

**COMMUNITY AND HOUSEHOLD WATER MANAGEMENT:
THE KEY TO ENVIRONMENTAL REGENERATION
AND POVERTY ALLEVIATION**

by Anil Agarwal and Sunita Narain

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Abstract: For people who live in an economy built on ‘natural capital’, which can also be described as a ‘biomass-based economy’, ecological poverty is invariably the main cause of their impoverishment and an inability to meet their basic survival needs. Ecological poverty is the lack of natural resources, both in quantity and quality, that are needed to sustain a productive and sustainable biomass-based economy. Lack of water resulting from an anthropogenic change in the local hydrological regime is usually the main trigger for the processes of ecological degradation and, therefore, improved management of the local water resources has often proved to be the counter-trigger for poverty alleviation through ecorestoration activities which, in turn, result in the regeneration of a biomass-based economy.

Management of the local hydrological resources is invariably a cooperative, community-based activity. The paper presents four case studies from India in which rainwater harvesting has led to both ecorestoration and poverty alleviation. Each case study shows that activities to manage local hydrological resources must be preceded by measures to mobilise local communities and create community institutions that can bring the community-members to act together in an egalitarian and cooperative manner so that the benefits of the new natural resources created are equitably shared and community-confidence engendered and strengthened. The role of the external agency, the state or an NGO, is to empower the community with financial resources needed for capital investment in ecorestoration structures and to ensure that laws governing land, water and forest resources do not obstruct the community effort.

1. INTRODUCTION: The importance of environmental regeneration for poverty alleviation

According to the State of World Rural Poverty produced by the International Fund for Agricultural Development (IFAD) in 1992, out of a population of some four billion people living in 114 developing countries, more than 2.5 billion live in rural areas, and of these approximately one billion live below the poverty line¹. These people suffer from a lack of basic necessities like safe drinking water, adequate food and health care which means that almost a third of the people in the developing world have a life expectancy of just 40 years. The IFAD report says that less than half the rural population had access to safe drinking water and even less to irrigation water to ensure sustained agricultural production. Gus Speth, UNDP’s administrator has argued that for these people, poverty is a denial of the most basic of all human rights: the Right to Life.

The IFAD report points out that though substantial progress has been made by several developing countries in reducing the percentage of the rural population below nationally defined poverty lines, the absolute number of the rural poor has increased.

The report concludes that the ‘trickle-down approach’ has not worked or it has not worked enough. The massive persistence of poverty, particularly in rural areas, represents a problem. The problem lies not only in the unintended consequences of the prevailing economic paradigm, but in the viability of the paradigm itself.

This paper presents four case studies which spell out a new paradigm which is built on the mobilisation of local natural and human resources in which the poor are not the objects but the subjects of economic development. Though poverty and its relationship with the environment was recognised by the United Nations Conference on Environment and Development, the subject remains largely neglected in terms of action. It is not a matter of chance that a large number of poor rural people live in areas of extreme environmental fragility where ecological changes have led to natural resource degradation.

In order to understand the proposed poverty alleviation paradigm, it is important to understand the ecological nature of rural poverty. Rural people largely survive within a biomass-based subsistence economy, that is, on products obtained from plants and animals. Food, fuel, animal feed, building materials like timber and thatch, medicinal herbs and other such needs are largely met through locally available biomass resources².

Environmental degradation, therefore, has a serious impact on the lives of rural people. A large portion of the world’s rural poor today live in highly degraded lands in China, South Asia, Africa and Latin America. For such people, improvements in the *Gross Nature Product* are far more important than the *Gross National Product*.³ In fact, the ‘economic globalisation’ process is expected to leave a lot of these people untouched. The climate instability predicted for the 21st century as a result of the greenhouse effect will make life even more difficult for the world’s rural poor living in degraded lands.

The 21st century human society will, therefore, have to address itself to the following critical question: Do we forget these marginalised people till they learn to integrate themselves with the world economy or do we do something for them in the meanwhile? The neglect of the marginalised will clearly lead to mass impoverishment and starvation, social violence and wars, and distress migration both within nations and between nations. The 1980s and 1990s have already seen these problems on a massive scale in several parts of the world. The answer to this problem is obvious: **If the market cannot reach the marginalised, we must at least do something to help them to help themselves.** And the best way to do that would be to address the problem of ‘ecological poverty’ that dominates the lives of the rural poor living in degraded lands. (See Diagram 1: Helping the Poor to Help Themselves)

‘Ecological poverty’ can be described as the lack of an ecologically healthy natural resource base that is needed for a human society’s survival and development. High levels of ‘ecological poverty’ today prevent a large part of the world’s rural poor from helping themselves to improve their economic condition. Healthy lands and ecosystems, when used sustainably, can provide all the wealth that is needed for healthy and dignified lives.

'Ecological poverty' is a different concept from 'economic poverty', which modern economists love to revel in. Economic poverty is measured largely in terms of cash incomes and is almost irrelevant in a biomass-based subsistence economy. The approaches to deal with 'ecological poverty' and 'economic poverty' are also vastly different. While economists normally talk of welfare measures to deal with 'economic poverty', rural practitioners who have tried to deal with 'ecological poverty' talk more of 'institutional, legal and financial empowerment' with a strong emphasis on community-based property rights over ecological resources.

The challenge today lies in empowering and mobilising the labour of the marginalised billion to get out of their 'ecological poverty', create natural wealth, and develop a robust local economy based on that natural wealth. It means natural resource degradation must stop and natural resource regeneration must start, as soon as possible.

Villages in the developing world are usually highly integrated micro-ecosystems. Indian villages, for example, especially those situated the semi-arid and sub-humid hill, mountain and plateau regions, are highly integrated agrosylvopastoral systems. In other words, each Indian village has its own croplands, grasslands, and tree or forest lands, and each of these land-use systems interact with each other. Developments in one component invariably impact on the others.⁴ (See Diagram 2: The Complex Indian Village Ecosystem)

The entire village ecosystem is often held in fine ecological balance. Trees or forest lands provide firewood. This helps villagers to avoid the burning of cowdung, which is used as manure to maintain the productivity of the croplands. The nutrients are gathered by the cows while grazing in the grasslands. Simultaneously, trees and crops help to complement the grasslands in the supply of animal feed. Grass is generally available from the grasslands during the monsoon period. As grass availability declines with the onset of the dry months, crop residues obtained from croplands and leaf fodder obtained from trees to help animals to tide over the critical scarcity period. This finely tuned system can get easily split apart.

Local water management and rainwater harvesting constitute the key organising activity to initiate the restoration of the ecological and economic base of villages dependent on a biomass economy. However, this demands a fundamental change in water management strategies. Community control and participation is essential for any strategy that seeks to use and manage local water resources. But this participation is not possible unless a community-based institutional framework for natural resource governance is developed.

Over the 1980s, the ecological crisis in India has generated several successful community-based resource management experiences. These experiences are testimony to the potential of generating economic wealth and well-being from rainwater harvesting. What is also remarkable is the short time it takes to transform a poverty stricken, destitute and ecologically-devastated village to a relatively rich and green village. This wealth can be used to create more wealth by regularly investing in resource management, thus, leading to a cyclical system of sustainable growth. The

community also begins to see a stake in the good management of its natural resource base as it benefits from its development.

