

Water and Poverty: A Case of Watershed Development in Andhra Pradesh, India

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Introduction

This case study of an inland and drought-prone district of Andhra Pradesh typifies the potential and the challenges of poverty-focused watershed development in a semiarid, low-resource, and high-risk environment. These are the conditions under which much of the future agricultural growth and poverty reduction in India will have to take place. In the state of Andhra Pradesh the government watershed-related policies and programs are enthusiastically implemented. The state is in the forefront as far as the watershed development program is concerned. The state has so far initiated about 7,000 watersheds covering about 3 million ha. This accounts for roughly a third of the land that needs treatment and a fifth of the total rain-fed area in the state.

Watersheds covered under different schemes are being implemented as per the guidelines of the 1994–1995 watershed development committee. About 85% of the watersheds are implemented through the government system and NGOs execute the rest. Studies show that the participatory approach used by NGOs results in higher economic and ecological impacts, a more equal spread of benefits, and better sustainability. This case study, based on some successful NGO-implemented watersheds, highlights that watershed development is a necessary condition, but not sufficient, for poverty reduction in arid and semiarid regions. It is observed that the impact of watershed development is conspicuous where watershed development has led to improved water availability. The study identified some complementary programs needed to make the watershed development an effective pro-poor program.

This case study highlights that poverty-focused policy interventions are crucial for maximizing the overall accomplishment and poverty reduction impact of watershed development. The paper recommends the following:

- Proper implementation of the watershed development is a prerequisite for better benefit flows toward poverty reduction. Care should be taken that scaling up the program should not be at the cost of intensive and participatory approach, which is critical for sustainable watershed management.
- Policy interventions that are complementary to watershed development are necessary to benefit the land-poor and landless poor men and women. These include dairying, promoting horticultural crops, establishing infrastructure

and processing facilities for their development (physical capital), etc., with a focus on development of human capital.

- Building up the capacity of the government agencies, NGOs, and Panchayati Raj¹ institutions involved in watershed development and management would effectively facilitate scaling up and speedy implementation of the program.
- Develop a package of poverty reduction-focused policies and programs such as supporting self-help groups, thrift societies, etc.
- Minimize inequities through more egalitarian institutional arrangements and legislation.

Background

The future of agriculture development and food security is critically dependent on the development of rain-fed agriculture. This is not only because these regions account for more than half of the total cropped area, but also because the productivity levels of the irrigated and green revolution belts are now saturated. As a result, returns to investment in agriculture are found to be substantially higher in the rain-fed regions vis-à-vis irrigated regions (Fan and Hazell 2000). Incidentally, the majority of the poor live in these regions. Therefore, development of these regions helps in solving the twin problems of poverty and agricultural production. Besides, it would help in reducing the regional inequalities as well.

While providing productive irrigation facilities to these regions is an effective solution, it would be a time-consuming (long term) and costly proposition given their geographical disadvantages. On the other hand, watershed development has proved to be the most suited technology for improving the conditions of these regions, at least in the short and medium runs. Watershed development helps in improving agriculture productivity of rain-fed areas through *in situ* moisture conservation, vegetative cover, increased availability of water, etc. It can also lead to sustainable irrigated agriculture in moderate rainfall (above 750 mm) conditions.²

This case study is an attempt to understand the potential of watershed development in addressing the issues of poverty reduction. The important issues in this regard include

- assessing the linkages between watershed development and rural livelihoods and poverty;
- type and nature of benefit flows accruing to various sections of the community: and
- challenges in making the watershed program pro-poor and sustaining it in the long run.

The study stems from the authors' long-standing experience in the region³ and some intensive field visits and discussions with various sections of society, as well as other stakeholders in the program such as NGOs, administrators, policymakers, etc. The case study is located in one of the most drought-prone districts of

¹ A form of grassroots local government.

² However, this is not to suggest that watershed development is a substitute for irrigation development.

³ In fact, one of the authors, Mr. Y. V. Malla Reddy, has been involved in the development activities of the region for the past 30 years.

