improving the living conditions of people in the uplands and lowlands. Integrated watershed management with participation of all the relevant key actors has become widely accepted as the approach best suited for sustainable management of renewable and non-renewable natural resources in upland areas.

WATERSHED MANAGEMENT – A HISTORIC VIEW

Large-scale removal of forest lands by humans in the nineteenth and early part of the twentieth centuries created significant changes in the hydrologic function of watersheds. Downstream flooding occurred more frequently, with subsequent increases in loss of life and damage to infrastructure. Accelerated erosion, produced by changes in the biotic and hydrologic components of natural drainages (watersheds), created unprecedented large-scale siltation of developed lowlands. At the time, the general consensus was that the removal of forest was causing these undesirable impacts. However, the mechanisms for reversing the process through sound scientific management had not been developed.

During the second quarter of the twentieth century, the discipline of forest hydrology evolved from the need for scientific management of the soil and water resources of headwater catchments in order to minimize the flooding and siltation of productive lands and infrastructure in the valleys and plains inhabited by humans. As the importance of rangelands and cultivated lands in the hydrologic cycle and the erosion–sedimentation processes of catchments became known, forest hydrology gave way to the more comprehensive, present-day watershed management.

Over time and in response to changing needs, the scope of watershed management has broadened from the initial concept of technical management of the water resource to an integrated discipline that applies biological, technical, social and economic principles to maintain the productivity of headwater and lowland areas through the scientific management of soil, plant and water resources.

Watershed management in its truest form is the conservation management of the soil, plant and water resources of a catchment to benefit humanity. It involves managing the land and human resources of the drainage in a manner that sustains adequate levels of water, soil, food and fibre production. This form of management requires a participatory integrated approach that includes the various physical, vegetative and human components of areas that range from a few hectares to large river basins.

The watershed part of watershed management implies management of these resources, to the extent possible, within a defined physiographic boundary. From a conceptual perspective, when the boundaries of a management system are defined it is easier to identify and monitor the components (e.g. inputs, storage and outflows) of that system – e.g. the hydrologic cycle. However, from a land management perspective, these physical boundaries are considered to be simply topographic demarcations within political and administrative boundaries that usually overlay a series of watersheds.

The theoretical concept of participatory integrated management of natural resources is difficult to apply. The myriad uses, ownerships, political and social constraints and biophysical systems in large watersheds limit application of the idealistic integrated approach. In practice, large catchments are usually managed according to economic, social and political considerations.

Management of the natural resources in headwater watersheds has the greatest potential for application of the participatory integrated concept. Agricultural, forest and rangelands often represent a potentially significant production resource for local inhabitants. However, the natural physical and biological constraints of uplands often limit productivity compared with lower elevations where major production and population centres are located.

WATERSHED MANAGEMENT REVIEW AND ASSESSMENT OF STRATEGIES AND APPROACHES

Degradation of the natural resources of upland areas has been occurring on the global scale for several decades. In an attempt to reverse this trend, concerned governments and development assistance organizations have been employing watershed management principles since the 1960s. Through these years of development, strategies and approaches for implementing watershed management interventions have changed as the discipline moves forward along the learning curve. By responding to research results, lessons learned, failures and successes, periodic reviews and evaluations, the discipline continues to be dynamic, with adjustment and modification as required to meet changing needs.

During the past decade, the social and economic aspects of watershed management have been given high priority. In addition, people's participation has been recognized as one of the keys to successful management of natural resources (Bendtsen and Sthapit, 1999; Petersen, 1999). The integrated concept has expanded to include community needs and problems as part of a holistic watershed management development scheme.

The last review and assessment of watershed management development strategies and approaches by FAO was held in 1985–1986 (FAO, 1986b). In view of the development changes that have occurred during the past decade, and the period of 17 years since this review, it was

decided to conduct a stocktaking exercise to determine the present status of watershed management development, identify any gaps and formulate guidelines for future development projects/programmes.

Objectives

The overall aim of the assessment was to promote, on the global scale, the dissemination and exchange of information regarding achievements and gaps in watershed management, and to provide future support for effective watershed management projects and programmes. Specific objectives include:

- to conduct a study, on the global scale, of the nature and extent of accomplishments in watershed management;
- to identify major gaps in watershed management strategies and approaches, with focus on the 1990 to 2000 period;
- to formulate guidelines for the next generation of watershed management development projects and programmes.

Procedures

A five-pronged approach was followed to collect information. The first step was to identify key actors) involved in watershed management development during the study period. A set of questions designed to provide information relevant to the study was prepared and sent to the key actors. The responses were reviewed and summarized.

The second step was to conduct stocktaking of FAO experience of watershed management development projects/programmes during the 1990 to 2000 period. This process included reviewing project terminal and evaluation reports, proceedings of seminars, conferences and workshops, personal and group consultations, and other information sources.