The natural assets that are created as a result of better management of water are quite fragile and, therefore, need to be carefully managed keeping sustainability in mind. This sustainable management of the asset base will only be possible if people are involved in the management of the resource. There has been absolutely nothing more heartening in the entire world in the last two decades of the environmental movement than the transformation that these communities have been able to achieve. On the other hand, bureaucratic resource management systems have either failed or have proved to be cost-ineffective, which makes them irrelevant in a world where financial resources are limited. Therefore, policy interventions are essential to create an enabling environment for local action.

2. The potential of rainwater harvesting

Water is not only vital for human survival but also for creating a sustainable biomass-based economy. Both natural and anthropogenic changes can affect the local hydrological regime and affect the economy dependent on that regime adversely. Deforestation in ecologically fragile environments, for example, can lead to substantial changes in the hydrological regime. Rural people need water for a variety of uses ranging from domestic use, livestock use, small-scale irrigation, home-based processing activities and other artisanal and industrial applications.

Though substantial investments are being made in exploiting river and groundwater resources to support large-scale irrigation systems and supply of water to urban centres, these systems have rarely reached out to poor rural people living in degraded or low quality rural lands who need water-based interventions to restore their rural ecology and get out of their 'poverty trap'. Large-scale water development systems have also often led to inefficient and inequitable distribution of water resources and forced displacement of the poor.

One of the biggest environmental challenges that developing countries face in the coming decades is to balance their increasing demand with the diminishing availability of water. Increases in population coupled with the ongoing processes of industrialisation, urbanisation and agricultural modernisation are, on one hand, leading to an ever increasing demand for water and, on the other, a decreased supply of freshwater, especially in the absence of effective mechanisms to regulate pollution. The future scenario is one characterised by overexploitation of water resources, decreased accessibility to clean water, and increased competition for and potential of conflict over water resources. Major institutional, policy and technological initiatives are, therefore, required to ensure an efficient, socially equitable and environmentally sustainable management of water resources.

There is only one source of fresh water and that is precipitation, whether it is in the form of snow that makes glaciers or rain which ultimately flows down as streams and rivers and recharges the groundwater. A major reason for the growing overexploitation of water resources is the current stress on riverwater and groundwater to the neglect of rainwater and floodwater, the availability of which is far greater.

India, for example, is one of the wettest countries in the world and yet a country that is facing a growing water shortage. It receives 400 million hectare-metres (mham) of precipitation, primarily as rain, which is supplemented by some 20 mham of river flows from neighbouring countries. But it uses only a small part of its water endowment. By 2025 A.D., India is expected to be using 105 mham.⁵

If all this water use was to be met from rivers and groundwater systems, riverine ecosystems and groundwater resources will come under extreme stress, as is already being noticed across the country. River flows and ground water add up to 247 million hectare-metres, of which a substantial amount must flow out to neighbouring countries and to the sea.⁶ But India still has an enormous amount — theoretically as much as 173 million hectare-metres — which can be captured as rain or as run-off from small catchments in and near villages or towns. Capturing the flood waters of major rivers can further increase water availability.

Two major discontinuities have emerged worldwide in water management since the 19th century. One, the State has emerged as the major provider of water replacing communities and households as the primary units for provision and management of water. Two, there has been growing reliance on the use of surface and groundwater, while the earlier reliance on rainwater and floodwater has declined, even though rainwater and floodwater are available in much greater abundance than river water or groundwater.

Theoretically, the potential of water harvesting in meeting household needs is enormous. *Rain captured from 1-2 per cent of India's land can provide India's population of 950 million as much as 100 litres of water per person per day. There is no village in India which cannot meet its drinking water needs through rainwater harvesting.* Even in an arid area with an annual rainfall level of only 100 mm, one hectare of land can theoretically capture as much as one million litres of water. As there is a synergy between population density and rainfall levels, less land is required in more densely populated areas to capture the same amount of rainwater. And in such areas, there is usually more built-up area like roof-tops which have improved runoff efficiency.

Rainwater harvesting can not only provide a source of water to increase water supplies but also involve the public in water management, making water management everybody's business. It will also reduce the current demand on government institutions to meet water needs, reduce the need for government subsidies, and help everyone to internalise the full costs of their water requirements, thus encouraging the public to be more conserving in its water demand. *And in rural areas water harvesting will also be an integral part of an integrated programme for sustainable development of land and water resources on a watershed basis whose objective is to improve total biomass output.*

Water harvesting *and integrated land-water management* is not new to India or to many other parts of the developing world. The art and science of 'collecting water where it falls' is ancient but this 'dying wisdom' needs to be revived to meet modern freshwater needs adequately, equitably and sustainably and modernised with inputs from science and technology.⁷

Water harvesting means capturing the rain where it falls or capturing the run-off in one's own village or in one's own town. And taking measures to keep that water clean by not allowing dirty activities to take place in the catchment.

Therefore, water harvesting can be undertaken through a variety of ways:

- a) Capturing runoff from rooftops
- b) Capturing runoff from local catchments
- c) Capturing seasonal floodwaters from local streams
- d) Conserving water through watershed management

These techniques can serve the following purposes:

- a) Provide drinking water
- b) Provide irrigation water
- c) Increase groundwater recharge
- d) Reduce stormwater discharges, urban floods and overloading of sewage treatment plants
- e) Reduce seawater ingress in coastal areas

Despite all official efforts to provide drinking water to India's villages, shortages of drinking water continue to plague India's rural areas. According to the Department of Rural Development, India's efforts to provide drinking water to Indian villages have run into peculiar problems.⁸ Even as the government invests in drinking water projects in numerous villages, there are always still many left to be covered (see table 1).

Table 1: Indian Governments experience in providing drinking water

Survey Year	No. of drinking water 'problem villages' identified at start of the survey	Villages covered till the next survey	Villages not covered till the start of the next survey
1972	1,50,000	94,000	56,000
1980	2,31,000	1,92,000	39,000
1985	1,61,722	1,61,652	70
1994	1,40,975	1,10,371	30,604
April 1997	61,747	-	-

Why are so many more drinking water 'problem villages' found at the start of a survey as compared to the number of uncovered villages at the end of the previous survey period? There could be several reasons:

- a) Corruption, leading to poor projects and data collection;
- b) Lack of people's interest in government project, leading to poor maintenance of projects implemented;

- c) Groundwater depletion, leading to new problem villages;
- d) Pollution, leading to new problem villages; and,
- e) Increased fluoride and arsenic contamination of groundwater leading to new problem villages.

It is obvious that appropriate policies are needed to address both the shortage of water and the declining quality of water.

In human terms, rainwater harvesting means making water everybody's business. Every household becomes involved both in the provision of water and in the protection of water sources. It means making water the subject of a people's movement, re-establishing the relationship between people and their environment and turning water into a sacred element of nature. It means the empowerment of urban and rural communities to manage their own affairs with the state playing a critical supportive role and the civil society playing a critical role in encouraging equity and sustainability in the use of water. It means a role for everybody with respect to water.

