

# Water Management Strategies in Rural Environment: Context of Economic Upliftment in India

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**Abstract.** The paper reviews scenario of rural environment and impact on human health. It emphasizes the water harvesting, water conservation and overall water management strategies. With observations on success stories of the revival of traditional Johads the paper describes needs of agricultural extension.

**Keywords:** Water Management, Extension Strategies, Rural Health etc.

## 1. Introduction

Rural environment represents the framework of regulations, institutions, and practices in villages defining parameters for the sustainable use of environmental resources while ensuring security of livelihood and a reasonable quality of life. While the scope of environmental infrastructure is often narrowed down to the provision of suitable water supply, sewerage, and sanitation it has within its purview (a) acquisition, protection, and maintenance of open spaces, (b) clean up and restoration of degraded lands, (c) integration of existing wildlife or habitat resources, (d) sustainable approaches to controlling flooding and drainage, (e) developing river corridors and coastal areas, and (f) forest management. Rejuvenation of natural resources through activation of watersheds, renewal of wastelands along with enhancement of farm productivity, is a component of environmental infrastructure that is attaining increasing importance as expanding anthropogenic activity stresses natural resources beyond their natural regeneration capability. The focus here is on natural resources, common properties, and rejuvenation of rural environment, especially the water resource.

## 2. Scenario of the Rural Environment

The ecosystem within which all rural activities are conducted encompasses the air, the water bodies, and the land. India supports approximately 16 per cent of the world population and 20 per cent of its livestock on 2.5 per cent of its geographical area, making its environment a highly stressed and vulnerable system. The pressure on land has led to soil erosion, water logging, salinity, nutrient depletion, lowering of the groundwater table, and soil pollution—largely a consequence of thoughtless human intervention. The extent of land degradation, the loss in capacity of our major water reservoirs and the decline in water level in wells in the past few years is alarming. Soil erosion from overgrazing, and intensive cultivation and soil degradation from excessive use of agricultural chemicals, have wide-ranging implications.

Agricultural activities that cause land degradation include shifting cultivation without adequate fallow periods, absence of soil conservation measures and cultivation of fragile lands, unbalanced fertilizer use, faulty planning or management of irrigation. Improper agricultural practices are usually observed under constraints of saturation of good lands and population pressure leading to cultivation of ‘too shallow’ or ‘too deep’ soils and ploughing of fallow land before it has recovered its fertility. Overgrazing and over-extraction

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of green fodder lead to forest degradation through decreased vegetative regeneration, compaction of soil, and reduced infiltration and vulnerability to erosion.

### **3. Impact on Human Health**

Globally, among the biggest dangers from farming is the continuous exposure to and the unsafe use of chemicals necessary for agriculture. In India, however, the danger to human health from such environment and pollution related causes are not given their due importance as accidents from farm machinery, with a fatality rate of 22 per 1,00,000 farmers. Fatality apart, chronic exposure to air and waterborne chemicals can have adverse health effects, which sometimes, can be difficult to measure because of problems in isolating individual chemical effects.

While certain cause and effect relationships are not easy to identify, cumulative effects are likely to be most critical. Cancer risk could be high from nitrate, metals, as well as pesticides; other problems like adverse hormonal functions, liver damage could also take place, as summarized. Moreover, toxic chemicals and pesticides in air, water, and earth enter body tissues and breast milk, through which they are passed on to infants.

On one hand, as human productive capacity has gone up, whether due to the green revolution or rapid industrialization, so has its ability to generate waste. On the other, there is a growing demand on nature's ability to provide life support as the population keeps growing and livelihood opportunities decline. We could look at this double squeeze on nature in the context of water resources. Water applied to the field in irrigation either seeps through to underground aquifers, or reappears as 'return flow' and finds its way back to the surface (regeneration); seepages from canals recharge groundwater aquifers; industrial use of water results in effluents; domestic and municipal uses become sewage; and whatever water evaporates comes back to earth as rain or snow. As seepages include pesticides, effluents include pollutants and untreated sewage; they find way into water bodies, which in turn leads to declining biodiversity. Excessive pressure on the environment leads to drought-proneness in certain areas owing to declining water table levels and flood-proneness in others owing to silting of reservoirs and loss of forest cover.

A much-generalized cause of environmental degradation is the failure of the governments to formulate appropriate policies to ensure sustainable land and water use. Such policy failures include price distortions through government- controlled prices, subsidies or taxes which give incorrect price signals, faulty delineation of property rights regimes and other legal structures, government projects which directly cause environmental damage, and weak public institutions. Furthermore, state appropriation of property rights has undermined traditional (often communal) property regimes, as in the case of our forest policy, and has in several cases led to de facto open access and resource degradation.

The answer, however, does not lie in large, centralized, 'top-down', technology-driven projects: local, decentralized, community-based, people-centered alternatives are available. Problems of scarcity of water, depleted aquifers, declining groundwater tables, and drought proneness have been successfully tackled by water harvesting endeavors in Ralegan Siddhi village in Maharashtra, Sukhomajri in Haryana, and Alwar in Rajasthan. These are not 'small' instances to be dismissed as one-off phenomenon but examples of significant and sustained success achieved in terms of increased water availability and rise in groundwater table.

