

# **PARTICIPATORY WATERSHED MANAGEMENT FOR SUSTAINABLE RURAL LIVELIHOODS IN INDIA**

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## **ABSTRACT**

International development goals moved beyond increasing food production to include poverty reduction and protecting the environment in a sustainable way. Degradation of natural resources due to exploitation coupled with population pressure in developing countries causing food insecurity and environmental degradation further. Participatory watershed management approach is proposed to address this problem effectively.

**Keywords:** Participatory watershed management, livelihoods, impact

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### **Background**

As the international development goals have widened from merely increasing food production to include poverty reduction and environmental sustainability, protecting the environment is a big challenge for developing nations, and greater emphasis should be given to check the exploitation of the natural resources base. Soil erosion and land degradation coupled with declining per capita availability of land and freshwater are posing serious threat to environment. This is becoming more intense with the burgeoning population causing food security problems in developing countries. Hence careful and concerted efforts are needed for efficient and effective management of natural resources for increased productivity of the soils.

Several government and non- government agencies have launched watershed development projects to tackle some of these generic problems with the objectives of soil conservation, improving the land productivity and promoting appropriate technologies for efficient and sustainable use of natural resources. However, many watershed projects around the world have not performed well because of the poor community participation (Johnson et al., 2001). The key to the success of any watershed project and its sustainability depends on people's participation. For achieving the desired participation of people, the roles of community organizations, groups and other stakeholders are crucial. Local people must play an active role starting from project design, moving to implementation and the project maintenance. In this context, a participatory watershed

management approach is considered as the ideal for achieving food security and sustainability.

### **History of watershed development in India**

The development of ideas on sustainable livelihoods was witnessed during 1990s. These grew from awareness that rural development approaches based purely on agricultural production were insufficient to meet the livelihood needs of the rural and landless poor. Agricultural land and livestock frequently generate only a portion of rural livelihoods, which are *not* primarily agrarian or land-based. Other forms of income generation, perhaps derived from migration, part-time trade or handicraft production may make a large contribution to an individual's or a household's livelihood. Instead of considering land or water and its potential for development, attention was given instead to people's needs and their priorities for development, which is challenging for land-based development projects, such as the watershed development program.

A watershed is a logical, natural planning unit for sustainable agricultural research and development particularly when environmental considerations are emphasized. Hydrologically, watershed could be defined as an area from which the runoff drains through a particular point in the drainage system.

India began to look at the watershed development programs in the 1970s for increasing land controlling land degradation and increasing the productivity of soils. In the 1970s, watershed development held no special significance for the development community in India, however by the end of the 1980s the situation changed radically. Initially watershed projects were concentrating on soil and water conservation issues. A decade later, it became apparent that technical and physical works alone would not lead

to the desired objectives of watershed development and it must also take into account the social, financial and institutional aspects of rural development. Watershed programs have been established over a diverse range of rain-fed agro eco-regions in India. Watersheds in India are broadly grouped into five agro-climatic zones: (i) Trans-Gangetic Plain zone, (ii) Western Himalayan zone, (iii) Western Plateau and Hill zone, (iv) Gujarat Plains and Hill zone, and (v) Southern zone. Due to inherent heterogeneity of agro-climatic characteristics over different regions, they have divergent potentials and opportunities. Depending upon the size of the watersheds, these are broadly divided into micro and macro watersheds. Watersheds with areas up to 1250 hectares were classified as micro-watersheds, whereas the macro-watersheds were those, of greater area.

In 1994, the Ministry of Rural Development (MoRD) of the GoI produced a set of guidelines for implementing its watershed programmes, which aimed to tackle the concerns related to the realisation of the full benefits of watershed work. This progressive policy was essentially people-centred and it incorporated good practice from NGO and government policy, such as awareness raising, bottom-up planning, partnerships with NGOs, and community participation. Since 1994-95 Ministry of rural areas and employment, government of India has spent over US \$3.5 billion and implemented nearly 10000 watersheds. Currently about US \$200 million is allocating annually for watershed development in India.