Andhra Pradesh, i.e., the Anantapur district of the Rayalaseema region. The main focus here is on the watersheds that are implemented by the Rural Development Trust (RDT), a local NGO.⁴ This case study is organized in five parts. A brief description of the case study region is presented in the following section. The linkages between watershed development, water, and poverty are explored on page 105. While impacts of the watershed development and other supportive programs on the poor are examined on page 110, the last section makes some concluding remarks and recommendations.

Description of the Case Study Area

Choice of Study Area

The government of Andhra Pradesh implements the central government watershed-related policies and programs enthusiastically on a wide scale. The state administration has identified watershed development as a key to promoting sustainable livelihoods for the poor. Andhra Pradesh is the forerunner and exemplifies what can be achieved in poverty reduction state initiatives in better watershed and water management. Its approach is unique as programs are implemented “top-down” with a “bottom-up” approach. The state has so far initiated about 7,000 watersheds covering about 3 million ha. This accounts for roughly a third of the land that needs treatment and a fifth of the total rain-fed area in the state. Therefore, Andhra Pradesh is a natural choice for understanding the links between poverty and watershed/water management initiatives.

The specific case study area, the district of Anantapur situated in the Rayalaseema region of the State, was chosen for two reasons. First of all, as a semiarid, low-resource, and high-risk environment with a high poverty incidence, it typifies the conditions under which much of the future agricultural growth and poverty reduction in India will have to take place. Such areas with rain-fed agriculture cover about 60% of the gross cropped area in India. Second, Anantapur represents some of the best-implemented watersheds in the state and hence provide the opportunity to assess their true potential for poverty reduction.

Physical and Socioeconomic Setting

While India is considered to be rich in annual rainfall and total water resources, water is spatially and temporally unevenly distributed. Andhra Pradesh is one of the states with less-than-average rainfall while within the state; Anantapur is the district with the least rainfall. The area is one of an undulating topography, poor soils, and a generally low resource base.

Over the years population pressure has added to the difficulties of this region characterized by high fragility and low carrying capacity. Moreover, of late, rainfall has become more erratic with its distribution, becoming unfavorable for crop calendars. Though average rainfall over the last 100 years appears to be stable or increasing, rainfall in the crucial months like July has declined (Hill 2002). Its geographical disadvantage provides little scope for surface irrigation facilities. As a result, Anantapur has the lowest proportion of area under irrigation (17%) in

⁴ The study focused on the following villages: Guddella, Kadiridevarapalle, Mallapuram, and Marrimakulapalle.



the state. Anantapur district accounts for 4.79% of the state's population and 6.97% of the geographical area. It has only 10% of its area under forests as against 22% at the state level. Anantapur district has a higher percentage of small (26.3%) and semimediam-sized (25.9%) farms, compared with other Rayalaseema districts.

About 19% of its population belongs to scheduled castes (SCs) and scheduled tribes (STs), which is lower than the state average (22%). Its sex ratio (972/1,000) is the same as that of the state average. However, the sex ratio has declined during the last decade. The incidence of gender discrimination is expected to be relatively more acute here because of its low level of development. Similarly, the district has a literacy rate (56.7%) below the state average (61%) as per 2001 census. The figures are much lower in the case of female literacy (43.9% as against the state average of 51.2%). Health of the population reflects its poverty. A UNDP pilot study in the neighboring Kurnool district found half of a village's 473 people suffering from body ache, general weakness, anemia, and cough. Most illnesses among the SC population stemmed from malnutrition and chronic anemia. Diseases associated with poverty (e.g., tuberculosis) are on the rise. On most indicators, the people of Anantapur are worse off than the average of Andhra Pradesh.

As far as basic services are concerned, 97.29% of Anantapur villages have access to water. However, access is not in terms of potable, reliable, and safe drinking water supply with easy access. In fact, most habitations are reported to have poor quality water. About 64% of the villages in the district have access to post and telegraph facilities. Transport-worthy roads or all-weather roads connect 70.15% of the villages in the district. All the villages have access to electricity.