The third step was selection and review of case studies on completed watershed management projects or programmes. The selected case studies are summarized in this paper.

The fourth step was to convene a series of regional workshops to provide a forum for regional, national and local actors in watershed management.

The fifth and final step was to prepare a summary of the results of the first four steps and to formulate guidelines and strategies for future watershed management development programmes, with subsequent distribution on the global scale.

RESULTS

Initial findings of the watershed management review are presented in the following sections.

Key actors survey

The survey questionnaire was sent to 30 key actors (organizations, agencies and institutions). A total of 18 responses were received: 14 of these provided answers to the questions, and four provided information on contacts and publications (see Table 1).

TABLE 1
Key actor survey: organizations and names of respondents to FAO review questionnaire

CGIAR, Consultative Group on International Agricultural Research.
Ruth Meinzen-Dick, Senior Research Fellow, International Food Policy Research Institute.

CIAT, International Center for Tropical Agriculture.
Joachim Voss, Director-General.

CIFOR, Center for International Forestry Research.
Mike Spilsbury.

CONDESAN, Consortium for the Sustainable Development of the Andean Ecoregion.
Roberto Quiroz.

DANIDA, Danish International Development Agency.
Poul Richardt Jensen, TSA.

DFID, Department for International Development, United Kingdom.
Professor Ian R. Calder, Director, Centre for Land Use and Water Resources Research.

EU, European Union.
Helmut Bloch, M.Sc., Ph.D., Director-General Environment.

FAO, Food and Agriculture Organization of the United Nations.
Kumar Upadhyay, CTA, and Prem N. Sharma, Consultant.

IADB, Inter-American Development Bank.
Roberto E. Quiroga, Senior Economist.

ICIMOD, International Centre for Integrated Mountain Development.
Roger White.

IWMI, International Water Management Institute.
Frits Penning de Vries.

NUS, National University Singapore.
Professor Roy E. Sidle, Department of Geography.

PROMIC, Programa Manejo Integral de Cuencas.
Roberto Mendez and **Ana V. Heredia**.

TMI, The Mountain Institute.
D. Jane Pratt, President.

UNESCO, United Nations Educational, Scientific and Cultural Organization.
Dr Mike Bonell, Chief of Section, Division of Water Sciences.

UNU, United Nations University.
Libor Jansky, Ph.D., Senior Academic Programme Officer, Environment and Sustainable Development.

World Bank.
Norman B. Piccioni, Sr. Agric. Economist LCSES.

The results of the survey were summarized according to three main topics: 1) major issues that require further investigation and in-depth analysis; 2) major constraints – past and future; and 3) challenges, needs and opportunities for future effective watershed management. A summary of the responses is presented in the following.

Major issues that require further investigation and in-depth analysis include: pathways of water, sediment and nutrients in response to land management; appropriate sustainable natural resources management options; cross-scale biophysical and socio-economic issues; the dynamics of natural resource use intensification; multi-institutional approaches to acting together in watershed management projects.

The above suggests that there is a need to establish linkages among central governments, local governments and civil organizations, together with a more coordinated and effective international aid effort. It is also necessary to find ways of: appraising the ecosystem services of catchments and the damage to on- and off-site environments from the viewpoints of farmers and society; creating options for catchment development in which all stakeholders gain (including through intersectoral or downstream–upstream transfers); and dealing with trade-offs and conflict. Staff require careful on-the-job training, particularly in dealing with people, and the role of youth in watershed management should be investigated in greater depth.

In its response, the World Bank stresses that "….finding the right way to address the policy framework and the sets of incentives that affect natural resources in watersheds (water, land, forests, etc.) is key. Also, issues of governance (local vs. central; upstream users vs. downstream users; community organization; mechanisms for water allocation and property rights) are central themes. The challenge is not a conceptual investigation of these issues, but rather the political will to move in the right direction."

Major constraints for the present include reconciling the needs of resource-based planning with "people-first" objectives, the weak national research systems in developing countries, and the need to develop central and/or local government/community commitment and the political will to allocate appropriate staff. Watershed management is about managing conflicts. Thus, lack of governance is a major constraint.

In addition, process-based concepts and models are lacking across many spatial scales. There is insufficient understanding of the reasons why some major catchment development programmes are working well while others are not – in other words there is an inability to replicate successes. Lack of sustainable financial and institutional mechanisms was identified as an additional "Achilles heel" of watershed management projects.

Major constraints for the future include the present-day constraints continuing. Additional constraints for the future are related to limited access to freshwater, with worsening of the environmental situation as water quality and flooding become more important in highly settled areas; upstream–downstream issues are most important where water supply limits productive land use.

There is also a need to improve project design and management in order to increase the participation and commitment of key actors. A major constraint for catchment development is often the willingness/capacity of national governments to act, e.g. with respect to land tenure and payments for ecological services of catchments, including that of water supply.