Water harvesting can bring many benefits:

- Apart from increasing water availability, local water harvesting systems developed by local communities and households can reduce the pressure on the state to provide all the financial resources needed for water supply. As governments in developing countries are often short of funds, this approach will greatly reduce constraints posed by financial considerations.
- Involving people will also give them greater ownership over water projects and will go a long way towards reducing misuse of government funds.
- Moreover, when communities and households develop their own water supply systems, they also be more likely to take good care of them — the spectre of unrepaired, broken down systems and wasted funds will haunt governments less. Water will also be used more efficiently instead of being squandered away.

Therefore, there is eminent sense — ecological, financial and political — in promoting community and household-based water harvesting systems. *In catching water where it falls*. Water harvesting can not only meet people's basic water needs but also improve the food and livelihood security of the rural poor.⁹

3. The Way Ahead: Policy Dimensions

In order to develop a good community-level natural resource management programme, the focus has to be on the mobilisation of the local community. As a rural community usually identifies itself with a settlement or a village, this means that a settlement-based resource management plan has to be developed. But first an integrated action programmes is needed to address both the private and common property resources of the village, its diverse biomass needs, and the interests and requirements of different socioeconomic groups within the village community. (See diagram 3). Productivity of privatised natural resources often depends heavily of the productivity and sustainability of common property resources.¹⁰

Such a programme should be able to set into motion a series of ecological successions, beginning with increased quantity and productivity of croplands because of increased water conservation and, hence, availability of irrigated water, and leading on to increased grass production from the local grasslands and slowly increased production of fodder and timber resources from the tree and forest lands. Each of these stages of ecological succession generate their own economic impacts on the village society which slowly unfold over the years. (See diagram 4) The ultimate impact of the ecoregeneration on the local economy will depend on the local resource endowments, land-use systems, and the technological interventions and economic strategies chosen.

Ecoregeneration will not only increase local carrying capacity, incomes and local employment but also, by reducing distress migration, it can also have a significant impact on reduction of urban poverty and, thus, enhancing social development in urban areas, especially if the ecoregeneration is undertaken on a large, regional scale. Rural ecoregeneration should reduce distress urbanisation and increase the bargaining capacity of the rural-urban migrant leading to reduced incidence of slums and exploitative practices like child labour. (See diagram 5)

Success stories in community-based resource management teach us that a bundle of policy measures to promote and sustain them. These measures include changes in institutional, legal and financial frameworks which engender community-level, participatory democracy.

Programmes to enhance the *Gross Nature Product* with equity and sustainability have to be developed at two levels:¹¹

a) The Conceptual Level

The conceptualisation of the natural resource management (NRM) programme must take into account the ecological dynamics of the ecosystem in which the settlement is based. NRM technology has to be ecosystem-specific. A technology package of water conservation built on rainwater harvesting combined with composite 'village ecosystem' planning and management which is suitable for semi-arid and sub-humid hill and plateau regions may not be appropriate for arid deserts, coastal regions or flood plains.

In order to develop good concepts to understand how the poverty-environment interface can be better managed in different ecological regions, the following approach can be taken:

- (i) Start with developing an understanding of the traditional use of the natural resource base and the village ecosystem of the region itself or of similar ecological regions in other parts of the world;
- (ii) Undertake settlement-level NRM projects based on community participation to develop field practices which go beyond technological dimensions and include institutional, legal (that is, property rights) and financial dimensions; and,
- (iii) Develop thereafter macro-strategy frameworks to translate these micro-experiences into macro-programmes.

b) The Action Level

The action level has to be the level of the human settlement because it is only at that level that people are best involved in cooperative ecological enrichment and biomass generation programmes.

At this level four different actions have to be undertaken as follows:

Action Point 1: Village ecosystem planning

Poor rural communities living in degraded lands need a holistic enrichment of their village ecosystems. Holistic means an approach in which attempts are made to increase the productivity of all the components of the village ecosystem including grazing lands, tree and forest lands, croplands, water systems and domestic animals, and in a way that this enrichment is sustainable. Rural development efforts are often fragmented, focus mostly on agriculture, and often the efforts are contradictory and counter-productive. For instance, government departments which build ponds and tanks do ensure that appropriate land-use is implemented in the village to protect the

catchment of these tanks. Those which look after animal husbandry and promote dairying operations often pay little attention to increasing fodder supply. These fragmented approaches do not encourage integrated village ecosystem planning.

This type of planning is best attempted at the settlement or village-level, settlement by settlement. Firstly, because there is an enormous diversity in village ecosystems. No central organisation can plan for each village. Even within one regional ecosystem, village ecosystems can vary greatly.

Secondly, this task of village-level planning can be achieved only if it is participatory. It can be assisted by government bureaucracies but cannot be done by them. Despite the fact that migration to towns has led to an erosion in villagers' interest in their immediate environment, experience shows that villagers still relate well to their immediate village ecosystem. And it is at this level that they can respond most readily.

The most important goals of village ecosystem planning for biomass regeneration are:

- 1) enhancement of the total natural resource base of the village ecosystem;
- 2) production of basic biomass needs of the village community on a priority basis; and,
- 3) equity in the distribution of biomass resources.

Equity and sustainability are both necessary pre-conditions and objectives of poverty alleviation built on ecosrestoration. A village-level plan which is both sustainable and equitable will consist of a matrix of solutions which keep in mind the specific natural resource base of the village, its diverse biomass needs and its social structure. (See Diagram: Components of a Village Ecosystem Management and Improvement Plan)

The *commons* have to be managed *as commons* by mobilising the village community to develop them as a community enterprise. This is socially and ecologically a difficult option but it is possible provided the following three principles of *control*, *unity* and *equity* are observed:

1. *The commons are brought under the **control** of the village community.* This may mean divesting government agencies of their control over the common lands through changes in legislation. This may not necessarily mean transfer of ownership.
2. *The entire community must be involved in the protection and management of the commons under its control. **Unity** of the community is essential. If only a few members of a community manage a common resource against the wishes of the rest, they will invariably fail.*
3. *All the members of a group will protect a common resource jointly only if all of them know that they will benefit from the resource equally. **Equity** is, therefore, a pre-condition for unity.*

Given good local leadership and suitable legal and institutional frameworks for community action, experience shows that rural communities do come together to manage village natural resources.

Diagram 6 shows that village ecosystem planning and management will have to continue for 15-20 years if the maximum economic advantages of ecological regeneration is to be derived.

Action Point 2: Village Institutions

Decentralised institutions work best when they are built on local traditions and culture. In most regions of the world, people live within well defined patterns of human settlements, often known as villages.

In such a situation, each settlement must have an institution of its own which brings its members together to manage its common resources and provides a forum for resolving disputes amongst them. The extent of common natural resources that belong to one settlement should be clearly and legally defined to reduce inter-settlement tensions.

The settlement-level institution must work with a high order of democracy and transparency in decision-making in order to engender cooperation and discipline within the group members. In India, village-level institutions have worked best when they are built on the Gandhian concept of a *gram sabha*, in other words, the village institution is one which empowers the assembly of all village adults to take decisions. Every family in the village can be actively involved through a *gram sabha*-like institution to take shared decisions of common interest to the village.

