PARTICIPATORY WATERSHED MANAGEMENT : PRESENT STATUS AND FUTURE PROSPECTS[1]

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Introduction - Participation and Watershed Management

Participation: Participation of local people or beneficiaries in development planning and participatory implementation of projects and programs have drawn much attention from the planners, policy makers, politicians and donor communities in the recent past. The concept of participation has become rhetorical and considered as a "panacea" for the problems such as the failure of projects to achieve expected benefits. At the same time it has been observed that different interpretations are given by different people for "participation". For example, Borrini considers participation as an inherited human quality and it connotes: taking part, sharing and acting together. People's participation is nothing more than the basic texture of the life. Historically, human beings have participated in shaping their cultures and survival strategies in a variety of ecological environments and their sharing of tasks an responsibilities took place in self regulated small groups- fifty, sixty individuals who interacted face-to face shared the hunting, gathering, leisure and learning of daily life (Borrini, 1993).

In the recent past, development planners "labeled" participation as the involvement of local people in development projects and programs. Umma Lale (1981) identified participation as: sensitizing people, and, thus, to increase the receptivity and ability of rural people and make them respond to development programs, as well as to encourage local initiatives. It has been claimed that participation is considered a voluntary contribution by people to programs that are supposed to contribute to national development, but the people are not expected to take part in shaping the program or to criticize its content (Community Development Journal, Vol.8 no.02). However, in this paper, it is argued that a participatory process should involve resource users at all stages of a given project or program including, project design, planning for watershed resource use, implementation, monitoring and evaluation and sharing benefits. And, it is proposed that participatory watershed management should be a collaborative process, and based on partnerships between stake holders such as the resource users, Government, organized private sector etc.

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Active participation of both the Government officials and rural communities, or partnerships and collaborative efforts are important to achieve cost effectiveness and success of natural resources management programs. After an in-depth "learning process" and analysis of the Gal Oya farmer organization program in Sri Lanka, Uphoff (1992) concluded that lot of potential exists in both rural communities and in government bureaucracies for promoting "bottom-up" development. Moreover, he argues that "bottom-up" and "top-down" approaches are not mutually excluded: top-down efforts are usually required for bottom-up development.

Watershed: Increasing awareness of world watershed degradation has led to form various definitions on *watershed* highlighting different dimensions, mainly spatial, hydrological, socioeconomic and political. Usually watershed is defined hydrologically as the area of land surface that drains water into a common point in a drainage system. Two of the oldest definitions on watershed has given by the United States Soil and Water Conservation Society (1951). One definition identifies watershed as the total land area, irrespective of the size, above a given point on a water way that contributed run-off water to the flow at that point while the other defines it as a major drainage area subdivision of a drainage basin. These two definitions do not totally agree with each other: the first one says that the size is regardless but, according to the second, watershed is smaller than the drainage basin. Moreover, they both consider only the hydrological aspect and have failed to consider a watershed as a socioeconomic and political unit as well. The FAO watershed management field manual (Sheng, 1990) covers not only the technical aspects but also the sociopolitical aspects more comprehensively. According to this definition watershed is a topographically delineated area that drains in to a point in a stream system or a river. Moreover, Sheng describes watershed not only as a hydrological unit but also as a physical-biological unit. In certain occasions, it has been considered as a socioeconomic-political unit for planning and management of natural resources.

Li Wenhua (1992) too, considered a watershed as to indicate the area of the land that drains into an individual, stream or lake. Thus watershed may only be a few hectares in area or may consist of tens of thousands of square kilometers in area. These definitions relate to the geographical extent, however, the FAO Conservation Guide included a range of natural resources especially, water, soil and the vegetative factors.

For the purposes of this paper the watershed is defined as "the area of land surface that drains water into a common point along a stream or river". Hence the river basin is considered as the highest order watershed. Areas that generate separate streams/tributaries within a larger watershed (or a river basin) can be conveniently defined as "sub-watersheds" and "micro-watersheds". It has been argued that "watershed" be considered as the basic planning, coordinating and implementing unit for natural resources management (or natural resources based development) for the following reasons (Wijayaratna, 1950):

- It is the physical entity geographically defined by the important natural resource, water,

- The ways in which the water is used in upstream affect the ways in which it *can be used* in downstream, and also affect the associated land use,
- Various segments of the watershed are physically and operationally linked,
- It is a logical unit to assess hydrological linkages,
- It is a logical unit to integrate land and water resources management,
- It is a logical unit for a holistic/integrated development approach based on natural resource utilization and conservation,
- Both on-site and off-site erosion effects can be considered,
- It is a logical unit to assess environmental impact,
- It allows to consider socioeconomic and institutional interactions,
- It is a logical unit to integrate the activities of irrigation, forestry, agrarian/support services and agriculture, and
- Sub/micro watersheds can be identified to be managed by local communities/groups and these can be federated upwards to integrate activities, for coordination and to achieve economies of scale.