### **Weaknesses in the conventional approach**

The traditional system of natural resource use in rural communities has significantly evolved over the years. In the past, priority of watershed management was given to the Biophysical frame work of watershed which is often based on top-down

approach (Rhoades and Elliot, 2000). However in the traditional system, local people were not often consulted in the design of top-down approach, which resulted in failure of projects in achieving the project goals. Watershed projects are more efficient and effective when users are given a role in managing their own watershed resources (Johnson et. al, 2001).

User participation has a lot of implications for watershed management and research. There was hardly any scope for learning in the traditional approach and there would be tendency towards giving priority to the biophysical frame work of watersheds justified a top-down planning approach. Planning in the traditional system was often based on the capacity of land rather than needs and capacities of local people (Rhoades and Elliot, 2000). This produced a mismatch between local population and outside watershed project managers and no flow of information between land users and other key actors such as researchers, planners and policy makers etc.

A major challenge in the traditional watershed management approach was the assumption of technology transfer instead of development of technology on peoples land and their surroundings. Another important weakness was regarding the training and research where the major responsibility for training has been given to agricultural research institutions and agricultural universities, which are sound in technical aspect of watershed but are weak in social science aspects of the institution building as well as forging links with non-farm sector to generate value added products from watersheds (SRISTI, 2005).

Another key weakness is ignoring local knowledge on local soil types and conditions for suitability of technology to the specific soil while designing and

implementation of the projects. It would be better to adopt on-farm research trails for watershed projects designed and implemented jointly by users, scientists and other stakeholders. Farmer participation in the on-farm research will provide an interactive mode so that both scientists and farmers can decide on the conduct of trials and technology to be tested, and active participation of stakeholders in the research that is important for successful adoption of technology.

In the conventional approach people's participation often limited to project implementation stage and no focus on institutional building for long term collective management of resources (Joy et. al, 2004). In many watersheds excessive emphasis on engineering structures, soil and water conservation measures.

### **Paradigm shift**

Earlier resources were allocated by the central and state governments for watershed development and which are supply driven. This top-down approach was not conducive for including the stakeholder's participation in designing the programs that are targeted to their improvement. There was lot of mismatch between the needs of the stakeholders and the activities for implementation of watershed development. Such watershed projects often failed to achieve the intended targets in the absence of peoples' participation. Realizing this, participatory watershed management has emerged as a new paradigm for watershed development in India. This paradigm shift was expected to contribute towards more decentralized governance and increased participatory approaches to natural resource management that will rise to face the new challenges by strengthening the capacity of local people.

## **Participatory watershed management and its evolution**

Participatory watershed management has emerged as a new paradigm for sustainable rural livelihoods and it occupied the central-stage of rural development in the fragile and semiarid environments of the developing nations. The concept of participatory watershed management emphasizes an inter-disciplinary, inter-sectoral and multi-institutional mechanism (Rhoades and Elliot). Participatory watershed management has been defined as a process “which aims to create a self-supporting system, which is essential for sustainability” (Wani et al, 2005). Participatory watershed management provides opportunities to the stakeholders to jointly negotiate their interests, set priorities, evaluate opportunities, implement and monitor the outcomes. This concept came widely into practice in late 1980s and over the time peoples' institutions, like zilla parishads (district revenue administrative units), self help groups, and watershed-implementing committees were gradually involved in the project management system. With allocation of more funds for watershed development, several non-governmental organizations came forward to aggressively participate in implementing the watershed programs.

In India, participatory watershed management has roots in the non-government sector that go back nearly as far as the government programs. The seeds of the participatory watershed management can be traced to a small village called Ralegan siddhi in Maharashtra state of India. Anna Hazare, a local leader was responsible for bringing many social changes in the village particularly soil and water conservation measures besides family planning, a ban on alcohol, protection of non arable lands against open grazing and felling of trees and voluntary labor for community welfare and other measures which helped in restoring natural resources base of the village (Kerr et al,

2002). This ultimately led to people participation in watershed management and the evolution of participatory watershed management looking beyond just the biophysical aspects to also focus on social and institutional aspects following a bottom up approach. It is now widely accepted that the communities must participate to enhance the productivity of natural resources in a sustainable fashion (Turton et al, 1998).