Open public forums, being more transparent by nature, work much better than small, elected village councils to bring about good natural resource management and sort out intra-community differences. Even in areas where inequality is intense, there will be greater chances of obtaining community decisions that are equitable in open village forums than in fora which are closed and secretive. Resolution of intra-village conflicts and coordination are invariably easier in open village fora because they introduce transparency, accountability and confidence in community decision-making. Decisions taken in a non-transparent manner by a small coterie of village leaders rarely engender confidence within the less powerful members of the community that the benefits of their cooperation will accrue to them too, in an equitable manner.

It is absolutely vital that all interest groups -- from the landed to the landless and women -- play an important role in the affairs of the village community. The role of women is particularly important. Women often take an active interest in ecorestoration programmes because of their culturally determined role as fuel, fodder and water carriers. Women are usually members of a community-based institution but they rarely participate in an institution dominated by men. Therefore, while community-based institutions are needed to involve all members of the community, there may be a need to develop a sub-set of community institutions to involve women which have clearly defined roles, rights and access to funds.

Where village boundaries do not overlap with the boundary of a shared natural resource like a forest, a stream or a watershed but cooperative decision-making of all those using it is necessary for its sustainable management, two tiers of institutions may have to be created in which the first tier consists of separate settlement-level institutions and the second tier consists of institutions that bring the separate settlement-level village institutions together for joint decision-making. For example, village watershed committees could be brought together into a common river parliament to manage the entire stream that flows through the multi-settlement watershed.

Action Point 3: Enabling Property Rights

As the village ecosystem consists of many different components some of which may be common property resources, which in many countries are owned by the state, the state will have to create appropriate community-based property rights so that the community can undertake the management of these resources.

Action Point 4: Village Funds

No village institution can work without money. Poor communities do not have the time to invest their labour in the re-building of natural capital because of the gestation period. Even if they invest their labour in such activities, they often do not have enough financial resources to wait for their labour to bear fruit. Therefore, state assistance can play an important role in mobilising local human resources to investments in building up the local natural capital. Public participation and management of natural resources takes place best when rural communities can develop their own plans and take their own investment decisions instead of plans and investment decisions being taken for them by central bureaucracies. Creation of community-managed funds for NRM usually yield the best results.

These funds can be quite small but they should be sufficient to enthuse the people with the feeling that they can set their own priorities. Once so enthused, village communities readily put in even free labour to undertake community activities

Over time, village institutions can raise substantial sums of money once their common property resources have reached a high level of productivity. If used properly, this money can be used to further increase the productivity of the common land and water systems. The commons will, thus, support the economic growth of the village through supply of food, fuel, fodder, artisanal raw materials, wood and monetary resources for development. Simultaneously, the village will also be able to save and invest in the ecological improvement of the commons. Thus, a kind of cyclical investment pattern can be developed which pushes the rural economy into an upward spiral.

4. Water as the key for ecorestoration: Four case studies

The paper presents four case studies from India of a transformation from a state of ecological poverty to a state of sustainable economic wealth. These case studies are important because they describe experiences which are now several years old and have

reached an advanced high level of ecological succession and associated economic impacts. They show that the ecological succession-economic growth is a long continuum with multi-faceted dimensions and strategies.

The experiences of Sukhomajri and Ralegan Siddhi villages now span over 20 years, and the work of Tarun Bharat Sangh is now 12-15 years old. All these three case studies describe efforts that were initiated by non-state actors. The work of the Madhya Pradesh Rajiv Gandhi Watershed Development Mission is only four years old but it is an important case study as it shows that government agencies can learn from NGO experiences of the type described in the first three case studies and replicate them on a large scale.

Even though the success of community-based experiences of Sukhomajri, Ralegan Siddhi and Tarun Bharat Sangh was beginning to be widely noticed but sceptics continued to dismiss them as irreplicable creations of remarkable individuals. But times has proved that scepticism to be wrong. *These examples remained scattered because the governance system needed to foster people's control over natural resources does not exist. The three non-state examples came into existence despite the system and not because of the system.* It takes enormous perseverance from an individual to bring change at the micro level especially if the governance system does not empower local communities to improve and care for their resource base. But now the Madhya Pradesh government has shown that the state can replicate these community-based efforts if there is adequate political will and pressure on the technical and administrative bureaucracy to deliver.

4.1 Sukhomajri: holistic watershed management

Sukhomajri has the distinction of being the first village in India to be levied income tax on the income it earns from the ecological regeneration of its degraded watershed. The village of Sukhomajri near the city of Chandigarh has been widely hailed in India for its pioneering efforts in microwatershed development.

In the 1970s, Sukhomajri -- a small hamlet with a population of 455 in 1976 -- was like any other village situated in the sub-Himalayan Sivalik foothills: sparsely vegetated, with poor agriculture, and high levels of soil erosion and runoff. As agriculture was riddled with uncertainty, villagers traditionally kept herds of livestock to minimise risk. The open grazing by the livestock suppressed regeneration and kept the surrounding hills and watersheds bare. Barely 5 per cent of the slopes had any vegetative cover.¹²

In 1979, when the nation was facing a severe drought, the villagers built a small tank to capture the rainwater and agreed to protect their watershed in order to ensure that their tank did not get silted up. Since then the villagers have built a few more tanks and have protected the heavily degraded forest that lies within and around the catchment of its minor irrigation tanks.¹³ The tanks have helped to increase crop production by nearly three times and the protection of the forest area has greatly increased grass and tree fodder availability. This, in turn, has increased milk production. With growing prosperity, Sukhomajri's economy has undergone a change. The villagers have replaced their thatch-and-mud dwelling with birch-and-cement houses and most of the

houses boast of radio sets, electric fans, sewing machines and television sets. “Who could imagine that televisions, tractors and bicycles could be had for mere grass and water?” asks a villager. Annual household income has also increased.

A combination of public, private and community investments and the participatory efforts of the villagers has produced, according to one cost benefit analysis, a rate of return of the order of 19 per cent.¹⁴ One of the most impressive savings resulting from the project is in the cost of desilting the Sukhna lake which supplies water to the downstream city of Chandigarh. The inflow of sediment has come down by over 90 per cent. This saves the government Rs. 7.65 million (\$0.2 million) each year in dredging and other costs.¹⁵

The following economic and ecological changes took place in the village over the years:

