Learning from Experience in India’s Watersheds

Two generations of projects to improve the lot of some of India’s poorest farmers illustrate why development programs have sometimes failed and how program designers, learning from these failures, can modify their plans to achieve lasting success. Between 1975 and 1983, three pilot projects were launched, with financing from the World Bank and its concessionary arm, the International Development Association (IDA), to improve agriculture in regions of India that lack irrigation.1 These were followed in 1984 by the Pilot Project for Watershed Development in Rainfed Areas. Although the pilot program generated significant advances, some have not been sustained over time. Even so, lessons gained from this experience were put into practice while the projects were still under way. More important, the lessons were incorporated, right from the start, into the program’s successors, two Integrated Watershed Development Projects. As a result, the lives of farmers who must rely primarily on rain to water their crops have been improved, and the architects of development programs have an example of project design do’s and don’ts to guide them in their work.

**Farming without Irrigation: A Hard Way of Life**

More than 200 million of India’s poor live in rural areas without irrigation, and about two-thirds of the country’s cropland currently depends exclusively on rain for needed moisture. Even with full development of irrigation capability, 50 percent of cultivated acreage will remain under rainfed farming for the foreseeable future. Farmers in nonirrigated areas, facing daunting natural conditions, generally follow traditional, low-risk cultivation practices that typically yield low returns. Rainfall is erratic and poorly distributed; soils are often severely eroded, infertile, and deficient in organic matter. Because of rapid population growth, cultivation of slopes and of even more marginal lands is increasing—a trend that only accelerates erosion. Forests and other sources of natural vegetation are being stripped for fuel and fodder, while roads, marketing facilities, and other infrastructure remain inadequate.

**Help for Farmers in Rainfed Areas**

Despite the prevalence of rainfed farming, national agricultural investment in India has traditionally concentrated on the development of irrigable lands. Such investment has focused on extensive and costly irrigation systems and Green Revolution technologies involving high-yielding crop varieties, inorganic fertilizers, and pesticides. Until the early 1980s, relatively little economically promising new technology was available to farmers in rainfed areas. To fill this gap, the Pilot Project for Watershed Development in Rainfed Areas was launched in 1984. Its goal was to develop and experiment with technologies and mechanisms for increasing agricultural production in rainfed areas through improved land and crop management, on-site moisture conservation, and production of fodder and fuel in noncultivated areas. Estimated to cost US$45.5 million, the project was financed with a credit equivalent to US$31.0 million from IDA, a US$0.8 million grant from the U.K. Department for International Development (formerly the Overseas Development Administration), and contributions totaling US$15.7 million from the governments of India and the four participating states. The project focused on watersheds as a way of integrating the development of soil, water, and vegetation and galvanizing community support for project activities.2 It initially provided for the development of about 250,000 hectares, covering eight watersheds with different soil types—two each in the states of Andhra Pradesh,
As designed, the project sought to encourage improved cropping activities in target watersheds, soil and water conservation on crop-lands, and drainage and conservation on community lands. It also supported pasture and fishpond development, establishment of forestry plantations on private and community lands for fuelwood and fodder, and research into on-site vegetative soil and moisture conservation measures. The project's management had three tiers: national, state, and district/watershed. The project was intended to include participation by farmers to promote ownership and lead to eventual payment by beneficiaries in cash or in kind for operation and maintenance of works.

By the time the project ended in 1993, it had expanded to cover 350,000 hectares in 27 watersheds. The program was instrumental in promoting innovation and learning by government policymakers and technicians, researchers, farmers, and IDA about this relatively new field of land and water management. Introduction of land shaping, graded bunds (ridges), and grass waterways significantly helped to reduce soil erosion on arable lands and, together with improved cropping techniques and inputs (such as high-quality seeds and fertilizers), stimulated agricultural production and boosted farm income. Project works reduced the velocity of seasonal floodwaters, curtailed loss of cropland from the deepening and widening of gullies, and caused large quantities of silt to collect upstream—all of which helped to recharge local groundwater. Farm forestry was generally successful; forest plantings, and plantations and pasture development on community lands, were less so, as explained below.

The project's midterm review in 1987 proved particularly important for adjusting the technical focus of the project and accelerating implementation. While the review supported the retention of integrated watershed management as the project's main goal, it encouraged greater reliance on contour cultivation, on-site conservation of moisture, and vegetative solutions. Most notably, the review promoted increased reliance on vegetative techniques to intercept runoff water and prevent soil erosion.