According to the 1991 census, 48% of the state's population are classified as "nonworkers" while 54% of Anantapur's population are "nonworkers." Anantapur has 17% of its population as agricultural laborers, compared with over 20% for the state as a whole. Incidence of poverty is the highest among the ST population (56.7%) followed by SCs (50.2%), backward castes (BCs) (45.5%) and other castes (OCs) (33.3%). The situation of SCs/STs and BCs are much worse in the district than the general situation in the state. In fact, 35.6% of the villages in Anantapur fall in the high deprivation category (income of less than Rs120.03 per capita per month). In the 1991 government survey on indebtedness, it was revealed that 45% of rural families are in debt, as against the state average of 18%. Drought is a major reason for this indebtedness.

Water Resources: Status and Linkages

In the study area, water resources, surface as well as ground, are limited. Rainfall is between 255 and 650 mm per year and falls mainly during the monsoon season (July–September). Rainfall data confirm what local people say, that rainfall patterns have become more unpredictable. The result is crop failure with only the 2000–2001 season giving a reasonable crop in the last 5 years. Even then, late rains damaged the groundnut crop in certain areas. Some localities have ephemeral streams or rivers. Villagers have, from time immemorial, had common access to tanks and open wells, some of which are still in use. There is a clear link between surface and groundwater resources. Rainwater is traditionally harvested by diverting surface water flows into tanks, open wells, and into the groundwater through specific infiltration areas. Most people in Anantapur district have access to drinking water from hand tube wells.

Untimely rainfall is the biggest water-related vulnerability. Crops require water, however limited, at certain stages of their growth. Uncertainty over rainfall characterizes agriculture and life in these areas. One farmer stated it clearly: “Agriculture is now like gambling.” The main source of irrigation is groundwater through open and bore wells. Though surface irrigation systems such as tanks used to be the main source of irrigation, most of these systems have degenerated over the years in the absence of policy support. Unfortunately, this has rendered the local institutions that were managing these systems as things of the past, though there are traces of these institutions in some villages. In the process, water resources have transformed from a community resource to a private resource. Due to its capital-intensive and lumpy nature, groundwater extraction has become the prerogative of large farmers. The advent of deep bore wells and submersible deep bore pumps has further aggravated the problem. Expansion of bore wells in the absence of any initiatives to strengthen the groundwater, replenishing mechanisms has led to depletion of groundwater table and drying up of open wells. This has adversely affected the resource of poor farmers. Even some common access (drinking) hand tube wells have gone dry as a result of private groundwater use for irrigation. The conversion of a common good into private property means that the genuine rights of the majority of the people to common pool resource are being denied.

In certain areas groundwater has high levels of fluoride, which is detrimental to the health of particularly the young and the old and those otherwise not completely healthy. As a result there is a high incidence of dental and, in some places, skeletal fluorosis. Poor diet and the consumption of foods contaminated with fluorine add to the problem of drinking water with a fluoride content exceeding the 1.5 parts per million limit. Water quality, particularly of open sources and at the end of the dry season, is often poor. Poor water quality leads to gastrointestinal and other diseases, adversely affecting both people and livestock.

People are aware of the links between ground- and surface water bodies. But due to the magnitude of the investment and collective efforts required, communities shy away from reviving the surface water bodies. They expect the state to take up such activities. They seem to be comfortable with the private exploitation of groundwater though they are aware of the externalities arising out of overexploitation of groundwater. Resource degradation and the widening

Watershed
Development,
Water,
Livelihoods, and
Poverty

inequalities are a common sight. This has not reached a conflict point due to the low awareness of the people regarding resource endowments and entitlements. But the impact of dwindling water tables (well failure)—coupled with adverse climatic conditions, adverse input-output prices, and poor quality of inputs (especially seeds)—has brought the agriculture sector to a flashpoint in these regions. There are reports of farmer suicides and widespread migration even among the large farmers.

The preceding section clearly brings out the fragility of the resource base and the prevailing socioeconomic conditions in the study region. This is a general phenomenon even in our study villages prior to the interventions of RDT through watershed development programs. Under such adverse conditions, the introduction of watershed development is expected to improve the living conditions of the local communities in varied ways. These improvements can range from dramatic to moderate changes. Before going into the details of impacts in the next section, here we attempt to establish the linkages between watershed development, water and poverty, and the institutional imperatives underlying the implementation of the program.