- * Between 1977 and 1986, because of the availability of irrigation water, wheat production increased from 40.6 tonnes in 1977 (with a productivity of 0.68 tonnes per hectare) to 63.6 tonnes in 1986 (with a productivity of 1.43 tonnes per hectare) and maize production increased from 40.9 tonnes in 1977 (with a productivity of 0.61 tonnes per hectare) to 54.3 tonnes in 1986 (with a productivity of 1.22 tonnes per hectare).¹⁶
- * Protection of the watershed has led to increased grass production which steadily went up from 40 kg per hectare in 1976 to 3 tonnes per hectare in 1992.(b) Increased availability of fodder led to a transformation in the livestock composition. The number of goats went down from 246 in 1975 to 10 in 1986 while the number of buffaloes went up from 79 in 1975 to 291 in 1986.(a) This led to increased milk production which increased from 334 litres per day in 1977 to 579 litres per day in 1986.¹⁷
- * Meanwhile, the tree density increased from 13 per hectare in 1976 to 1,292 per hectare in 1992. The 400 hectare Sukhomajri forest today has over 0.3 million, highly valuable khair (*Acacia catechu*) trees.¹⁸ Each tree provides about 100 kg of wood which sells at about Rs. 30 (US cents 70) per kg. Thus, each tree is worth Rs. 3,000 and the entire forest is worth Rs. 90 crore (Rs.900 million) (US\$21.08 million). If the wood is converted into *katha* as a village enterprise, the return from the forest will be even higher because *katha* is a highly valued condiment used with betel leaves. If the forest is harvested on a sustainable basis -- say, about 10,000 trees a year with a girth of more than 60 cm -- the forest will yield Rs. 3 crore (Rs. 30 million) (US\$0.7 million) annually.¹⁹ If the villagers were to set up a small village enterprise, they can produce and market *katha* directly and hope to earn Rs. 3.6 crore (US\$0.84 million).
- * Watershed protection has also resulted in increased production of a highly fibrous grass that is commonly found in the region called *bhabhar* (*Eulialopsis binata*). This grass provides good fodder when it is young but is also very good pulping material for paper mills when it is mature. This grass was very widely used traditionally to make ropes that were commonly used to make beds across north

India. Villagers of Sukhomajri use bhabhar both as fodder and for sale to paper mills.

- * The economic benefits have been substantial. By the mid-1980s, Sukhomajri had turned from a food-importing village to a food-exporting village. In just five years, from 1979 to 1984, its household income went up from about Rs. 10,000 to Rs. 15,000. It today earns about Rs. 3,50,000 from sale of milk and another Rs. 1,00,000 or so are earned collectively from sale of bhabhar.²⁰ The village has yet to earn anything from the wood in the forest because the forest department has not yet decided how it will share the proceeds with the villagers. But, as indicated above, it will run into crores of rupees.
- * A survey conducted in 1998 revealed that the income distribution in Sukhomajri matches the income distribution of rural Haryana which is one of the most agriculturally prosperous states of India.

Table 2: Distribution of household income in Sukhomajri village and Haryana state

Annual household income per month	Distribution of households in Sukhomajri village in 1998¹ (%)	Distribution of households in Haryana state in 1994² (%)
Less than Rs. 2,000 (US\$47)	30.2	38.65
Rs. 2,000-4,000 (US\$47-94)	41.5	32.16
Rs. 4,000-8,000 (US\$94-187)	24.5	21.02
above Rs. 8,000 (US\$187)	3.8	8.17

Note: The survey questionnaire had solicited responses on monthly household income. Converting the monthly into annual household income may result in an overstatement of the annual income as respondents may not be earning the same monthly income round the year. But figures are given above in annual household income merely for comparison with available data on the distribution of annual household income in rural Haryana, the state in which village Sukhomajri is situated.

Source:

1. S C Gulati and Suresh Sharma 1998, Population-Poverty-Environment Interface: Case Study of Sukhomajri, Jattamajri, Ralegan Siddhi and Panoli villages, Centre for Science and Environment, New Delhi, *mimeo*.
2. S L Rao and I Natarajan 1996, *Indian Market Demographics: The Consumer Classes*, Global Business Press/National Council of Applied Economic Research, New Delhi, pg. 49.

In Sukhomajri, the main incentive for the villagers to protect their watershed came because of the assurance they got from the forest department that they would have the right to the usufruct of the degraded forest land. Earlier, the forest department would auction the grass in the degraded watershed to a contractor who in turn would charge the villagers high rates to harvest the grass. The villagers argued that as they were protecting the watershed, they should get the benefits from the increased biomass production and not the contractor. The state forest department agreed to give the grass rights to the village society as long as the villagers paid the forest department a royalty

equivalent to the average income earned by the department before the villagers started protecting the watershed.

The villagers pay their village society a nominal amount to cut grass in the watershed. A part of this is used to pay the forest department and a part is used to generate community resources for the village. If the forest department's assurance, however tenuous, was not available, the entire Sukhomajri experiment would collapse overnight.

A crucial role in this entire exercise was played by a village-level institution that was specifically created for the purpose of watershed protection. The Hill Resources Management Society, as this institution is called, consists of one member from each household in the village. It provides a forum for all households to discuss their problems, manage the local environment and maintain discipline amongst their members. The society makes sure that no household grazes its animals in the watershed and in return it has created a framework for a fair distribution amongst all the households of the resources so generated, namely, water, wood and grass. Today, the entire catchment of the tank is green and the village is prosperous and capable of withstanding even serious droughts.

4.2 Ralegan: high value ecoregeneration

Ralegan Siddhi is today held up as a model of development. It is a village situated in a drought-prone area of Maharashtra where the annual rainfall ranges from 450 mm to 650mm only and where the villagers were once not even assured one regular crop.²¹

In 1975, the village was stricken by poverty. It had hardly one acre of irrigated land per family. Yield was less than 0.75 tonnes per ha. Food production was only 30 per cent of the village requirements and some 15-20 per cent of the families were undernourished and most men migrated each year to look for work. The village was in the grip of chronic poverty, moneylenders and countrymade liquor.²²

Krishna Bhaurao Hazare - a retired driver from the Indian army - began work in the village by constructing storage ponds, reservoirs and gully plugs. Due to the steady percolation of water, the groundwater table began to rise. Simultaneously, government social forestry schemes were utilised to plant 300,000-400,000 trees in and around the village.²³ Because of the increased availability of irrigation water, land that was lying fallow came under cultivation and the total area under farming increased from 630 hectares to 950 hectares.²⁴ The average yields of millets, sorghum and onion increased substantially.

Every effort was made in the village to ensure equitable access to the resources generated. Water is distributed equitably. As cultivation of sugarcane requires a large quantity of water, it was forbidden in the early years to ensure that the limited amount of water available was distributed equitably to all farming households. Only low water-consuming crops were allowed. All families get water in turn. One farmer will not get a second turn of irrigation until all families have been served. Since the commons belong to all, even the landless families - four to five in the village - have a right to the water. Even where individuals have dug wells, they have been persuaded to share water with

others.²⁵ Water conservation efforts resulted in increased availability of groundwater which in turn has facilitated the development of community wells. Water from these wells, supplied at a moderate price, has enabled farmers to grow two to three crops a year including fruits and crops, some of which are exported all the way to Dubai.²⁶

Today not a single inhabitant of the village depends on drought relief. Incomes have increased substantially. A 1998 survey revealed that the monthly income distribution in Ralegan Siddhi shows considerable wealth when compared to the income distribution estimates of rural Maharashtra prepared by the National Council of Applied Economic Research for the year 1994.

Table 3: Distribution of household income in Ralegan village and Maharashtra state

Annual household income per month	Distribution of households in Ralegan Siddi village in 1998 ¹ (%)	Distribution of households in Maharashtra state in 1994 ² (%)
Less than Rs. 2,000 (US\$47)	13	60
Rs. 2,000-4,000 (US\$47-94)	24	28
Rs. 4,000-8,000 (US\$94-187)	17	10
Rs. 8,000 -16,000 (US\$187-375)	9	2
Rs 16,000- 25,000 (US\$ 375-585)	4	--
Rs 25,000- 40,000 (US\$ 585-937)	5	--
Above Rs 40,000 (US\$ 937)	28	--

Note: The survey questionnaire had solicited responses on monthly household income. Converting the monthly into annual household income may result in an overstatement of the annual income as respondents may not be earning the same monthly income round the year. But figures are given above in annual household income merely for comparison with available data on the distribution of annual household income in rural Maharashtra, the state in which village Ralegan Siddhi is situated.