### **4. Water Harvesting in Alwar: Revival of the Tradition of Johad**

A Johad is a dugout pond, created at a place chosen with native wisdom, informed by remembered patterns of water flow during the rains to harness the rainwater run-off with high embankments on three sides. The height of the embankment depends on the volume of run-off from the catchments. The water storage area varies from 2 hectares to a maximum of 100 hectares. The water collected in a Johad during monsoon penetrates into the sub-soil and recharges the groundwater, improving soil moisture in vast areas mostly downstream. Apart from arresting and storing rainwater, it stops soil erosion, mitigates flood, and ensures water availability in wells for several successive drought years.

The groundwater can be drawn from traditional open wells, built and maintained by the villagers themselves. The water from the Johad is also directly used for irrigation, watering of domestic animals and other household purposes. During the dry season, when the water gradually recedes in the Johad, the land inside the Johad becomes available for cultivation. This land, by receiving good silt and moisture, allows crops to grow without irrigation. Johad is built using simple technology and local materials.

In the Alwar district of Rajasthan it took three years to build the first Johad. In the fourth year, Tarun Bharat Sangh, a non-governmental organization (NGO) actively helping villagers, had built fifty Johads. As on date, 9000 such structures exist catering to water needs of more than 1000 villages. This area, which was classified as 'dark zone' in 1995, was reclassified as 'white zone' in 2005.

As water availability improved, agriculture became productive and cattle rearing started, resulting in increased production of milk. Studies have shown that an investment of Rs 100 per capita on Johad raises village domestic production by Rs 400 per capita per annum. Because of the dominant role of natural resources in local livelihoods, it is true that people need to have an effective voice in decisions over the natural resources they depend on. The proponents of decentralization argue that the establishment of local (formal) institutions has the capability to improve people's management and use of common property resources, thereby improving the resource base on which poor people are often disproportionately dependent. It is hoped that through these institutions, participation can better target benefits to the poor through the identification of key stakeholders who are most affected, and can imply an on-going information exchange and discussion through consciousness-raising by shared understanding of problems and a vision for the future that leads to commitment and ownership by the community.

The governance structure is likely to change as a result of decentralization from centralized to localize, with the 'people' at the centre. Ideally, the higher authorities will not manage natural resources, but through a participatory process, the local people will manage them, thus resulting in a change in the pattern from a 'command and control', to a 'responsive and accountable' operative system. The new people-centered bottom-up paradigm in development thinking has created the overly optimistic view that decentralization will produce just and equitable outcomes for all, and that engaging the people will also act as a check on state power, thus helping to democratize local governance.

The new paradigm stresses the involvement of local people in contrast to the top-down paradigm, and tends to dominate management of natural resources at the local level. It has been argued that the emergent paradigm for humans living on and with the earth brings together decentralization, democracy, and diversity. The importance of traditional ways of combating with problems could be important too: here, informal institutions could be involved. For instance, whenever villagers in Karnataka's Bijapur district sense a drought is imminent, they prepare for war with nature. Harbingers travel from place to place and try to bring rain through magic. Rainmaking may not work but the participants at least endeavour to do something in a situation.

## **5. Strategic Review of Agricultural Extension**

Farming systems vary with agro-ecological conditions and no single intervention will work as a magical cure for improving farm productivity. In some regions, solutions for increasing yields may involve a shortening of fallow periods and extension of cropping periods while in others where soil fertility and/ or access to purchased inputs is good, solutions such as annual cropping or multi-cropping without fallow would work. Again, farming systems based on tree crops, are suitable for some regions only and should be encouraged accordingly. Further, the degree of market integration, choice of crops and cropping systems, use of conservation technologies and use of purchased inputs and their effects on the farming system, are all important in determining the sustainability of particular farming systems.

Revival of agricultural dynamism calls for corrective steps to deal with the near collapse of the extension systems in most states and the decline in agricultural research universities. Lab-to-land concept should be encouraged and put to practice by providing land-users multidisciplinary technical information and viable land-use options and alternatives identified for various agro-ecological and socio-economic units. Crop combinations and rotations suitable for different agro-ecological regions (as suggested by the Indian Council

of Agricultural Research) need to be advocated for better land management. There is a need to stay abreast with evolving resource conservation technologies and practices and on analyzing the conditions and principles of sustainable land use. Efficient use of marginal lands needs to be encouraged and areas of untapped potential developed to ensure optimal utilization. For agricultural diversification to be a major element in the agricultural growth strategy, action on several fronts is necessary.

Ideally, there should be a shift of land from cereals to non-cereals (increasing both farm incomes and employment) combined with an increase in productivity in cereals to ensure that per capita availability of cereals does not decline. Improvement in fertilizer application efficiency, integrated with the use of bio fertilizers, to check the degradation of existing resources due to contamination with nitrates could be brought about through on-site farmer training programmes. Success in providing extension services so that the farmers can implement breakthroughs in research necessitates focus on water resource management.

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