Watershed Management

United States Soil and Water Conservation Society defines watershed management as the use of watershed lands in accordance with such predetermined objectives as the control of erosion, stream flow, silting floods etc. (US Soil and Water Conservation Society, 1951). This definition considers only the technical aspects. However, later on the definitions have incorporated, production, and socioeconomic, including human factors into the subject area of watershed management. For example, Li-Wenhua had defined (1985) "rational watershed management" as "the management of land and water resource within a watershed to achieve optimum production which can be sustained without causing degradation to the resource base or disturbing the ecological balance (Li-Wenhua, 1992). Even though, this definition has not directly included socioeconomic factors, it considers both production and ecological balance as a requirement of watershed management. The FAO conservation guide and watershed management field manual defined watershed management as the comprehensive development of a basin so as to make productive use of all its natural resources and also to protect them. It is suggested that watershed management is a process of formulating and carrying out a courses of action involving the manipulation of a watershed to provide goods and services without adversely affecting the soil and water base. Further, it advocates that watershed management must consider social economic and industrial factors operating within and outside the watershed area (FAO Watershed Management Field Manual 1990).

Watershed Problems

Severe effects of watershed degradation are challenging the sustainable development efforts of many countries of the world. Watershed erosion had caused serious off-site effects such as the siltation of reservoirs, consequently affecting hydropower generation and downstream irrigation. In addition, on site effects, includes the reduction land productivity and agricultural production. Loss of land productivity may also lead to

extensive and destructive uses of land. For example, slash and burn cultivation without an adequate fallow cycle leads to loss of soil fertility and this in turn result in more and more encroachments by inhabitants. Watersheds are also threatened by the encroachment of farm population, firewood collection, large-scale commercial logging (more often than not illegal), road construction into virgin areas, major civil works such as dams and highways and the conversion of forest to plantation.

FAO report on Natural Resource for Food and Agriculture in the Asia and Pacific Regions has emphasized the severity of region's watershed degradation problem and commented that the Asia and Pacific regions support over the half the world's population, and nearly 50% of them live in mountain areas experiencing serious environmental degradation. Population pressure in uplands is leading to degradation of watersheds. As a result, the other half of the population living in the plains suffers from floods and droughts and the waterways, harbors, reservoirs and water development schemes are affected by sedimentation. The entire economy of these droughts-prone areas is subjected to periods of emergency as mountain watersheds loose their capability to hold water and regulate river flows (FAO 1986-7). Further more, off site effects, including water shortages for downstream irrigation as well as hazardous floods, due to watershed degradation are common in many areas.

Participatory Watershed Management Experiences in India and China

India: National government, state governments, international funding agencies and NGOs are working in several areas with local people in improving watershed resource use. Some of these are participatory watershed management projects. Salient features of these projects are:

- Usually the watershed projects consider water conservation as a priority area;
- Conservation activities have been coupled with income generation activities, day to day life style and with the local social structure;
- In many of the participatory watershed management projects, agriculture and forestry are taken as key areas of people's participation;
- Application of biological conservation measures and simple low-cost mechanical measures are being considered as important elements;
- In many of the successful projects, success is largely attributed to the leadership quality and dedication of some key people attached to the Government, an NGO or local communities.

Watershed development in India is a recent phenomenon. And, the severely degraded watersheds require well planned long-term interventions which would be extremely difficult to implement by the Government alone. Hence, especially in a country like India participatory programs need to be given priority. Also, because of the difficulties in funding and because most of the watersheds are inhabited by a large number of small farmers who are at subsistence levels, India may have to continue to rely much on low cost technologies.