Source:

1. S C Gulati and Suresh Sharma 1998, Population-Poverty-Environment Interface: Case Study of Sukhomajri, Jattamajri, Ralegan Siddhi and Panoli villages, Centre for Science and Environment, New Delhi, *mimeo*.
2. S L Rao and I Natarajan 1996, *Indian Market Demographics: The Consumer Classes*, Global Business Press/National Council of Applied Economic Research, New Delhi, pg. 49 and 133.

By Indian standards, Ralegan Siddhi is a rich village now. Over a quarter of the households earn over nearly half a million rupees a year has to be seen against the fact that there are only a million households in India -- whom the National Council of Applied Economic research calls the 'super rich' -- who earn more than a million rupees a year, including estimates of black money. Ralegan Siddhi's income distribution is also much less skewed than that of rural Maharashtra.²⁷

Ralegan Siddhi is, in fact, so rich that it has now even got a branch of a major bank in the village itself. The total savings of Ralegan Siddhi villagers alone is reportedly Rs. 3 crore (Rs.30 million or about US\$ 0.7 million). For a village that was less than two

decades ago, a drunkard's den with a badly degraded environment, this is indeed a miracle.²⁸

An impressive system of decision making has been created in the village. Some 14 committees operate to ensure people's participation in all decision making. A participatory democratic institution called the *Gram Sabha* was created to take community decisions. According to the Gandhian philosophy on rural development, the *Gram Sabha*, an assembly of all village adults, should act as the most important forum for collective decision making in a village just as a nation's Parliament collectively decides on the welfare of a nation. If villagers are involved in the planning and decision making process, they are more open to any changes taking place in the village. The purpose of the *Gram Sabha* is, therefore, to involve every villager in the development process and exert social pressure wherever required.

Ralegan Siddhi gave considerable importance to the participatory institution of the *Gram Sabha* in which all villagers could participate rather than the elected village council called *Gram Panchayat* which is a statutory organisation under the Constitution of India. In other words, Ralegan has given greater importance to participatory democracy rather than representative democracy.

In 1994, the village witnessed the creation of the first women's self-help group. "As the village economy has become surplus, we thought about small saving by women to help other women in future. Within three years the village has already seven self-help groups, each of 20 members," says Dillip Gowane who looks after this activity. Every month the members save from Rs. 25 (\$0.6) to Rs. 100 (\$2.4) and they have a collective saving of Rs. 2 lakh now (\$4,800). From this saving, soft loans (with an interest of as low as two per cent) are given to women who want to start their own business or for other purposes.

The evolution of village institutions in Ralegan has been an important part of its development. As Hazare puts it, "Institutions were never made but evolved out of need as we wanted to involve all the villagers in different activities."

The financial resources for the transformation of Ralegan have come mainly from the villagers themselves and from government rural development programmes and bank loans. Till 1993-94, the total cost of development programmes undertaken in the village was Rs 74.37 lakh (\$0.38 million). The contribution by people -- through voluntary labour to this investment Ralegan Siddhi was over 48 per cent.²⁹ The rest came through the various government rural development schemes.

At Ralegan Siddhi, self-sufficiency and a spirit of self-dependence has been fostered through *Shramdan* (voluntary labour). Each individual contributes one day of *Shramdan*, every 15 days. Very poor and very old people are not expected to participate. Poor people are, in fact, paid to do work on community projects. Days for *Shramdan* are allocated to each family according to the number of members in the family. When a particular project is taken up, the number of days for *Shramdan* are decided according to the amount of labour that will be required for the project.

The village benefitted from government schemes like the watershed development programme of the soil conservation department. About Rs. 22 lakh (Rs. 2.2 million) (\$0.18 million) were spent on 855 ha at the rate of Rs. 2500 (\$205) per hectare. The social forestry department of the government also did some work in Ralegan. Houses were constructed for the homeless under a scheme of the District Rural Development Agency (DRDA). Solar energy equipment was installed under the government's 'Urjagram' (Renewable Energy Village) project. Because the villagers were eager to learn and were responsive, the Urja Gram Udyog Medha (Rural Energy Development Centre) installed solar panels for heating water. Solar cookers were supplied at subsidised rates. The government Council for Public Action and Rural Technology has provided funds for putting up a windmill that is used to pump water. But no special preference or extra allocation was given to Ralegan. It was the coordination between the government agencies and the villagers that made all the benefits more visible in Ralegan whereas in other villages there was improper implementation and, as a result, commensurate benefits did not accrue and were, thus, not visible.³⁰

Even in Ralegan, not all government schemes were successful right from the beginning. But the villagers did not abandon any project just because it did not succeed. For instance, on one plot, the afforestation done by the government did not succeed. The villagers and the forest department discussed the problems and tried again on the same plot and succeeded the second time. A percolation tank built by the minor irrigation department in 1972 had failed to store water but the villagers did a proper repair job of it. The farmers also undertook the job of tree plantation all over again after the work done by the agricultural department in their fields did not give the desired results. In other words, the villagers made the best out of the numerous government schemes that would have otherwise produced limited results.³¹

4.3 Alwar: bringing rivers back to life

Gopalpura is a poor, drought stricken village, located at the base of the Aravali hills in the state of Rajasthan. The area is semi-arid and over the years deforestation has left it devoid of any vegetation. Water shortages are common and have a deep impact on the lives of the people and their agriculture. In 1986, assisted by the Tarun Bharat Sangh (TBS), a local voluntary agency, the villagers built three small earthen rainwater harvesting structures – locally called *johads* – on their fields and village grazing lands to store monsoon rains, irrigate their fields, and increase percolation in the ground to recharge wells. The science of *johads* comes from traditional knowledge in which village communities built earthen structures across their fields to catch the small rainfall of the region. In the hot, semi-arid and arid regions of Rajasthan, surface water evaporates fast. The *johad* harvests the rain and holds it to improve percolation and recharge. Farmers cultivate on the same moist land after the water has seeped into the soil.³²

These engineering structures are built across the contour of a slope to arrest rainwater. Sometimes a series of such structures are built to hold the run-off from one structure to another. The region gets roughly 600 mm of rainfall, most of it is distributed in 4-5 rainbreak periods of a few days each and separated by several days.³³

The effort of Gopalpura has attracted so much attention that within ten years Tarun Bharat Sangh has been able to build almost 2500 water conservation structures in over 500 villages of the region.³⁴ Till 1997-98, the water conservation structures had cost Rs 15 crore (Rs.150 million) (US\$3.5 million), of which Rs 11 crore (Rs.110 million) (US\$2.6 million) was contributed by the poor villagers in cash or kind. The voluntary agency follows clear guidelines – while villagers contribute labour and local material, TBS supplies external resources like cement or diesel for tractors. In each village, detailed discussions are held with the village assembly – the *gram sabha* – to identify the site which receives the maximum run-off, the size of the dam and the beneficiaries. The village assembly also makes rules about the annual repairs, the distribution of water and the management of the watershed. In some villages, in order to protect the watershed of the *johad*, villagers have evolved rules for penalising cutting of trees and even breaking of leaves.