**Problems That Resulted in Progress**

Although the project spurred experimentation and learning, it is uncertain whether the benefits in many of the project watersheds will be sustained—as experience with the Kabbalanala watershed, discussed below, shows. The problems—and some of the lessons that can be drawn—include the following:

**Beneficiary involvement in project implementation was minimal.** Involvement was mandated in the project design, but it generally proved insignificant in practice. Project works—including on-farm activities—were usually carried out by state government departments using hired labor. As a result, some project activities have not been sustained for lack of beneficiary engagement in planning and execution, as evidenced by the unwillingness of village communities to operate and maintain completed structures and plantations on community property. While farmers accepted on-farm technology and works that led to increased net farm income, even these have not been without difficulties. For example, farmers were frequently not satisfied with earthworks constructed with project-provided bulldozers; the structures often lost their shape, and breaks appeared within one...
monsoon season. Farmers preferred man- and bullock-made bunds. They participated more—and quality was consistently better—when indigenous construction methods were adopted. The lesson is that beneficiary involvement must be an explicit part of all phases of planning and implementation.

**Project design fell short in flexibility and in responsiveness to farmers’ preferences.**

After the review, the project turned from engineering solutions to vegetative methods of soil and water conservation—a shift that has had long-term importance. While this modification was sound, the techniques were very new to India at the time, and the overemphasis on the use of vetiver grass to control erosion limited the impact and spread of vegetative measures. Many farmers were dissatisfied with vetiver and have not maintained barriers made with it. Applied research carried out as part of the project was productive and well implemented, but its impact was reduced because of its concentration on vetiver. Research on other vegetative approaches began only toward the project’s end. More generally, the experience of the pilot program suggests the need for design flexibility. In this case, the project needed to provide additional technological options, especially ones that involved locally available plant varieties and experience. Even more important, there must be in-depth consultations with beneficiaries to match prescriptions for management with the specific characteristics of a watershed and with farmers’ needs.

**Criteria, procedures, and guidelines for replication of successful watershed technologies in other areas were not developed.** Data on the costs and benefits of project interventions in individual watersheds were not maintained, thereby restricting the effectiveness of project monitoring and evaluation. To assess the outcomes of such an experimental project, and ultimately establish criteria and guidelines for replication, precise, pertinent data are essential.

**The Kabbalanala Watershed: A Case Study for Project Planners**

The experience of the Kabbalanala watershed shows most clearly what went wrong, what went right, and what planners could learn from the project. Located in the state of Karnataka in southwestern India, about 70 kilometers southwest of Bangalore, the Kabbalanala watershed is one of the original eight watersheds included in the pilot program. It covers approximately 29,800 hectares, of which about 15,000 hectares are under rainfed farming. Another 2,200 hectares are community lands controlled by the watershed’s 110 villages. The area receives an average of 775 millimeters of rainfall each year, spread unevenly between April and October. Most of the watershed’s 98,000 inhabitants depend on rainfed cultivation for their livelihood. Traditional dryland crops in the region are finger millet and groundnut, with oilseeds and pulses typically grown as pre- and postmonsoon crops.

Overall, the watershed benefited from the integrated array of project activities aimed at conserving soils on cropland, controlling seasonal monsoon runoff, recharging area groundwater, boosting crop and forage production, and increasing area supplies of fuelwood and fodder. Some of the changes fostered through the project have continued after its completion, but others have faded away, reflecting many of the general problems outlined above.

Today, farmers in the watershed are continuing most of the agronomic practices—improved crop varieties and intercropping—encouraged by the project. Growers are maintaining small check dams on community lands, even though most of the other water control structures in the watershed have fallen into disrepair. Farmers and government officials report that the water table in the watershed has risen as a result of project works and that formerly dry wells now fill seasonally, permitting limited irrigation and domestic use, but this benefit may disappear if water control structures continue to degrade. Perhaps the most significant result of the project has been the increase in mango cultivation in the area. With the project’s introduction of improved grafted seedlings, mango cultivation has expanded from 75 hectares in 1984 to an estimated 6,500 hectares in 1996 and continues to rise. The Kabbalanala watershed has indeed become a mango belt.

There have been failures, however, that offset many of the project’s achievements. Most forestry plantations established under the project have largely disappeared, not only on community land but also on private land and even in government forest areas. Community forestry plantations and pastures have generally reverted to their degraded preproject state, while most of the project’s on-farm forestry plots have been planted with mango. Contour bunding, line hedges, and community-based water-harvesting structures have largely fallen into disrepair.

Farm families in the area have benefited from the project’s agronomic activities and the physical
structures that remain, as well as the significant economic growth in the greater Bangalore region. IDA estimated in 1995 that the project boosted the net income of a typical farm family by 125 percent. However, most farmers never developed enough appreciation for on-farm soil and moisture conservation works carried out by the project to maintain the physical and vegetative structures. Villages developed little sense of ownership and responsibility for the forestry plots and works established on community lands. The comment of a mango farmer in the village of Dombaradoddi highlights the problem: while inspecting flood damage to a project-constructed check dam, he said, “We had hoped that the project would return to repair it for us.” In short, the beneficiaries of the project were too often merely passive recipients rather than active participants.