China: It is reported that the Chinese people have a history of forced participation of soil conservation, with the influence of king or under communist system, until the recent past. Nevertheless, it is accepted that in China, although watershed management is continuing to progress through stages of refinement, it is not a new concept. The early Chinese recognized the importance whitewashed management and, in particular, the importance of maintaining forest cover. For example, as early as 1600 BC, Chinese Emperor Yu implemented a major forestry program to "control erosion and floods" under the slogan "to protect the river, protect the forest" (Brown and Beschta, 1985 quoted by UNDP/FAO, 1986). The country's population is about 1250 million people and the average per-capita land availability is about 0.1 ha. Further, 43% land area is mountainous and hilly. Watershed degradation is severe; for example, the average annual sediment discharge of *Yellow* River along is 1887 million tons. However, China has made a remarkable progress in the field of watershed management using various strategies including participatory approaches. According to Wu-Deyi (1996), China has made an accelerated progress in the area of watershed management in the last ten years. Some of the significant supporting policies include: a) a household based management system in which land management has been carried out by the individual household through a contract system, b) a conservation system in which number of watersheds were comprehensibly managed to get multiple benefits and c) the integration of short , medium and long term benefit generating from conservation measures. The land productivity and per-capita income of farmers have increased by 100-200% with the implementation of comprehensive management system of small watersheds.

Economic and social policy changes under the new concepts adopted by Chinese have led to a rapid progress in the field of Participatory Watershed Management. Despite the fact the ownership of land is vested with the Government, participation of the resources is encouraged by different types of land management contract systems, which could be agreed by the farming community according to their desires. Farmer's contribution to participatory watershed projects has risen up to 60-70%. The strategies that contributed to these achievements include: family level watershed land development contract system, collective or group contract system, professional family contract system and responsible participation of the government officers (Wu-Deyi, 1996).

Watershed Management in Sri Lanka

Agriculture accounts for nearly 25 - 30% of the Gross National Product and remains to be the main employment provider of the Sri Lankan economy. With the restoration of the ancient irrigation systems, Mahaweli Scheme and the construction of other new irrigation systems, Sri Lanka has exhausted the most promising and cheapest sources of irrigation supplies. At the same time degradation of the catchments of many of these reservoirs, some of which also serve as power generators, is continuing at an alarming rate. Hence there is a growing emphasis on the need for watershed management in the central hills and the other watersheds in the intermediate and dry zones.

The Upper Mahaweli Catchment (UMC), in the central high lands of the country which covers an extent of about 3125 km2 is the source of the country's largest river the Mahaweli Ganga and the watersheds of Kotmale, Victoriya, Randenigala, Rantembe and Polgolla reservoirs. Because of the severe catchment erosion, Pollgolla has sedimented 44% of its volume after 25 years and sedimentation of Rantembe is 4-6% per annum (Manthreethalaka and White, 1995). The magnitude of the problem should be viewed in the context of the expected services of Mahaweli reservoirs: it is expected to provide water for about 125000 farm families in the settlement areas and also provides 52 % of the country's electricity supply to the national grid.

Furthermore, except Mahaweli reservoir, there are about 200 major irrigation schemes and 13000 minor tank schemes functioning all over the country. Many of these schemes, too, are seriously affected by siltation. The feasibility report of the Asian Development Bank funded NorthWestern Water Resources Development Project (ADB-NWP/WRDP) highlighted the siltation of the tanks is one of the major problems faced by the many irrigation schemes (ADB-NWP/WRDP, 1990).

Managing these watersheds including the adoption of soil and water conservation measures is important in order to protect the reservoirs and to increase the long-term agricultural productivity. Attention has been drawn by the Food and Agriculture Organization, FAO, to the higher rates of erosion rates and their impact on productivity of the land and the sustainability of the farming systems and development projects (Stocking, 1996). Non protective land use and agricultural practices including chena cultivation, tobacco cultivation as well as such events as overgrazing, illicit felling of trees for timber and fuel wood, poorly managed tea states etc., are among the major causes of watershed degradation. Few selected attempts of watershed management are examined below.

Hapuwela Micro Watershed Management Program (HMWMP)

Hapuwela micro watershed is situated about 40 km east to Kandy in the mid - country intermediate zone, with an average rainfall of 1500 mm falling mainly in the North-East monsoon period. The geographical extent of the area in 264 ha and elevation vary from 1400 to 1500 meters, with rolling and undulating terrain. Land use comprised of tobacco, vegetable and marginal type Kandian forest gardens, in the uplands and irrigable paddy in the valley bottom. There are 477 households in the area with an average size of 5 members per family and an average family farm is less than 0.5 ha for both upland and low land. Agriculture, animal husbandry (with free grazing), off-farm activities are the main economic activities. It should be noted that 87% of the families are food aid receivers. Community organizations include village development society, funeral society and young farmers clubs etc. However, these are not strong and nothing much has been done on natural resources conservation.