Table 4: Cost sharing arrangements of Tarun Bharat Sangh

Johad's Name	Village	TBS Contribution	Village Contribution	Total	Villagers Contribution to the total cost (%)
Gopal Johad	Buja	14,510.60	1,76,000.00	1,90,510.60	92%
Chavada Johad	Pathroda	30,483.00	21,156.90	41,639.90	51%
Saankada Johad	Bhavata	15,183.50	60,701.30	75,884.30	80%
Harala Johad	Kakar ke Dhani	17,418.00	29,159.80	46,577.80	63%
Bhajaka/ Natata	Bhajaka/ Natata	83,537.00	96,497.50	1,80,034.50	54%

Source: Anon 1998, *Putting Tradition back into Practice: Johad--Watershed in Alwar District, Rajasthan*, UN-Inter Agency Working Group on Water and Environmental Sanitation, New Delhi, pg 9.

The direct and most dramatic impact of these structures has been to increase the groundwater as well as surface water availability in the region. An evaluation done by the former head of the department of civil engineering at the Indian Institute of Technology, Kanpur, G. D. Agarwal shows that the rise in the groundwater table was a direct impact of the conservation structures. Agarwal's study which covered 36 villages has made the following interesting conclusions³⁵:

- * Though all the structures were built by the people themselves without any calculations, essentially on their gut feelings, 36% of them had the right capacity. Only 13% had a capacity which was more than required.
- * In 1995 and 1996 when intense rainfall washed away numerous structures designed by government engineers, each one of these structures stood the test.
- * The structures have been built an extremely low cost -- ranging from a low of Rs.0.2 (US cents 0.4) per cubic metre of storage capacity to a high of Rs. 3 per

(US cents 7) cubic metre and an average of Rs.0.95 (US cents 2.2) per cubic metre. No engineering organisation would be able to build water harvesting structures at this cost.

- * The study assessed that about 1000-1500 cubic metre of storage capacity would have to be created to support one hectare of cultivated land. This would raise the average groundwater table by about 20 ft.

Table 5: Groundwater level in wells of the village Buja before and after Johad

No.	Total depth of well (in feet) 1988	Water level before Johad	Water level of well after Johad, 1994 (in feet)
1.	81	Dry completely	44.5
2.	73	Dry completely	37
3.	67	3 feet	40.5
4.	55½	4 feet (dry most of the time)	27
5.	81	10 feet	66
6.	69	20 feet	50
7.	43	15 feet	35
8.	83	20 feet	58
9.	80½	19 feet	55
10.	66½	Dry completely	25

Source: AFPRO, 1994, quoted in (1) Anon 1998, *Putting Tradition back into Practice: Johad-- Watershed in Alwar District, Rajasthan*, UN-Inter Agency Working Group on Water and Environmental Sanitation, New Delhi, pg 16.

- * In the 36 villages by Agarwal, 166 johads with a combined storage capacity of 335,000 cubic metres to capture rain running off a combined catchment area of 8,152 hectares and the total cost was Rs. 30,35,202 (US\$71,100). In these villages, the groundwater table rose from a low of 10 feet up to a high of 24.5 feet. The annual Gross Village Product rose from a low of Rs. 78,648 (US\$1842) to a high of Rs. 1,123,857 (US\$26,326) and the annual per capita income rose from a low of Rs 126 (US\$2.95) to a high of Rs.3585 (US\$83.98). In order to calculate the increase in the annual Gross Village Product, Agarwal took into account the increase in the value of agricultural produce, increase in milk production and increase in produce from forests before and after the water conservation programme began. Thus, with an investment of Rs. 30,35,202 (US\$71,100) in water conservation in these 36 villages, the total annual Gross Village Product of these villages combined has gone up by Rs. 1,30,43,721 (US\$305,550) and the average per capita income has gone up by Rs. 845 (US\$19.78).
- * Agarwal found that not only did these water harvesting structures have a direct impact on the economy of the region, increases in income were strongly correlated with the investments that had been made in *johads*. An investment of Rs. 1000 (US\$23.4) on *johads* raises economic production by over Rs. 4,200 (US\$ 98.38) per annum.

As a result of these efforts, there is the “rebirth” of several rivers in the region. In just three years of making water conservation structures along the dead, dry courses of streams in these hills, the rivers started coming to life. Today, two seasonal dry streams, Arvari and Ruparel, for example, have become perennial rivers whereas these rivers earlier had no flow in them after the monsoons. Both rivers are roughly 90 km long flowing from the Aravali hills through hundreds of villages. Villagers have built over 250-300 johads and water conservation structures along the river courses, bringing them literally to life again.³⁶

Water has increased agricultural productivity of this extremely impoverished land. Most villagers who earlier used to migrate with their men and women to work as labourers in cities are now returning to till their lands which had been lying fallow for decades. A study has estimated that wheat production with johad water had increased by 100 per cent.³⁷ People are still practicing subsistence agriculture, but now they have enough to eat and do not have to migrate anymore.

TBS has had numerous problems with the government bureaucracy. As soon as Tarun Bharat Sangh had built its first *johad* in the village of Gopalpura, the state irrigation department declared the structure “illegal” under the existing water laws. Under the Rajasthan Drainage Act of 1956, “water resources standing/collected either on private or public land (including groundwater) belong to the Government of Rajasthan.” The villagers were asked to “remove” these structures as all drains and small streams are government property. The irrigation agency first argued that a downstream dam would get reduced water because of these village structures. Later it changed its stand to say that these unauthorised structures could get washed away and flood local villages. The next rains, ironically, saw several “official” structures being washed away but not the *johads* built by the people. After a protracted fight, the charges were dropped by the administration. The people refused to allow their *johads* being broken down. Later the rules were amended people’s participation in the creation of water conservation structures.³⁸

4.4 Jhabua: when government learns

This transformation of rural ecosystems with people’s participation described above has remained isolated and scattered, led by remarkable NGO leaders. Government efforts in afforestation and watershed management have never been able to replicate these successes. In most cases, the problem has been that the devolution of power to local communities has been half-hearted and inahi dequate. People’s participation has remained largely stuck in the “you participate in my programme” syndrome.

In Madhya Pradesh, however, the watershed management programme has become an outstanding example in which the government has been able to intervene in a way that promotes public participation in environmental management. Trees are coming up in the district of Jhabua which in the mid-1980s looked like the moonscape. Today, dugwells are literally overflowing with water in a place that was described as chronically drought-prone. Some 149,283 hectares covering 374 villages in Jhabua alone which account for some 22 per cent of the district’s land area have been brought under the Rajiv Gandhi Watershed Development Mission (RGWDM).³⁹

The state-wide programme had covered 750 milli-watersheds (a milli-watershed covers 5,000-10,000 hectares and consists of several micro-watersheds of 500-1,000 hectares), 7,827 villages, and an area of 3.39 million hectares by end-March 1998, which is slightly more than one per cent of India's total land area. The total investment in the programme has been of the order of Rs. 300 crore (US\$70.27 million) since it began in 1995-96.⁴⁰ The cost of treating one hectare has come to be less than Rs. 1,000 (US\$23.42) which is amazing because even standard afforestation programmes cost more than Rs. 5,000 per hectare (US\$117).