Challenges include adapting decision support tools for different biophysical and socio-economic conditions, and documenting experiences and lessons learned in order to become the leading organization in this field.

Needs include a specific focus on water and sustainability as they apply to protection of human health and the environment, capacity building of youth through training and rural school curricula appropriate to their environments, and demonstrations of the usefulness of methodologies for science-based project design and monitoring and evaluation.

Opportunities include recognition of watershed management's important role as one of the most important mechanisms to address global climate change and the high negative impact of desertification in a sustainable way. There is also increasing public understanding of the importance of managing watersheds. Information collected during the 1990s will make it possible to assess performance more effectively and compare methodologies and approaches based on actual results.

FAO experiences

The second step of the study was to conduct stocktaking of FAO experiences with watershed management development projects/programmes during the 1990 to 2000 period. The process included review of project terminal and evaluation reports, proceedings of seminars, conferences and workshops, personal and group consultations, and other information sources. The results of the stocktaking exercise are presented in the following according to major topics.

Evolution of watershed management methodologies/approaches over the past decade, 1990 to 2000

The top-down approach, which was prevalent during the 1970s and 1980s, has given way to the grassroots, bottom-up approach. However, it appears that neither of the extremes is the recipe for success. The correct, sustainable approach is somewhere in between. The proper mix would include factors such as biophysical, social, cultural, financial and political considerations for all concerned stakeholders.

The emphasis of watershed management has changed from development of upland water and soil resources to all-encompassing management of upland natural resources, communities and associated infrastructure, with diffusion of the focus and prioritization of objectives. Community development has become a part of many integrated watershed management projects, with subsequent lower priority being set for management of soil and water resources. Technology for soil and water conservation on sloping lands has changed from mostly physical methods to emphasis on biological and biophysical treatments.

To some extent, the transfer of technology has shifted from a major emphasis on training professionals to training the local inhabitants who are directly involved in implementing development activities. Some of the more recently developed technologies are being used for planning and decision-making; e.g., Geographic Information Systems (GIS), global positioning systems (GPS), satellite imagery, management decision-making tools, advanced monitoring and evaluation, and participatory models.

FAO's role in sharing experiences and lessons learned in watershed management

Owing to the significant decrease in FAO field projects and the associated decrease in FAO field personnel, national meetings and technical backstopping, the sharing of technology and experiences at the national and local levels has decreased. At present, the sharing of experiences and lessons learned consists primarily of attendance, and sometimes presentations, at high-level conferences.

There is a need for networking of watershed management technology on the global scale. FAO is lagging behind as other organizations set up their own systems. This is an excellent opportunity and time for FAO to take the lead role in fulfilling this gap.

The International Year of Mountains (2002) provided FAO with a forum to share its experiences in upland watershed development. Regional and national conferences and workshops have also provided fora for information exchange between FAO and national-level professionals. The regional participatory watershed management training project in Asia (1996 to 1999) provided a forum for information exchange between FAO and participating countries. Implementation of the second phase of this project could provide the mechanisms for a sustainable network in Asia, with links on the global scale.

The existing FAO conservation guides are being formatted on CD-ROM for distribution. However, some of these documents were prepared several years ago and may need revision to reflect the current trends and status of technology development and transfer in watershed management. The most recent FAO conservation guide that specifically addressed watershed management was prepared in 1996. Periodic articles on state-of-the-art watershed management topics in journals such as *Unasylva* have provided a mechanism for disseminating information on the global scale.

Decentralization seems to have created a technology transfer gap between FAO headquarters and regional offices. With respect to forestry and watershed management, the flow of technical information between the regions and the relevant central office is lacking. This particular initiative has shed some light on this issue. The causes are most likely multiple and the solutions complex. A detailed problem analysis with subsequent solutions is warranted.

Participatory processes in the planning and implementation of watershed management activities

Global experience has shown that there is no universal model for participatory planning and implementation of watershed management activities. There is a process that would, in most cases, have similar steps. However, this process – which should include all levels and steps of

the participatory process, e.g. planning, design and implementation with all concerned stakeholders – has not been well defined. Bits and pieces of the process have been identified by various projects. The complete participatory process for watershed management needs to be mapped out in a logical manner, tested and refined.

Experience has shown that empowerment of the main stakeholders in watershed management projects/programmes to plan and implement appropriate activities is essential if the project/programme is to have any chance of sustainability. For example, regardless of good intentions, it is not enough for a project to form a community conservation committee at the grassroots level – in isolation from local governments – plan and start interventions, provide technical, financial and other required inputs to the end of the project and then expect the government to make the project sustainable by providing the required inputs into the future. This is a recipe for failure.

Participatory research methods such as participatory rural appraisal, which have been developed and employed on a wide scale in watershed management projects, have sometimes been a good instrument for initiating the participatory process. However, owing in part to the inherent nature of rapid data collection, subjective questions and answers and limitations on statistical analyses and the subsequent extrapolation of findings, the data generated by these rapid survey methods have limitations for use as baseline data for future assessment of project success. In addition, these participatory appraisal methods are only one part of the participatory process. Participatory appraisal methods, if used, should be conducted in proper sequence as part of the overall participatory process.