Watershed development is a land-based technology consisting of various components aiming at land, water, and tree conservation. Basically, every piece of land is a part of a microwatershed, which is a subset of a macrowatershed. When a micro- or macrowatershed is treated, land quality will improve due to checking of soil erosion caused by wind and water. Activities like contour bunding, pebble bunding, trenching, nala bunding, gully plugging, plantations, etc. are expected to check soil erosion, enhance in situ moisture, improve the vegetative cover, etc. As a result of improved quality of soil and availability of moisture, productivity of land would increase. Besides, these measures also improve groundwater recharge due to the reduced runoff. At the macrolevel when watersheds, micro as well as macro, are treated, the availability of water resources will improve. Rainwater harvested per unit of land would rise. This could be either groundwater recharge or increased capacity of reservoirs due to low siltation. Besides, watershed development can also create small-scale local reservoirs with the help of check dams, which have multiple uses including groundwater recharge (Box 1).

Basically watershed development is expected to improve the conditions of farmers and the poor through greater availability of water. While overall impact of watershed development on water resources at the macrolevel is clear, it is not so in the local context. At the local level, improvement in water availability depends on local rainfall pattern, soil type, slope, gradient, etc. These aspects may vary from village to village and hence, the availability of water due to watershed development. In the case study region, which is characterized with low rainfall, water gains from watershed development range from improved in situ moisture content to moderate improvements in groundwater availability (Box 1).

Given the socioeconomic context of the study region, the key program beneficiaries would be the landed households who are in the majority. Large farmers are generally better off, but in Andhra Pradesh, in general, and the case study area in particular, their indebtedness is high. The main reasons are drought-induced

Box 1. Check Dams: Beneficial or Not?

The impact of check dams is a debated aspect of watershed activities. Check dams are small, capital-intensive structures, retaining the stream flows of a small catchment area. They help store water for 3–6 months, resulting in groundwater recharge, availability of water for livestock and plantations during the water stress periods. They may even support fish farming. The most important ecological impact is groundwater recharge and revival of open wells.

Of late, check dams have become controversial, for both ecological and economic reasons, as they may obstruct downstream flows. Evidence from the case study area and elsewhere does not support the criticism.

In Kadiridevarapalle, a 100-year-old open well that has dried up during the 1980s was revived in the 1990s when two check dams were made nearby. In the 1950s, the owner of the well, Mr. B. Venganna (80 years old), got the well widened and deepened and added another well. These 40-ft deep wells used to irrigate 2.67 ha of land, growing paddy, millet, and bajra. In 1983–1984, when the water table went down due to severe drought, he installed four in-well bores. Three of them failed shortly thereafter and supply from the remaining one was barely sufficient to irrigate half his land.

After the construction of check dams in 1992 and 1995, both open wells were revived with plenty of water. Another bore well was also installed. Despite the drought conditions of the last 5 years, the wells can supply water round the clock. These wells support 5.33 ha of growing paddy, papaya, sunflower, vegetables, millet, etc. The main constraint is power supply, which is available for only 7–9 hours a day.

crop failure and unsuccessful bore well drilling. Indebtedness is one of the main reasons behind the relatively high number of suicides in the area. Marginal and small farm households are the other interest group. Though Andhra Pradesh is the only state in the country where land inequality has shown a downward trend over time, land continues to be concentrated in the hands of a few while small and marginal farmers dominate in numbers. Relatively speaking, the study region has a low incidence of landlessness. Inequalities are more prevalent in the case of access to water than to land.

SCs and STs are also key interest groups when it comes to poverty reduction. Traditionally, they have been at the margin of society, owning few resources, such as land and also having less social and other forms of capital. Similarly, women make up the majority of the poor and suffer the most from poverty. Census data show that women are predominantly engaged in agricultural labor. In general, women are involved in activities that are less remunerative or unpaid because it is work within the household for subsistence. Only about 2% of women in the case study area own land.

Different interest groups in the case study area have diverse ways of making a living. Their livelihood patterns are largely determined by their access to six forms of “capital,” namely

- human capital—health, education, skills, etc.;
- physical capital—infrastructure, land, buildings, etc.;
- natural capital—water, fodder, fuelwood, etc.;
- financial capital—cash flows, savings, etc.;
- social capital—institutional strengths, cooperative behavior, etc. and, finally,
- political capital—active political participation, policy influence.