Watershed Problems: About 80% of the people have experienced soil loss on their fields and consequently crop yield reduction. Land degradation has influenced their agricultural

decisions, notably the selection of crops and farming practices. For example, most of them farmers cultivate vegetable and tobacco on lands with slopes over 30%, with least or no conservation measures. People have experienced water shortages in their wells during long dry spells. Agencies working in the area have not emphasized much on soil and water conservation.

Approach and Implementation: Initial area selection was done by considering physical factors like slope of the terrain, erosion rates, land use and socioeconomic factors such as poverty, income distribution as well as the availability of rural infrastructure. Farmer participation has been observed during the planning workshops organized by the UMWP. Further, they participated lively at meetings and made their comments on the activities.

Implementation activities initiated with the environmental awareness program followed by the introduction of various soil and water conservation measures such as Sloping Agricultural Land Technique (SALT), mulching, stone terracing and gully control measures. Field level activities were carried with the help of the government line agencies, non-governmental organizations, watershed level farmer groups and the field staff of the UMWP and extension officers. Moreover, one field officer of the UMWP permanently resided in the catchment area with the purpose of improving the coordination and contact between farmers and the management. Incentives were given for agreed conservation activities and UMWP contributed for infrastructure development activities.

Progress: Initial planning workshop was a good starting point to get the views of the people on watershed degradation, but most of them are not priority watershed degradation issues. Their main concerns were road development, pipe borne water, school building and so on. Beneficiary participation in terms of free labor through *sramadana* was high during the project period, but this was drastically reduced towards the end of the program. This implied that they have not understood the reality or the core problem of the watershed degradation and consequences. Farmers were not much serious in doing soil conservation to avoid siltation in the Victoria reservoir.

Towards the end of the program there was a tendency for people to depend much on incentives for conservation works, and many farmers expected every thing free of charge, an attitude which has existed for a long time (Decurtins, 1995). Further, poor relations between institutions, conflicts among villagers due to political differences, implementation problems through line agencies and problem of law enforcement on various watershed management issues were among the main obstacles during the implementation period.

Watuliyadda Watershed Management Program

Watuliyadda village is situated about 45km. East to Kandy, on the immediate left bank of the Victoria dam. The area belongs to the intermediate zone and therefore climatic pattern is as same as Hapuwela watershed. The geographical extent of the area is about 120 ha.

and elevation varies from 1100 to 1450 meters. There were 134 households in the village with an average of five members per family and household land ownership was less than one ha. for both upland and lowland. Agriculture was the main livelihood with less off-farm activities. Land use comprised of Kandian home gardens, vegetable, tobacco, and paddy. Several village organizations have been observed including village development society, school development society, and funeral society. It has been observed that these organizations are comparatively better than in Hapuwela.

Watershed Problems: Like in Hapuwela, watershed degradation was observed to be severe and due to population pressure people have encroached more land in the surrounding government forests.

Implementation of Watershed Management Interventions: The objective of the program was to initiate action to restore the ecosystem. The strategies used were: awareness building, training, mobilizing human and other local resources for action with maximum farmer participation and minimum external inputs. The project promoted farmer-farmer dialogue and interactions, attempted to cultivate self-reliance, facilitated ecosystem restoration planning through animators and tried to obtain support from other programs. A detailed PRA mapping exercise was conducted.

Progress: Even though most of the planned inputs of the project had been provided during the project period, due to factors such as: shortcomings in the line agency activities, inadequate services of the animators etc., project could not achieve the expected benefits. Encroachment in to forest, forest fires etc., continued. However, farmer participation in project activities has bee successful to certain extent.

The Asian Development Bank - North Western Province Water Resources Development Project, ADB-NWP WRDP, -- Watershed Management program

The ADB assisted North Western Province Water Resources Project commenced in 1992. In the past five year period the project was provided with financial and other resources to rehabilitate and improve about 630 minor tanks and 33 major/medium tanks. Under the environmental management component of the project, two pilot watershed management mini projects have been implemented in Wilgamuwa and Patapola. These two are micro watersheds and Wilgamuwa is selected for a brief analysis. Wilgamuwa is located nearly 27 km. Southwest of Kurunegala in the Alawwa Divisional Secretariat area. The area is in the wet zone and the annual rainfall is about 2500 mm.