### **Management and institutional set up**

The management structure and the institutional setup appears to be complex and it is better to look at the institutional arrangements in implementing participatory watershed development program for understanding the impact of participatory watershed management better. The series of steps followed for forming watershed committees are presented below.

Management of watershed development in India evolved significantly over the past three decades. During the 1970s to early 1980s, the main concentration was largely on biophysical criteria. In late 1980s there were some significant changes looking beyond soil and water conservation to include improving the productivity of natural resources. In 1994-95 Ministry of Rural Areas and Employment, Government of India came up with strict guidelines to achieve multiple objectives including productive, social, ecological/environmental and equity issues to achieve optimum utilization of the watershed's natural resources; employment generation and development of other economic resources in the village; easy and affordable solutions and social condition of the resource poor, respectively. The present guidelines outline the various implementation stages of the watershed development projects, the operational procedures



and provide sufficient operational flexibility at State, District and Project levels to enable them to respond to differing situations and aspirations of the village community.

The 1994 Guidelines assumed new arrangements for allocating funds and managing projects. The District Rural Development Agency (DRDA) or *Zilla Parishad* (ZP—district level council) was made responsible for the overall responsibility for program implementation in the concerned district. They appoint watershed Development Advisory Committee to advice on issues like selection of villages, training and monitoring. PIAs (Project Implementation Agencies) are selected by the DRDA and the programs requires formation of Watershed Development Teams (WDT) of technical experts like civil or agriculture engineers, agronomists, soil scientists etc. to assist watershed committees. The WDT works closely with the rural communities in planning and implementing the watershed program. Each WDT is expected to handle 10 micro watersheds. The Watershed Association (WA) represents all members of the community who are directly or indirectly associated with the watershed. The WA appoints a watershed committee (WC) consisting of representatives of user groups, self help groups, the *gram panchayat* (elected village assembly) and the WDT. Secretary from each committee is responsible for maintaining accounts and records. Funds flow directly from central Government and state government to the DRDA/ZP.

Partnership based community participation is central to the watershed program and the guidelines lay down a detailed planning process. The guidelines also encourage the involvement of users groups (UGs) and self help groups (SHGs). Each team is expected to conduct a participatory rural appraisal to identify potential programs and concerned user groups. This leads to the development of a watershed development plan,

containing details of various activities, lists of user groups, funding requirements and users' contributions. The plan is approved by the WA and then submitted to the DRDA through the PIA. These new guidelines also aim to promote up-gradation and adoption of low cost local technologies and materials and emphasize the importance of people's participation in the programs and the need to improve technical as well as management skills of project staff and the village community

### **Analysis of the impact of participatory watershed management**

In recent years, many developing countries have adopted watershed development approach as part of their rural development strategy. For example the Government of India with the help of external donors, extensively undertaking the watershed development programs in the dry and semi-arid regions as a means of addressing soil erosion, drought rural unemployment and poverty. It was anticipated that watershed programs would augment farm income, raise agricultural productivity and conserve soil and water resources through the process of participatory watershed management.

Watershed programs were initiated over a wide range of agro eco-regions of India. These watershed programs are supported by National governments and also by some international donors. As Rhoades and Elliot noted funding participatory watershed projects was one of the most popular investments by development agencies and international donors in the post-Earth summit years. The new paradigm shift in watershed development focused on achieving the overall goal of enhancing sustainable rural livelihoods for reducing the incidence of rural poverty. Most of the watershed projects were launched for the following purposes:

- Raising farm income

- Enhancing agricultural productivity
- Soil and water conservation
- Generating rural employment
- Reducing risk by diversifying crops in rain fed areas

Several useful studies have been conducted to assess the contribution of participatory watershed programs (Turton et. al, 1998, Kerr et. al, 2002, Wani et. al, 2005, Joshi et al, 2003 and Reddy et al., 2004) and the results from these studies are discussed here.