While livelihoods vary considerably, two general trends are clear. First, most households invest in the future of their children by sending them to school.

Second, most households strive to diversify their income-earning sources to spread the risk.

In times of extreme hardship, such as during the drought that occurred in 4 of the 5 most recent years, the poor start by skipping a meal a day or shift to low nutritional value foods. This has aggravated their health problems and led to greater medical expenditure. Often huge, and unexpected health expenditure pushes households into the debt trap. Furthermore, some poor households have taken one or more of their children, usually daughters, out of school. This reduces expenditure and adds a partial income-earning member.

Marginal and small farmers diversify by working part time as laborers or by getting into nonagricultural income-earning activities. Laborers cope with setbacks by temporarily migrating out of the area to places of work, in the worst cases selling themselves as bonded laborers. Even large farmers cope by reducing social expenditure such as for education, religious festivals, and marriages. Of late, even medium and large farmers are migrating due to well failure consequent to severe drought. For households that have always maintained themselves from their land honorably, impoverishment is a social and psychological trauma.

Context of Watershed Implementation

Collective action institutions are a prerequisite for watershed implementation and management. This aspect is well recognized in the new watershed guidelines formulated in 1994–1995 by the Government of India. The guidelines prioritize participatory approaches to watershed management, and the Ministry of Rural Development has implemented them from 1995–1996 onwards.⁵ Watershed work in districts is managed by especially appointed project directors who work as a part of drought-prone areas programs, district development programs, or district rural development agencies. Watershed development teams (WDTs) constituted by project implementing agencies (PIAs) implement the work. Multidisciplinary teams (MDTs) from the project director's office supervise field operations. Members of MDTs, WDTs, and PIAs are drawn from relevant line departments and NGOs. Villages with watershed development programs have a watershed association (WA) and watershed committee (WC). Representatives from *panchayati raj* institutions (local village level elected institutions, or PRIs) are represented in the WC, and where NGOs are involved, they usually insist on representation from existing informal groups as well. Where watershed development is done by government agencies, WCs are usually rather inactive, while in cases where NGOs have done awareness raising and group formation, WCs are more active. Andhra Pradesh is at the forefront of implementing these guidelines with adequate flexibility for local level adaptations. In Anantapur, this has resulted in a move from check dams to the revival of traditional water bodies such as ponds and tanks, horticulture plantations, and dairy development.

To ensure that watershed development has the intended positive impact on the rural poor, the government is experimenting with a “watershed plus” approach.

⁵ The 1994–1995 guidelines were updated in August 2001, though the basic principles of the former remain the same.

Among others, this is done through the Andhra Pradesh Rural Livelihoods Programme (APRLP). The APRLP has watershed development at its core, but at the same time it has additional activities not directly related to water, such as dairy farming, savings and credit programs, and horticultural activities that allow the poorer sections of the community to benefit from the security provided by better water management. To ensure maximum and lasting impact, the APRLP has the following seven components

- Capacity building for primary and secondary stakeholders
- Innovation to enhance the impact of watershed works
- Lesson learning and policy influence
- Convergence of top-down and bottom-up activities
- Gender and equity
- Watershed and watershed plus Sustainable Rural Livelihoods initiatives
- Participatory technology development (Government of Andhra Pradesh, 1999).

Implementation is done through NGOs, such as RDT and line agencies in six districts.

The 73rd Constitutional Amendment Act (CAA) greatly strengthened the position and role of PRIs in planning and managing rural development. Andhra Pradesh passed a conformity legislation to acknowledge the acceptance of the principles laid down in the CAA and conducted elections for PRIs. However, Andhra Pradesh has been slow with devolving powers and functions to PRIs. Generally, the line departments and district rural development agencies manage the rural development activities. PRIs with little training and orientation, no experience in managing watershed programs, and with allegations of widespread corruption are seen by many government officials as unfit for playing a major watershed role at this stage. In Andhra Pradesh, *panchayats* are therefore not normally involved in implementing watershed programs.