The land area is 88 ha. With sloppy terrain and the elevation ranges from 47 meters to 170 meters (above sea level). Degraded forest, poorly managed coconut home garden is the major land use patterns. There were 49 households in the micro watershed and the total population was about 260 people. Upland cultivation and off-farm employment were the main livelihood of the inhabitants. Several of village organizations were present but conflicts, mainly due to political factors, were common.

Watershed Problems: Wilgamuwa micro watershed has been degraded and it was clearly evident from rill and gully formation, loss of top soil and resulting problems associated with cultivation and siltation of the tank, downstream. Nearly 60 % of the tank capacity has lost due to siltation. Forest fire has been recognized as another problem and it removes ground cover, which in turn result in enhanced sheet erosion. Over grazing, poor land and road management etc., were also identified as causal factors for environmental degradation.

Watershed Interventions: When the ADB-NWP WRDP started investigating for the development / rehabilitation of the Wilgamuwa small tank and the distribution system, it discovered the status of catchment degradation and associated siltation problem. The project initiated discussions with water users (in this case the farmers) and the users were willing to collaborate. The planning process has been participatory and much similar to that of Watuliyadda. However, farmer participation at Wilgamuwa has been better: they agreed to form and strengthen the farmer organization, contribute labor for most of the items included in the development process and to work closely with the relevant government organizations.

Participatory Rural Appraisal procedures have been used for diagnostic analysis and to enhance farmer collaboration. Implementation of the plan was begun in 1995 and despite the drought situation prevailed in 1996; the project recorded a considerable progress by 1997. Improvements effected by the resources included: installation of mechanical barriers in gullies, tree planting, establishment of biological soil and water conservation measures (such as Sloping Agricultural land Technologies, SALT, hedges, live fences and brushwood work for water conservation etc.).

The degree of participation and collaboration of different government organizations had been different; certain institutions did not pay much attention to the program while few others actively played a partnership role. Encroachment of state land and political disputes can be quoted as major problems confronted. However, a significant progress had been observed in such areas as: farmer collaboration in conservation based production, participatory monitoring using simple indicators of soil erosion, home garden development and use of appropriate technologies (especially biological methods) in conservation etc.

Shared Control of Natural Resources, SCOR, Project

Shared Control of Natural Resources, SCOR, funded by the United States Agency for International Development (USAID) has been implemented by the International Irrigation Management Institute (IIMI) in collaboration with the Government of Sri Lanka, resource users and Non-Governmental Organizations. SCOR) aimed at developing and testing a holistic approach to integrate production goals with environmental and conservation concerns. The underlying theme of SCOR action research was to "learn from action". The project considered watershed management as the process of (participatory) planning/formulating implementing and monitoring/adjusting and evaluating a course of

action involving natural, human and other resources. Therefore, the project believed that an integrated/holistic watershed management approach should consider those physical, socioeconomic and institutional linkages that exist between upstream and downstream of a river basin/watershed, and between systems within watershed.

SCOR Approach: With watersheds as basic units, SCOR operated at multiple levels with different organizational/institutional arrangements. At the lowest level, the sub- or micro-watershed, which typically includes a couple of villages, the local officials, the resource user groups/organizations, and SCOR catalysts/change agents, interacted to understand the present resource use pattern, combined indigenous and external knowledge, developed a vision for the future and translated it into action plans. At the divisional and watershed levels, the officials, representatives of farmers and SCOR professionals discussed plans emerging from grass roots levels.

The project has selected about 25 sub-watersheds ranging from 75 ha to 600 ha. for interventions. In the sub-watershed, a participatory appraisal of the characteristics of resource uses and users as well as mapping of current resource use were done by groups comprising of resource users, NGO, Government agencies and SCOR project team. Subsequently, a participatory resource management "mini project" was formulated. The "mini-project" aimed at changing the present land and water use pattern to a more profitable yet environmentally sound resource use.

Progress: Analysis of progress in the first four years of project implementation revealed that the project has achieved significant outputs in farm production, enhanced farmer incomes and profits, policy impacts and to some extent, outputs related to natural resources conservation. Farmers were exposed to new knowledge on conservation farming. Farmers have adopted selected conservation measures -- notably, organic bunds followed by earth bunds on contours and produce cash crops such as soybean and maize for identified markets through forward contracts. In addition, valuable timber trees have been planted to provide security for the future. Many farmers tried out mulch farming using straw in rice fields raising a crop in the dry season for the first time in their village.