Many studies revealed that participatory watershed projects had a positive impact on crop productivity. Due to increased irrigated area under watershed area helped in increasing crop productivity (shah, 2001). Productivity gains were reported to be greater in case of rain-fed crops. Average yields of rain-fed crops (e.g. soybeans and legumes) increased by as much as by 280% (Renfro, 2005)

This information suggests that participatory watershed management programs made significant impact in terms of productivity gains in rain-fed areas which contributes to increased farm income and better livelihoods of the poor in fragile and high risk environments. The watershed programs have also helped in improving soil moisture content. Many farmers in the watershed development area reported an increase in soil moisture level (shah, 2001). This improved soil moisture will open new opportunities for diversifying farming activities in rain-fed areas. Due to the watershed programs cropping intensity will be increased significantly and it is observed that cropping intensity is increased by 13-25% (Renfro, 2005).

Another important impact of watershed development was its impact on controlling soil erosion. Many studies have revealed that watershed development

interventions were successful in controlling soil erosion. (Kerr et. Al, 2002) This effect was more significant in case of rain-fed areas as dry lands are more prone to erosion compared to the irrigated lands.

Soil and water conservation measures adopted in the watershed development projects were helpful in augmenting water storage capacity and improving local water resources by reducing the rate of runoff, and increasing the ground water recharge. (Butterworth et. al, 2001 )

Watershed development projects have greater potential to generate employment opportunities to the rural people. This was due to the increased availability of water resources, diversified cropping pattern including cultivation of labor intensive vegetable crops and other horticultural crops (Reddy et al, 2001). This additional employment generation from a watershed program varies across regions depending on the cropping intensity, and the labor intensive crops grown in that region. This additional employment generation in the villages led to minimizing migration of landless and other labor. Thus watershed programs also contributed towards checking migration of rural people to the urban areas. This migration has greater concern for planning and devising rural development strategies.

## **CASE STUDIES**

There were several studies on examining the impact of participatory watershed management programs. We have selected three important case studies and the important results are presented below.

### **Case 1: Farmer-participatory integrated watershed management – Consortium model**

This case describes a novel approach that International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has developed to address the issue of efficient use of natural resources in rain fed areas. The NRM team at ICRISAT led by Dr Wani adopted the participatory consortium model which is a unique model extended to their flagship watershed management project. This model has been adopted with great success in one of the ICRISAT's water shed project at Kothapally village of Andhra Pradesh in India. Consortium approach was an innovative model with a consortium of institutions (local, national and international research and development institutions for providing all the technical support to the NGO's and farmers) was formed for project implementation. In this approach, all the government authorities were involved in the consortium from the beginning. Participation of local community was central to this approach and community participation will be encouraged by various communities. The important element of the model was using 'users pay' principle without giving any subsidies for investments on individual's farm for technologies, inputs and conservation measures.

#### **Impact of consortium watershed model:**

- Sustainable increase in the productivity of crops
- Intensive avenue plantation has come up in wastelands of the project area
- Gliricidia saplings planted on bunds were generating Nitrogen rich organic matter
- Worm farming was helpful to women in generating income
- Significant reduction in runoff and soil loss

- Ground water levels were improved and additional lands were irrigated with additional ground water recharge.
- Crop productivity was optimized by adopting integrated soil, water, crop and nutrient management in the watershed
- Vegetation cover was increased from 129 ha to 200 ha
- With improved technologies farmers obtained high crop yields, particularly in dry lands
- Net returns on rain-fed cereal crops have more than doubled
- Watershed projects contributed towards capacity development of local people
- Finally this consortium watershed model also contributed towards poverty reduction by increasing average household income. (for complete details see Wani et al, 2005)

***Case 2: Impact of watershed program and people's participation using Meta analysis approach***

An important study by Joshi et al was useful and note worthy to mention here. This study was based on the meta-analysis and the authors made an attempt to evaluate the watershed programs and people's participation, some important results of this study are presented in table 1. (For complete details see Joshi et al, 2003)

It can be observed from the table that the mean benefit-cost-ratio of watershed program was 2.14 which indicate that the returns for investments in rain-fed areas are quite impressive. The mean internal rate of return on watershed investments was 22 percent. Another important result from this study is about creating additional annual employment generation in watershed areas was about 181 man days per hectare.