Participatory approaches and institutional considerations

The pendulum is swinging in support of empowering people with regards to the conservation of natural resources. There are several reasons for this, one being that past endeavours by governments to solve natural resources degradation problems on their own have for the most part been unsuccessful in terms of sustainability. Second, most national governments do not have the human or financial resources for the countrywide mitigation of natural resource degradation. Throughout the world there are examples of successful, sustainable resource conservation being carried out by local communities that have been empowered to manage their land-based resources.

Change is also occurring, albeit slowly, in governments. New policies are being implemented that permit and encourage people's management of their natural resources; e.g. land tenure, user rights, water rights, crop tenure, formal recognition of community groups and committees, privatization of communal lands, rights to the income generated from these conservation activities, etc.

The participatory process requires an active, well-trained field-level extension service in sufficient numbers to carry out watershed management activities on a large scale. The extension component is usually a weak link in the development process.

Gender issues

Review of past FAO projects revealed that gender issues have been a part of watershed management projects. However, the extent to which these issues were addressed has varied and the recommended changes have not always been made. FAO has promoted the involvement of men and women in implementing watershed management activities since the early 1970s. Through time, the importance of directly involving women in these activities has grown. The degree of success of women's involvement has varied for many reasons, including the following:

- *Inadequate project design:* All of the projects reviewed from the 1990 to 2000 period included component(s) for women. However, most of the inputs provided for these activities were minimal compared with other interventions. In addition, the designs addressed only parts of the gender issues in rural environments. Consequently, most of these activities were inadequate in terms of addressing key gender issues.

- *Cultural and social constraints:* Experience has shown that cultural and social constraints are limiting factors regarding rural women's involvement in project activities. Regardless of the level of inputs, these issues have to be considered and project activities designed to fit the norms for a particular rural setting.

- *Policy and legal constraints:* If there is no supporting policy and legislation, the involvement of women in watershed management projects will continue to be limited.

As the empowerment of people movement moves forward, the inclusion of women in the decision-making process is a prerequisite to sustainable development in rural environments.

Impacts of watershed management technologies

Watershed management technologies have proven to be effective for mitigating erosion on sloping land, stabilizing landscapes, providing clean water, and stabilizing – and in some instances improving – agrarian production systems on the small to medium scale. With modification, these existing technologies can be used successfully in most terrestrial environments inhabited by humans. The degree of success of watershed management interventions is primarily a matter of the will of the people and the scale of the activities.

Regarding the *upstream* effects, examples exist throughout the world where upland resource conservation activities have been successful on the micro and macro scales; e.g. micro- to meso-scale activities in Honduras, the Philippines, China, Thailand, Burundi, Nepal, Pakistan, Sri Lanka, India, Bolivia, Peru and other countries, and the macro-project in Santa Catarina, Brazil.

Regarding the effects *downstream*, the impact of upland watershed management activities on downstream water quantity, quality and siltation remains a controversial issue, partly because of economies of scale, and partly because of difficulties in predicting with reasonable accuracy the results of these activities. Until the magnitudes of natural and human-induced erosion and subsequent sedimentation can be quantified with reliability in a watershed, the controversy will remain regarding upstream effects on downstream infrastructures. The same applies to the quantifiable affects of land use on the hydrologic cycle and water supply and quality.

In the meantime, downstream infrastructures such as hydroelectric and/or irrigation dams are being constructed for hundreds of millions of dollars. However, in the past, when watershed management activities were to be carried out to mitigate downstream siltation of these structures, at best a few million dollars were provided to treat all of the contributing upland areas. In many catchments, the upland areas are in degraded condition before the dam is constructed, so implementing small-scale watershed management interventions is like putting a band aid on gangrene; furthermore, the results of poverty level inputs are poverty level outputs.

Sustainability and replicability of watershed management technology

The interpretation of *sustainable* in the context of watershed management interventions is a matter of perspective. Many interventions at the community, household and farm levels have continued after the project terminated. For example, woodlots were still being managed years after projects ended in Pakistan, Nepal, Myanmar, Thailand, India and the Philippines. The same applies to terracing works that have stabilized hillsides and improved agriculture production in China, Nepal, Thailand and Honduras; biophysical gully erosion control treatments that have stabilized gully cutting on sloping lands – structures that were built 15 to 20 years ago are in place and functioning as an energy modifier on the landscape, which was the original intention; and simple low-tech water supply interventions that continue after projects finish. The development process has provided many examples of low-tech and low-cost upland interventions being more sustainable than high-tech, high-cost ones.