Deeply inspired by the work of Krishna Bhaurao Hazare in his village Ralegan Siddhi, Digvijay Singh after he became chief minister in 1993 decided to launch a similar programme across the state by the name of Rajiv Gandhi Watershed Development Mission. Funds were no problem because the Central government provides several thousands of crores every year to state governments for rural employment programmes. The Central government's guidelines encourage state governments to use these funds for watershed development but few state governments actually do so. Digvijay Singh decided to use these funds for an integrated and participatory watershed development programme in the state.⁴¹

The foundation of any watershed programme is water and soil conservation. In the case of Jhabua it meant arresting the water that falls on the hillslopes and instead of allowing it to run away and carrying away with it precious topsoil, the water is so trained that it percolates into the land and recharges the groundwater wells. Numerous economic and ecological benefits have resulted from this exercise. A study of 18 microwatersheds in Jhabua district revealed that within four years, the following benefits were obtained:⁴²

- * With increased water availability, the irrigated area increased to 1115 hectares, which is nearly double the irrigated area of 1994-95.
- * The flow intensity and duration of natural streams has also increased.
- * With increased irrigation, agricultural productivity is increasing.
- * Estimates show that over 2 million trees have regenerated.
- * The regeneration rate has been far more rapid as compared to lands where only forest protection programmes have been implemented because the water conservation efforts increase soil moisture and, therefore, plant growth. In turn, there is a more rapid increase in economic returns to the poor people involved in watershed management. The biggest and earliest benefit to the local people has come from the rapid regeneration of grass and, therefore, increased fodder availability. Some estimates suggest a 5-6 times increase in grass from the regenerated lands.
- * The watershed programme is already having a substantial social impact. Dependence on local moneylenders has gone down. In the 18 microwatersheds studied, loans from moneylenders had gone down by 22 per cent. Grain banks have

resulted in increased food security. And distress migration has reduced considerably.

The transformation of Jhabua is a fine example of the results we can expect when a government seriously starts working with the people. The watershed programme in Madhya Pradesh has happened because several tiers of institutions have been created: firstly, at the state level, for policy coordination; secondly, at the district and milli-watershed-level level, for implementation coordination; and, finally, at the village level to ensure that *all villagers acquire an interest in the effort*. For example, there were 1,748 women's groups, with 25,506 participants, were created in 374 villages of Jhabua (see graph 6).

Table 6: Village-level institutions for the watershed development programme in Jhabua district

Village-level institution	Number of institutions	Number of participants	Distribution of participants
Users' groups	1,668	13,947	About 7 users' groups per micro-watershed About 8 participants per users' group
Self-help groups	1,256	9,699	About 5 per micro-watershed About 8 participants per self-help group
Women's groups	1,748	25,506	About 7 per micro-watershed About 15 per women's group

Source: Anon 1998, Rajiv Gandhi Mission for Watershed Development, Key Findings of Intermediate Assessment of Watershed Management Programmes in Jhabua District, Government of Madhya Pradesh, *mimeo*.

But most importantly, serious efforts have been made to give local communities powers over decision making. And control over resources. For instance, the villagers play an active role in managing the funds meant for the watershed programme. Nearly 80 per cent of the funds for the programme are put in a bank account managed by the Watershed Development Committees made up of village people. The Watershed Development Committee tries to bring together all the important interest groups in the village and thus replicates the concept of the *gram sabha*.

Till mid-1998, the total expenditure in Jhabua was Rs 16.48 crore (US\$3.86 million), of which Rs 11.95 crore (US\$2.8 million) has been direct investment into watershed development works, mostly spent on employment generation. The project encourages villagers to put save a part of their wages into a village-level watershed development fund (which will provide villagers with money to maintain their water harvesting structures after the government withdraws after its stipulated period of 4 years), a village fund (which will provide the village community for village welfare and investment), and women are encouraged to put aside their savings in thrift and credit groups. By mid-1998 the village welfare fund had Rs 0.42 crore (US\$0.098 million), the village watershed development fund which would support maintenance of village watershed structure had Rs.0.48 crore (US\$0.11 million) and the womens groups had total deposits of Rs 2.44 crore (US\$0.57 million) or about 18 per cent of the project

expenditure. all this money was saved by the villagers from the wages they had received for the watershed development work. Thus, the project had not only improved the ecology but also the financial security of local villagers⁴³ (see graph 7).

It is interesting to see the state bureaucracy in a unique mode to work with the people. Now that the groundwater is being recharged, many people fear that the more powerful will begin to exploit it through private tubewells even though recharge is the result of a united community effort. Nowhere in India has bureaucratic regulation of groundwater regulation worked and water tables are falling rapidly everywhere. In Madhya Pradesh, too, the officials now know that their success in Jhabua has brought them to a stage where they have to confront issues of inequity in the water management. In an unprecedented move in favour of community-regulated water management, the officials working with the programme propose to argue that communities who have come together as watershed committees should be given powers to regulate withdrawal of water from their watersheds.

The example of Jhabua shows that increasing population pressure does not necessarily result in an irreversible trend towards environmental degradation. It simply means improved environmental management that is usually not possible without the involvement of the people and the government playing a limited but strategic role.

5. CONCLUSIONS

The above case studies show clearly that ecorestoration is possible even in highly degraded lands and that this ecorestoration can regenerate the local rural economy and thus help in poverty alleviation in a sustainable and cost-effective manner. In other words, helping the people to help themselves by improving their local natural resource base is a viable and effective strategy for poverty alleviation. The key to this ecorestoration lies in good management and use of the local rainwater endowment but the entire exercise must be underpinned by community-based decision-making systems and institutions, and enabling legal and financial measures which promote community action.

The technology package must also take into account the specific dynamics of the regional ecosystem. While 'ecological poverty' can be found in almost all types of ecological regions, there are not enough field experiences from different types of ecological regions which provide us with a comprehensive anthology of successful field practices which are appropriate for all different regions. As Table 7 shows the four cases cited above all relate to semi-arid to sub-humid (500 mm to 1200 mm average annual rainfall) hill and plateau regions. Therefore, further documentation of successful efforts is needed to understand how poverty alleviation can be undertaken through ecorestoration in other ecosystems of the world.

Table 7: Diversity of Eco restoration Field Experiences in different Ecological Regions

<u>Ecological Region</u>	<u>Traditional dominant land-use component</u>	<u>Field Experiences of ecological succession leading to economic growth</u>
1. Semi-arid to sub-humid hill and plateau regions	Mixed land-use consisting of integrated components of croplands-grasslands-tree and forest lands	Numerous field experiences (four case studies in the paper)
2. Arid regions	Grasslands interspersed with sparse amounts of croplands	No noteworthy field experiences
3. Humid slopes in hill and mountain regions	Forest lands interspersed with shifting cultivation and/or terraced farming	No noteworthy field experiences
4. Highly flood-prone flood plains	Croplands interspersed with wetlands	No noteworthy field experiences

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