Local Initiatives

Community-based rainwater harvesting has traditionally been practiced. Under the leadership of kings, temple committees, or local lords, tanks were built and maintained. Furthermore, common pool resources, including rivers, streams, forests, and grazing areas were maintained and any income from these was used to pay for their maintenance in particular and village development in general. For various reasons, the maintenance of these common property resources has suffered. Landowners have also traditionally tried to retain rainwater on their land by building water harvesting structures, such as ponds, bunds, open wells, cross dams, and infiltration areas. This increased the moisture content of the soil and increased crop production. These measures are extended through the soil conservation program of the Central and state governments from time to time. During the 1980s, land conservation activities culminated into an integrated watershed development program.

RDT is one of the largest and leading NGOs in the state, with more than 30 years of standing in Anantapur district. It has worked with the poorer sections of

society in awareness building as well as group formation. RDT has been involved in environmental development and drought mitigation activities for the past 11 years. These previous activities created a good basis for forming watershed committees and for additional activities. RDT has its own model of participatory watershed development, which is close to the “watershed plus” approach. Its main focus has been soil and moisture conservation, rainwater harvesting, vegetation development, horticultural development, and dryland agriculture. RDT works closely with the government at the district and state levels. At present, RDT is working in 50 microwatersheds with the objective of integrated watershed development. In addition to these 50 watersheds, the government funds another 22 under new guidelines. Salient features of the RDT model include

- emphasis on selecting potential villages (for collective action);
- RDT watersheds covering the entire village rather than being restricted to 500 ha to ensure widespread benefits and participation;
- two members from each household (at least from 90% of the total households) should become members of the watershed association by paying a membership fee of Rs11 each;
- mandatory cooperation from the *gram panchayat* president and other members;
- firmness on user contribution to ensure a demand-driven approach; in some instances the user contribution is as high as 30%;
- a somewhat different organizational structure of watershed management in comparison with the guidelines—there is no watershed secretary, who is usually a paid employee;
- a watershed committee that is supported by a watershed advisory committee consisting of village elders (influential people);
- RDT having broad-based technical and nontechnical specialists on a (more or less) permanent basis.

RDT emphasizes a gender perspective. A separate female staff (watershed women organizer) is employed for every 10–12 watershed villages. The organizer lives in the village and interacts regularly with women to talk about their role and responsibility.

RDT has a two-pronged approach to watershed development and poverty reduction:

- land-based watershed development targeting the whole village population and the natural resource base, private as well as common; and
- poor-based socioeconomic development targeting only the poorest in the village, i.e., the dalits and tribals (Table 1).

The approach is designed in such a way that the poorest communities also improve their “six forms of capital” and enhance their proximity to access the benefits of watershed development and poverty reduction, thereby strengthening the equity and sustainability aspects.

Even within the watershed development programs, poor farmers and the dalits and tribals are positively discriminated in cost sharing or people’s contribution. For instance, in soil and moisture conservation programs, the dalit and tribal

Table 1. Rural Development Trust's Approach to Watershed Development and Poverty Reduction

Watershed Development Target Group: Entire Population and Natural System	Poverty Reduction Target Group: Dalits and Tribals (poorest)
<ul style="list-style-type: none"> • Soil and moisture conservation • Restoration of traditional water bodies and construction of small in situ rainwater harvesting structures • Development of vegetation and biomass • Water-saving technologies • Rain-fed agriculture practices and technologies • Rain-fed horticulture • Dairy and livestock development • Biogas plants • Development of human capital, institutions, and infrastructure 	<ul style="list-style-type: none"> • Organizing the poorest communities • Universal education with special focus on girls • Women's development • Special programs to develop marginal lands owned by the poor • Credit support for off-farm/nonfarm income-generation activities for women • Health programs, integrating promotional, preventive, and curative aspects of health • Housing • Drinking water and sanitation • Awareness building, institutional, and leadership development of the poor

farmers as well as small and marginal farmers share only 5–10% of the cost, while other farmers share 15–30% of the cost. Similarly, incentives are higher for dalit and tribal farmers in the case of horticulture, as their investment capacity is very low. Such discrimination enables the poor to make best use of the watershed program, which creates some equity.