Two key factors regarding the sustainability of watershed management interventions are financial and institutional stability/instability. As stated by some of the contributors to this assessment exercise, the "tragedy of the commons" continues to be a problem. Experience has shown that the political, social and user rights issues must be solved on common lands before interventions are sustainable.

The technical solutions available for managing soil and water resources are *replicable*, with modification to fit most landscapes inhabited by humans. These techniques are being used throughout the world. The degree of replication depends to some extent on the degree of technical skills and investment required to implement a technique. For example, high-tech, high-cost torrent/landslide control is replicable to most sites. However, the scale of these interventions is limited by the technical and financial resources available. Whereas, low-tech, low-cost interventions at the community and farm levels have potential for replication on the large scale if local technical skills are available and people are willing to implement the activities.

Important scale factors for upscaling from site, to watershed, to basin, to region include institutions, finances, and cooperation and coordination of all concerned parties. Important factors for out-scaling from plot or demonstration site to local farms and communities include biophysical considerations, finances, and the capacity of local institutions.

Development status of institutional/organizational arrangements, policy and legislative mechanisms

Watershed management is an integral part of natural resources management in many countries; more so today than ten years ago. Some countries give it more attention than others. In Asia and the Pacific and in Latin America it has been institutionalized into existing forestry and agriculture line agencies. The degree of institutionalization varies, from one or more professionals in watershed management such as in Bhutan or the Lao People's Democratic Republic, to watershed management units or divisions such as in Myanmar, Nepal, Honduras and the Philippines. Institutionalization of watershed management in Africa has been slow to develop. The reasons for this lag are beyond the scope of this exercise.

Policy and legislation that support participatory watershed management remain major issues. Governments have been slow to respond to the need for changes in existing and new policies and legislation that enhance upland inhabitants' opportunities for sustainable participation in natural resource conservation interventions. However, some progress has been made, for example: 1) the granting of user rights for communities and households on government lands in Asia, Africa and the Americas; 2) many countries' enactment of tree crop tenure rights that permit individuals or groups to harvest and market products from trees that they themselves have planted (Nepal, Bhutan, Pakistan and other countries); and 3) formal recognition of local watershed resource conservation development groups/committees.

Training and education

Watershed management training and education programmes have progressed significantly during the past decade. The results of a study by Brooks (FAO, 1992) of the Asia and Pacific region indicate that there are many talented professionals. The study also pointed out that there are excellent education institutions in the region. None of the respondents to the global survey stated that there was a dearth of well-trained professionals. The Brooks study pointed out the need for training/education of all the key actors, from policy- and decision-makers to field-level technicians and villagers who are implementing watershed management activities.

The regional FAO watershed management training in Asia project (FAO, 2000) indicated the need for training in participatory methods and interpersonal skills at all administrative, professional and technician levels.

The major training constraint that surfaces in all the study reviews is the need for more emphasis on well-designed training programmes for local government staff and for the villagers who are directly involved in implementing field-level activities (FAO, 1996; Dent, 1996; FAO, 1999).

Evaluation of FAO projects

Eight FAO projects with a watershed management theme that were implemented during the 1990 to 2000 study period were evaluated in the context of the stocktaking part of this study. Terminal and evaluation reports were reviewed and evaluated according to the following criteria:

- scale of operation;
- participatory approach;
- project design;
- major constraints;
- sustainability indicators;
- training;
- technology;
- government capacity.

A summary of the project evaluation is presented in the FAO project evaluation matrix, Appendix 3.3. The results indicate that all of the projects had a community- or group-level participatory component. Project design was unsatisfactory in two projects, with satisfactory performance for the others. None of the projects were rated highly satisfactory. The major constraints varied, but were common to the constraints that have been identified in this overall assessment exercise. Evaluation of project training components indicated a trend towards more emphasis on the training of local-level technicians and villagers. All of the projects had social and biophysical technical components. However, indicators of the performance of these technologies were insufficient for evaluation. Government capacity ranged from unsatisfactory to satisfactory. In some projects, government performance was not clearly defined. Sustainability indicators were not clearly defined in most of the projects. In addition, these indicators were not of sufficient scope and detail in any of the projects to provide clear evidence of sustainability.

Analysis of the results of the FAO project evaluation identified some points that may need attention for the improvement of future projects. These points are the following:

- Project design is lacking: e.g., overdesign in terms of expected outputs; unclear objectives; less than comprehensive design (i.e. a design that includes the required inputs for all of the key actors in the project [FAO, 1991]).
- Performance indicators need to be comprehensive and clearly defined.
- There is a need for monitoring and evaluation procedures at the project and agency levels that clearly link performance with objectives.
- There is a need for sustainability indicators that are clearly defined and linked to project objectives.

Comparison of major watershed management development issues: 1986 and 2002

During 1985–1986, FAO conducted a study on the problems of watershed management in Asia and the Pacific (FAO, 1986a). One of the outputs of this study was identification of major issues and constraints with respect to implementing watershed management development projects and programmes. These major issues and constraints were used as a baseline for comparison with the major issues and constraints that were identified in the current study. The results of the comparison are presented in Table 2.