Problems and Prospects: However, in both watersheds, achievements in regard to the adoption of conservation practices have been below the expectations. For example, farmers could not cover the entire landscape with conservation measures during the 5-year project period. There exist significant variation across farms in regard to the quality of conservation measures such as the contour bunds. Nevertheless, it is too early to evaluate the sustainability of conservation measures. Moreover, as farmers are increasingly producing for identified markets through forward contracting mechanisms and as they get a better price, they may invest more on technologies that would enhance the sustainability of production. Therefore, such an approach may be considered as a "market oriented conservation" strategy that may have the potential of replacing "subsidized conservation." (Wijayaratna, 1998).
In a process of participatory and market-oriented natural resources management, resources users grouped and united for various purposes, ranging from groups for fish

farming through small hydropower plants (coupled with conservation of the corresponding hydro catchment) to production companies. Four farmer companies have been formed during the project period they are responsible for organizing conservation-based production processes for special markets, capturing economies of scale in input and output markets, collection, storage, quality control and value-added production. Companies have already established new partnerships between farmers and state and between farmers and the private sector.

The significant policy changes initiated by SCOR includes: grant of usufructuary rights for using state lands; Government's acceptance (as a declared policy) of small farmer companies and follow up action; decision to establish a "legal" agricultural settlement incorporating "illegal encroachers" of Government land in the upstream of Huruluwewa watershed; recognition of watershed-based farmer organizations by the government, even though they are not coterminous with administrative boundaries; extending the mandate of the Irrigation Management Division of the Ministry of Irrigation, Power and Energy, to manage watersheds; decision by the Cabinet to offer contracts for supplying maize and soy bean (for the requirement of a Government program) to farmer companies etc.

Lessons for the Future

The rationale for using the watershed as the basic unit for integrated planning of (land and water) resources utilization is clear. The watershed is a physical entity geographically defined by an important natural resource, water; the way in which the water in the upper parts of the watershed are used affect the ways in which it can be used downstream, and they affect the associated land resource.

The experience of Hapuwela, Watuliyadda, ADB-NWP/WRDP and SCOR as well as the experience elsewhere suggest that a participatory watershed management approach is more effective when the watershed is occupied by people, especially small farmers and when their day-to-day activities are largely responsible for watershed degradation. It has been pointed out that the most glaring gap in watershed management is, that most professionals and trainers do not know the process to make them farmer programs (Sharma, 1997). Collaboration or partnership between actors, mainly the resource users, government officials and project implementers, is important at all stages of watershed management including the design process, implementation, monitoring and evaluation and the identification of constraints and their removal.

The basic concept, direction and goals may be the same for all participatory watershed management programs. However, the strategies, activities and action may differ from one watershed to another, depending on the technical (including biological), socioeconomic and political differences. This implies two important propositions: every participatory watershed management program is a "novel learning process" and it is essential that socioeconomic, technical and political characteristics should be studied prior to the formulation of action plans. Hence, a pure top down or a blue print approach should be

avoided. Instead, planning should be based on a learning process[3] starting with a participatory assessment of present resource use pattern, a participatory diagnosis of reasons for watershed degradation and participatory evaluation for alternative intervention strategies followed by carefully designed action plans. In the process of diagnostic appraisal, the conventional PRA/RRA and associated mapping processes can be modified and advanced techniques could be used in countries like Sri Lanka, because secondary information and maps drawn to scale are available and also because the literacy level of users is high.

Another important lesson learned is that, simple but effective progress monitoring indicators can be used. Such indicators on watershed degradation including soil erosion, reservoir sedimentation, reduction of soil fertility and crop yields, changes in the type of vegetation etc., can be submitted/developed by both the intervention team and resource users agreed upon at the participatory appraisal and planning stages. In designing production and conservation interventions and in formulating monitoring and evaluation indicators, it should be recognized that both indigenous as well as external knowledge are important and should be respected.

It is recommended that crops/enterprises with economic value should be included in a program of changing land use aimed at conservation. This need to be linked with the adoption of simple soil and water conservation measures and conservation farming techniques. Participatory monitoring, using simple indicators to identify and understand such processes as: tank bed siltation, soil erosion, magnitude of rill and gully formation, changes in weed composition (due to changes in micro environment), decline in upland productivity etc., should be an integral component of such a program.

Inadequate coordination among the relevant institutions was seen as a major threat to watershed management programs. Watershed resources belong to various ministries, departments and statuary bodies. This has been further complicated due to the lack of clearly demarcated responsibilities between the central Government and Provincial Councils. This situation affects watershed management decisions and need to be resolved.

[3] Learning and building awareness are important for both parties – resource users and "implementing agencies" or intervention teams.

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