Impacts

The impacts of watershed development can be termed as short-run and long-run and/or direct and indirect impacts. Being a land-based program, watershed development mainly helps the landed households. Soil conservation activities are beneficial to landed households in the medium to long run. However, the landless and landed poor have benefited from increased employment and wages in the short run. All watershed works are done on a legal unit rate basis by local laborers. As there are no middlemen, the labor earnings resulted in daily wages 2–5 times the normal rate. Because of the volume of work, labor households, as well as small and marginal farms households with extra labor capacity, have benefited considerably from the interventions.

For the poor, the watershed development provided some benefits in the long run while the short-term benefit of earnings from labor have been substantial during the implementation stage. In a recent study of RDT, it was established that many laborers, who have worked continuously for 5–7 years in the watershed program, have improved their living conditions. They have also repaid their old debts, bought assets like land, gold, livestock, etc. Moreover, no fresh borrowings were reported despite the continuous drought. It was heartening to note that the women were the happiest of the laborers, as they had earned and acquired assets like gold for themselves or for their daughters, and bought household articles and kitchen equipment, indicating an improved social status for the family and the women.

Another impact of watershed development on the poor is the decline in migration. For instance, in Kadiridevarapalle, about 5 families used to be on permanent migration and about 20 families on seasonal migration before the advent of watershed development. But after the watershed development, none of the families migrated even seasonally due to an increased underirrigation of the area and diversified cropping patterns consequent to assured groundwater availability. However, the impact of higher wages is normally in the short run, i.e., during the period of watershed works.

Landed households benefit in the medium and long run, as the yield rates tend to improve by 20% (Reddy et al. 2001). Cropping pattern changes are noticed even in the rain-fed agriculture, though on a smaller scale. In irrigated areas, the cropping pattern has shifted from paddy and ragi to sunflower, horticultural crops like papaya, as well as floriculture and vegetable crops (Box 2). But given the uncertainty in rainfall and its distribution, these benefits are not stable. Unless these instabilities are addressed, the benefits from watershed development remain uncertain even to the landed. On the other hand, farmers with access to groundwater are reaping stable benefits from watershed activities as those have improved and stabilized groundwater yields. However, access to groundwater is limited to large and medium farmers in most cases (Table 2). Often, marginal farmers do not have access to

Table 2. Distribution of Well Owners by Farm Size in Kadiridevarapalle

Farm Size (acres)	No. of Households that Have Open Wells	No. of Households that Have Bore Wells
00 – 03	0	0
3.01 – 5.00	1	4
5.01 – 10.00	2	3
Above 10.00	22	28

Box 2. Shift to Horticulture

In 1996–1997, a year after the Rural Development Trust (RDT) started a watershed program in Mallapuram village, Mr. Timmappa started horticulture cultivation under RDT's advice. He planted mango saplings on 5 acres of his land on which he earlier cultivated groundnuts. RDT paid the cost of the saplings, fertilizers, and for digging the pits. While the 200 saplings grew, Mr. Timmappa grew groundnuts as an intercrop. To supply the necessary water to the mango trees, he dug a hand bore, spending Rs10,000. The guaranteed water supply has enhanced the survival and growth rate of his plants.

During the summer of 2001, the first mangoes were harvested. Mr. Timmappa did not sell all the mangoes in the market, but distributed some among his relatives and retained some for his own consumption. What he did sell gave him a net income of Rs5,000. Marketing is no problem as contractors come and buy the mangoes directly from farmers.

Mr. Timmappa is reasonably happy with the returns from the mango crop. As a result of his success, about 80 ha of land in the village is now under mango cultivation as compared with 6 ha at the beginning of the watershed establishment. With water supply guaranteed, and with some initial external support, there is huge potential for horticulture in the area. Now that horticulture is being taken up in a big way in the district, there is a need for strengthening facilities such as transportation, marketing, storage, and processing. The lack of such facilities is already being felt in the case of papaya.