TABLE 2

Comparison of major issues and constraints, 1986/2002

	1986	2002
Policy, legislation and regulations	The concept of watershed management (WM) had not been introduced into upland strategies or national development policies	WM has become an integral part of upland strategies in many countries
	Coherent policies to promote good WM were inadequate	Some improvements in policy, but it remains a major issue
	Inadequate coordination policies	Coordination remains a key issue
	Legislative and regulatory measures emphasized policing for enforcement	In some countries, enforcement is now being given less importance than empowerment
Institutions and organizations	WM activities were implemented through forest and agriculture departments promoting the formation of separate WM units within government technical sectors	Experience indicates that this approach is preferable to multi-agency responsibility; separate WM departments are not necessary to achieve success; and well-trained WM staff are needed at all levels
Problem identification, programme planning and project implementation	Diagnostic methods were needed for rapid assessment of biophysical and social parameters	Rapid rural appraisal method developed and used globally
	Scope of WM activities was often not clearly defined	Failure to define scope of WM activities remains an issue although further diffusion of objectives and activities has occurred, with inclusion of integrated rural development
	WM planning methods overemphasized biophysical elements and inadequately considered social and cultural issues	Social and cultural issues have become an integral part of WM planning
	Inadequate economic analysis of WM programmes	Economic analysis models remain inadequate
	Absence of operational guidelines to overcome conflicts between project objectives and administrative organizations	Little progress on making operational guidelines
Monitoring and evaluation	Monitoring often started after, rather than before, projects started	Pre-project monitoring is still rarely carried out
	Monitoring was often inadequate to evaluate achievements and outputs	The advent of verifiable indicators in project design has improved monitoring and evaluation
	Social and cultural factors not covered	Project design considers social and cultural factors
Training and education	Professionals and technicians in WM lacked broad perspective	Good progress, but they still lack people skills
	Curricula copied from external sources, with limited application to local conditions	Many institutions have modified curricula to fit local conditions
	Emphasis on university training, with lack of training for field workers	Emphasis now on training field workers, But training of local people is lacking
	WM is mostly ignored in primary and secondary education	Conservation of natural resources is taught in many elementary and secondary schools throughout the world
	Hardly any planning for development of technical personnel in most countries	Still inadequate technical personnel planning

TABLE 2 - continued

	1986	2002
Research and demonstration	Relationships between technical and social benefits of WM were not clearly understood	Remains an issue
	Causes and effects of watershed degradation in highly populated watersheds were not fully understood	Remains an important issue
	Scarcity of well-designed demonstration watersheds	Demonstration watersheds established, but of little use because of unreplicable levels of inputs and other factors
	Need for linkages among research, demonstration, extension and educational organizations	Remains an important issue
Awareness raising	Inadequate public awareness campaigns	Public awareness campaigns are an integral part of conservation education worldwide
	NGOs are not being used effectively for awareness raising	NGOs are involved in all aspects of WM
Extension	Extension networks were one of the weakest links in WM	Still an issue, although there is more resource conservation and WM extension in many countries
	Majority of extension workers had inadequate training in conservation extension	Training of extension workers is common in many countries
	Weak linkages among extension, research and training	Remains an issue
People's participation	Large deficiencies in methods used to ensure participation	Participatory processes widely used. However, the total process, including all stakeholders, has yet to be well defined
	Unsatisfactory legal, institutional and organizational approaches to involving local residents in project planning and implementation	Remains an issue, and is a key topic being considered by development practitioners
	Land tenure was a major constraint to community and farmer participation	Significant progress, as rural people have gained more user rights, land tenure and crop rights
	Community-owned land was rarely well managed	Remains a key issue in most of Asia. Reasons for poor management of community land have been documented, but little implementation progress
Investments	WM is a long-term process needing long term investments	Donors and governments are aware of the need for long-term commitments
	It was seen as unfair to expect upland communities to bear costs of WM when most benefits were enjoyed by lowland people	Remains controversial, but note recent movement towards payment to upland dwellers for environmental services provided to lowlanders

Source: 1986 issues paraphrased from FAO, 1986b, Chapter 6 – Issues and constraints

Some of the issues and constraints identified in 1986 remain important today. Some of the institutional, administrative, project planning and research issues listed in the 1986 study have been identified in this current study (Table 1). Progress has been made on several issues and constraints. For example, policy and legislative reform is occurring. Improvements have been made in training and education, awareness, extension, people's participation, and monitoring and evaluation (Table 1).