Table1. Summary of benefits from the sample watershed studies.

<b>Indicator</b>	<b>Particulars</b>	<b>Unit</b>	<b>No. of studies</b>	<b>Mean</b>	<b>Mode</b>	<b>Median</b>	<b>Min</b>	<b>Max</b>	<b>t-value</b>
Efficiency	B/C ratio	Ratio	128	2.14	1.7	1.81	0.82	7.06	21.25
	IRR	percent	40	22.04	19	16.9	1.68	94	6.54
Equity	Employment	Mandays/ha/yr	39	181.5	75	127	11	900	6.74
Sustainability	Irrigated area	percent	97	33.56	52	26	1.37	156	11.77
	Cropping intensity	percent	115	63.51	80	41	10	200	12.65
	Rate of runoff	percent	36	-13	-33	-11	-1.3	-50	6.78
	Soil loss	Tonnes/ha/yr	51	-0.82	-0.91	-0.88	-	0.11	-0.99

Source: Joshi et al, 2003.

### **Case3: Sustainable Rural Livelihoods Frame work for assessing the impact of participatory watershed development**

This case study was based on the work by Reddy et al, (2004). This was an interesting study and the authors have adopted sustainable rural livelihoods frame work for assessing the impact of watershed program on the five capital assets. Any watershed development will have implications for all these five capital assets which are measured in different terms.

**Physical Capital** — through increase in durable assets such as house, machinery, livestock and irrigation facilities

**Natural Capital** — through changes in access to or improvements in land, water and other common pool resources (CPRs)

**Human Capital** — through changes in education, capacity building activities

**Social Capital** — through formation of watershed committees and self help groups, women's participation in decision-making process

**Financial Capital** — through savings and other income generating activities

The impact of watershed programs on each capital is presented below.

**Physical Capital** — There was a positive impact on physical capital in terms of enhanced availability of irrigation in the study area.

**Natural Capital** — Impact on this capital asset also was positive. The value of land assets has gone up in all the villages of the study area. There was also improvement in the terms of fodder availability in three of the four sample villages studied. Another improvement in the form of increased availability of drinking water that was greater in case of poor households. The proportion of area under irrigation has also increased marginally among all the households in the sample villages.

**Human Capital** — Impact on this capital asset was little and the expenditure on education was reported to be increased significantly.

**Social Capital** — Since the social development is a complex and long process, the study attempted to assess the social impact in terms of migration and gender. It was reported that migration of people was less during the implementation period of water shed which created additional employment in the villages. The other positive impact was strengthening the self help groups (SHG) through better employment and wages for women.

**Financial Capital** — Impact on this capital asset was positive in terms increased land productivity, increased employment in villages and significant increase in household income. (for complete details see Reddy et al, 2004)

The case studies described above provided sufficient evidence that participatory watershed management program met the desired the objectives towards creating sustainable rural livelihoods in India.



## **Conclusions**

The participatory watershed management is a critical area of rural development that could support rural people in many ways. India's watershed development project is seen as flagship project of Ministry of Rural development, Government of India. Watershed management in India has undergone dramatic change to include greater stakeholder's participation for management of natural resources in a sustainable way. It is increasingly recognized that community participation was central to watershed development. More participatory approaches have achieved greater success in enhancing livelihoods in an equitable fashion (Kerr and Pangare, 2002).

It has been noted that participatory watershed management projects have been raising income, agricultural productivity, generating employment and conserving soil and water resources. Evidence from the three case studies and other general impact studies suggests that watershed development brought several positive trends including diversification of the rural economy, development of new institutions, increasing cropping intensity, Increasing cropping intensity, improved fodder production, increased availability of drinking water with rising ground water table, capacity development of the community etc. Based on the evidence found, it has been suggested that participatory watershed management could be a viable strategy of rural development for achieving sustainable rural livelihoods in India.

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