**A NEW GENERATION BUILDS ON THE OLD**

The mixed results of the programs caused a change in approach when a new attempt at watershed development got under way. Those involved in the planning realized that continuity of effort, learning from experience, and adjustment based on these lessons are keys to the long-term success of development projects. In this regard, a number of important lessons learned from the pilots have been incorporated into second-generation projects—the Integrated Watershed Development (Hills) Project and the Integrated Watershed Development (Plains) Project. Launched in 1991 and scheduled for completion in 1998, the hills project is being implemented in rainfed areas of the Himalayan foothills in the states of Haryana, Himachal Pradesh, Jammu and Kashmir, and Punjab. It is being financed with a credit from IDA equivalent to US$75.0 million. The plains project, also begun in 1991 and ending in 1998, is being executed in rainfed areas of the states of Gujarat, Orissa, and Rajasthan with financing by an IDA credit equivalent to US$55.0 million. Both projects are widely regarded as successes, as measured by impact and likely sustainability.

The hills and plains projects enjoy greater chances of sustainability than the pilots because beneficiary participation and cost sharing are integral parts of their design. This participation has been encouraged through early formation of village development committees (VDCs) made up of local beneficiaries to contribute to the planning and execution phases of work. Project activities such as works construction and community forestry development are being carried out by beneficiaries. In Rajasthan, all funds for the project are being channeled through the VDCs. All assets created in the project are being handed over to beneficiary groups for operation and maintenance, with supervision by government departments being provided as needed. Stressing the link between participation and sustainability, A. S. Dogra, joint development commissioner for the state of Punjab, concludes, “No project can succeed without the active participation and cooperation of the people of the area. With this aim, village development committees were formed in all villages falling in the project area. The activities undertaken in the [hills] project are intended to serve as demonstration areas so that these can be replicated in the adjoining areas by the people themselves. This will lead to sustainability and replicability of the project activities.”

The second-generation projects have also tried to respond better to beneficiary needs. For example, farmers reported that livestock development and protection of pasturelands are very important to...
their economic welfare. In response, the projects encourage activities that boost fodder production and increase milk production through animal cross-breeding. The projects were made more flexible, permitting beneficiaries to select work sites and the species of grasses, legumes, and trees to be used for pastures, runoff barriers, and forestry plots. Both the hills and the plains projects stress the use of local plant species, as well as indigenous technical knowledge, which has yielded unique water-harvesting methods to increase drinking water supplies and supplementary irrigation. Involvement of beneficiaries in decisionmaking has yielded a keen sense of ownership and encouraged them to assume responsibility for asset operation and maintenance and to contribute toward construction and upkeep in cash and in kind.

Lessons for the Future

As the hills and plains projects draw to a close, important lessons are still emerging to benefit future initiatives meant to improve the lives of inhabitants in rainfed areas. These are some of the findings under discussion:

- The demand-driven strategy for design and execution must be strengthened even further to ensure that beneficiaries set the development agenda.
- Increases in agricultural productivity through land-based activities have important, but limited, scope for improving the economies of rainfed rural areas. To encourage more broadly based social and economic development, future projects might include investments in complementary infrastructure such as rural roads and drinking water supply and, depending on local potential, might encourage agroprocessing and marketing development.
- Common conceptual guidelines for watershed development are needed. These should cover such topics as methods of selecting conservation activities, beneficiary participation, cost sharing, responsibilities for operation and maintenance of works, technology options, local institution building, and monitoring and evaluation. Watershed development is currently being carried out in India under an assortment of central and state government schemes and nongovernmental programs, some with assistance from bilateral and multilateral donors, and these activities are often implemented using different conceptual approaches. In November 1997, the Indian government’s Ministry of Rural Areas and Employment convened a meeting of concerned donors, central and state government representatives, and nongovernmental organizations to discuss the need for more uniform guidelines; all agreed that a common conceptual approach should be developed and followed. The ministry is preparing such guidelines for review and discussion in a meeting to be held in 1998.

India’s watershed projects have contributed significantly to the evolution of rainfed technologies and approaches to implementation. They have done much to encourage the country’s research and extension establishments to focus on rainfed land and its potential. But beyond these accomplishments, the projects have also brought about an awareness in India, and the World Bank, that beneficiary participation is crucial to project success; local communities and individuals must share the responsibility for planning, implementing, and maintaining the development programs that benefit them. The projects have also taught the importance of flexible design to permit midcourse corrections as new lessons are learned. These lessons are valid for all who seek to make lasting improvements in the lives of the world’s poor.

1 The Drought-Prone Areas Project (1975); the Kandi Watershed and Area Development Project (1980); and the Himalayan Watershed Management Project (1985).

2 A watershed is a piece of land that drains at a defined outlet. This natural unit evolves through the interaction of rainwater and land mass and normally comprises arable and nonarable land, nonagricultural land, and natural drainage systems. Watershed areas are typically delineated on the basis of the distribution and flow of rainwater up to the defined outlet.
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