CASE STUDIES

A literature search was conducted for case studies that had been prepared for projects with watershed management as a major component. Several case studies were reviewed (Dachanee, Lakhaviwattanakul and Kalyawongso, 1996; Hoang and Nguyen, 1996; Lim Suan and Rosaria, 1996; Rice, 2000; and Warren, 1998). The following two case studies were selected for presentation in this paper: the Begnas Tal and Rupas Tal Watershed Management Project (BTRT), Nepal (Bogati, 1996) and the Project Land Management II in Santa Catarina, Brazil.

BTRT, Nepal

The Begnas Tal (lake) and Rupa Tal (BTRT) watershed management project was funded and implemented over from 1985 to 1994 by the international NGO, CARE. A case study of the project was conducted as part of the FAO regional project on participatory watershed management training in Asia.

The BTRT watershed area comprises about 173 km^2 of land area that includes two main lakes and three minor lakes. The area is about 10 km east of Pokhara in western Nepal. The population is about 31 000. The terrain is hilly with gentle to steep slopes. The area is rural with an agrarian economy. The nearby town of Pokhara is the major population centre of the area.

In the project area, seven village development committees (VDCs) were established and used as the primary mechanism for implementing participatory methods. The local people were involved in planning, implementation, follow-up and maintenance of individual and community watershed resource activities. Watershed management technicians who were part of the external support served as technical facilitators. Community development conservation committees (CDCCs) were organized to ensure people's participation in interventions that were relevant to their particular needs. Every household in the community was represented on the CDCC. The participatory process began with formation of a CDCC, which in turn identified its problems, prioritized its conservation needs and presented these to the VDC and the project office for consideration. At the end of 1994, 100 CDCCs were in operational status. As the project progressed, the need was recognized for a third level of communication and decision-making at the community level. Consequently, a community development board (CDB) was formed at the village level to facilitate communication between the VDC and the CDCC. All members of the VDC and the chairperson of the CDCC are members of the CDB. The end result of this process was a participatory communication pathway of CDCC to CDB to VDC to facilitating agency.

Agricultural diversification interventions have minimized the risk of crop failure and enabled farmers to earn income throughout the year. The average farmer now grows about six kinds of fruits, five different fodder crops, and cereal crops.

Following initial education and implementation by the project, with people's participation, management of natural forests was handed over to the local users. The end result is denser forest lands.

Several conservation farmers adopted improved agriculture practices, which they share with their neighbours. They have set up demonstrations on their farms, and have converted many followers. Homestead agroforestry plots and kitchen gardens provide source of income. Cash crops such as coffee, pineapples, oranges, cardamom, broom grass, vegetables and other fruits are sold at local markets.

Local women are active in forest management and conservation farming activities, and are fully involved in the decision-making process. Three major factors that facilitated active participation of women were: a clear prospect of benefit sharing; support from their families; and the small size of the CDCC.

Overall, the project was considered a success. The participatory model developed in the BTRT area was used by other development projects in Nepal; e.g., the FAO Shivapuri watershed management and fuelwood project. According to Bogati, the participatory model and many of the activities that were implemented during the life of the project have continued after the end of international assistance.

The major reasons for success of the project included:
- clear and transparent decision-making procedures by project management;
- clear and simple guidelines and flexible operational procedures to facilitate people's participation in watershed management;
- well-defined programmes, budgets, plans, implementation procedures and benefit sharing mechanisms;
- integration of a wide range of diversified watershed management activities, and guarantee of benefits;
- strong motivation among project staff.

The main lesson learned by the project are as follows:
- Interest groups for women should be formed for income-generating activities.
- Indigenous technology for the conservation of watershed resources should be evaluated before external technology is imposed.
- Training of leadership skills for local users is needed.
- Training of local users on maintenance of activities is needed.
- Mid-level field technicians should be oriented in project goals, and receive refresher training in watershed management subjects.

Santa Catarina, Brazil

The Land Management project in Santa Catarina was implemented from 1995 to 1999 with World Bank funding. The project objective was to safeguard farmers' incomes and natural resources by increasing agricultural production and income for about 81 000 mostly small-scale farmers, by promoting the adoption of sustainable, modern forms of land management and soil and water conservation, and mitigating existing upland land degradation.

Project interventions centred on the introduction of land management methods that would improve soil and water conservation and the disposal of animal, human and pesticide wastes in 520 of Santa Catarina's 1 700 micro-catchments. The major components included agriculture

extension, research, incentives to share the costs for implementing new methods with farmers, support for reforestation of critical parts of the landscape, rural access road improvement, land-use planning and mapping, environmental monitoring, training assistance to state parks and biological reserves, and project administration.

The overall project performance was rated as successful. Owing to the good performance of the project and the apparent sustainability of activities, a second project is being considered, which incorporates the successful components and lessons learned from the original project.

A case study was conducted on the Lajeada Sao Jose micro-watershed (FAO, 2002), which was one of 520 micro-catchments included in the project. This micro-watershed was chosen for study to illustrate the positive effects of improved land management on land degradation, agricultural production, water quality, and upstream and downstream beneficiaries. The watershed is about 7 744 ha in size, with elevation of about 659 m and slopes ranging from 0 to 20 percent. Total population of the watershed is estimated at 28 375, with a distribution of about 1 057 people in the upland rural area and 27 300 in the downstream urban area.

Improved land use and management (zero and minimum tillage, crop rotation, cover crops, green and organic manure, level terracing and forestation) produced on-site benefits such as reduced soil erosion. Crop production increased (maize by 40 percent, soybean by 21 percent, beans by 3 percent and tobacco by 32 percent) with subsequent increases in farm income. Owing to the downstream environmental monitoring of stream flow, the project was able to determine some of the offsite benefits of the land management interventions. One important benefit was the reduction in suspended sediment levels by 69 percent. This reduction represented a savings in water treatment costs for domestic supply of about US$2 445 per month. This study illustrates that investment in upland watershed management-related interventions can produce downstream economic return.

Some of the important lessons learned during implementation of the project at the study watershed are as follows:

- Active participation and organization of land users are essential factors for success.
- Participatory methods need to be promoted at the micro-watershed level.
- Formal extension to and education of farmers is necessary.
- Existing farmers' organizations need to be strengthened.
- Farmers are most interested in activities that improve farm-level production.
- Environmental education of upstream and downstream inhabitants is essential.
- Decentralization of research and extension is needed.

CONCLUSIONS

Watershed management projects and programmes are being implemented throughout the world. It is considered by many to be one of the important development sectors now, and will continue to be so in the future.

As the trend continues towards empowerment of rural people to manage their natural resources, the integrated, multiple use concepts of watershed management at the community and farm levels with linkages to local and State governments will become more viable.

The watershed management development approach is not perfect in any sense. It continues to evolve with time, with ever-changing development needs. As described here, some of the major constraints that were identified in 1986 are still prevalent today. However, some of those earlier constraints have been removed, or are being given attention by the key actors in development. New approaches such as payment for environmental services are being implemented and tested. The role of national and local NGOs is becoming more important as the participatory approach is being expanded at the community and farm levels. However, the effectiveness of NGOs in implementing sustainable watershed management activities has yet to be determined.

According to Sayer and Campbell(2001), the integrated management of natural resources requires three key elements:

- Management needs to be adaptive.
- Movement along the research–management continuum is essential.
- There must be provision for negotiation among all stakeholders, with interventions that are based on (an outcome) of this process.

Sustained improvement of the well-being of poor people in developing countries, such as farmers, will require natural resource management research that gives more emphasis to: 1) management risks; 2) reduction of dependence on external inputs; 3) avoidance of long-term depletion of production potential; and 4) more careful control of environmental externalities (Sayer and Campbell, 2001).

In the 1990s, the watershed management development sector, to some extent, became ambiguous in context. The basic principles of multiple use management of renewable and non-renewable natural resources, with emphasis on soil and water resources, gave way in some projects to a more holistic, integrated rural development and agriculture production systems approach, with less importance to upland conservation of soil and water resources.

RECOMMENDATIONS

Analysis of the results of this review and assessment study suggests that a paradigm shift is warranted to refocus the watershed management development sector and improve the performance of future projects and programmes. Some of the important paradigm components and recommended changes are listed in Table 3.

TABLE 3

Preliminary recommendations of the FAO stocktaking exercise

Present scenario	Future scenario
1. Treating the symptoms of watershed degradation (i.e. deforestation, soil erosion, siltation, decreasing production) (WRDP-WMIC, 1998).	Identifying and treating the underlying causes of watershed degradation (i.e. lack of knowledge, poverty, population increase, demand for resources, improper land use). More focus on prevention rather than cure.
2. Priority focus on off-site/downstream costs and benefits of watershed management (i.e. downstream infrastructure risk, decrease in floods and sedimentation, increase in water quantity and quality for downstream users).	At minimum, equal priority to on-site costs and benefits of watershed management (i.e. improving and maintaining upland agriculture, forest, and rangeland productivity, water quantity and quality).
3. Inadequate project designs that often overestimate government capacity and assume policy changes will occur.	Project design that provides for adequate government capacity and assures policy changes.
4. Top-down research and development, and transfer of technology to local stakeholders that is driven by donors and education and research institutions.	Emphasis on stakeholder participatory learning and technology development process that builds on indigenous technologies and addresses local research needs.
5. Diffuse focus of watershed management, which often maximizes production of resources/commodities other than water and soil.	Sustainable multiple-use management of watersheds that combines water resources development with compatible economic land-based production systems (i.e. trees, crops, livestock, fish, recreation).
6. Encroachment of integrated rural development approach with multisectoral steering committees and line agencies (which, for the most part, has been a failure) into the integrated watershed management concept.	Multiple-use management of natural resources (renewable and non-renewable), with emphasis on water and soil resources in upland watersheds and with development responsibility given to the relevant line agency.

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