Box 3. Getting Watershed Benefits to the Poor

A major way to target long-term watershed benefits to the landless and other poor households is to strengthen the common pool resources (CPRs), making them accessible to the poor. An example is the arrangement concerning palm trees in the CPRs of Guddella village. Palm leaves are used in basket- and mat-making activities, while toddy (local liquor) is extracted from mature palm trees. Two economically and socially poor communities depend on these activities for their livelihoods.

Guddella village has 1,000 palm trees under the 30 ha of temple lands (CPR). Before the watershed committee was started, everyone had access to these palm trees. Even neighboring villagers would cut their branches for various purposes. The households from within the village often faced shortage of leaves and were forced to travel far to procure palm leaves.

The watershed committee and the village development committee (VDC) have now taken charge of these trees. Two guards were employed by the VDC at Rs600 per month to protect the trees year-round. Yearly, the households depending on the palm trees pay some money to the VDC to obtain use rights. The amount is decided on a consensus, rather than on an actual cost basis. This arrangement has ensured that the village poor have better access to the resource and has led to a more productive use of their time.

There are similar instances of giving exclusive fishing rights to tanks and behind check dams to the local fishing community. Furthermore, in some villages, SCs are given exclusive use rights to roadside plantations.

groundwater. Therefore, while in the short run agriculture labor (landed as well as landless) benefit from the activities, farmers, especially with access to water, benefit in the medium and long runs.

Watershed development has many positive and potentially long-term impacts. For instance, water retention works on agricultural lands result in better yields due to residual moisture. Removal of pebbles and rocks from fields increases the suitability of the soil to grow crops. Cleaning and deepening of tanks and open wells increase common access for washing, bathing, feeding of livestock, and in some cases, irrigation of nearby fields. Check dams have benefits such as storage of water for fisheries and/or irrigation, and infiltration of water into the ground, and therefore recharging of open wells and boreholes (Box 1). It is observed that on average, each check dam supports three wells in Kadiridevarapalle.

Making the Watershed Benefits Pro-Poor

The government's stress on poverty reduction calls for an all-out effort to ensure a more equitable distribution of watershed development benefits. At present, major benefits of watershed development go to the richer households as 70% of the expenditure goes to interventions that benefit them. At the same time, only 7.5% of the input is used to support livelihoods of poor and landless families (Government of India 2001). The watershed plus approach of the APRLP is a step in this direction, but more innovation and experimentation is needed. Here we discuss some of the pro-poor initiatives that RDT in particular is undertaking.

Most infrastructure built and/or repaired under watershed development interventions is done on private land. These benefits mainly accrue to the landed. There is a clear bias against the landless and landed poor as far as receiving sustained benefits are concerned. One way of addressing their needs is strengthening the common pool resources. However, there is concern over the maintenance of common property resources as there are no effective institutional arrangements in many places to maintain them. At the heart of this is lack of participation, which, though at the core of the program, remains largely unrealized. Further, the people have not been effectively motivated or organized and involved in preparing action plans.

PIAs and WDTs generally see their role as implementers, as indeed the name “project implementing agency” suggests. The transfer of management and technical capacities to communities and watershed committees is neglected. However, the effectiveness of community involvement in common pool resources management is clearly demonstrated in RDT villages (Box 3).

Unlike the general approach, RDT begins its intervention in villages with a poverty reduction stream of activities. Watershed activities are added after a few years. Thus, the poor are strengthened socially and economically to a degree, before the watershed program begins. The idea is that dalits and tribals need a longer-term, poverty-focused intervention due to their socioeconomic backwardness. Such an approach seems to be more effective (Box 4).

Another important activity, which has potential for improving rural livelihoods, is dairy activity (Box 5). Dairy activity is closely linked with the improvement of common pool resources (CPRs) like water and grazing lands. Renovating water bodies, horticulture, and dairy activities are eagerly pursued by the district administration in the study region. While dairy development has a lot of potential, it needs to be tuned to local constraints. At present, the program is not favorable to poor households. Dairy could be an effective pro-poor program under the watershed development if the policy support is tuned to the needs of the poor.

One more activity under the watershed program, which has greater potential for poverty reduction, is the formation of self-help groups. Forming and strengthening institutions at the village level is an innovative feature of the watershed development guidelines. Small groups (10–15 members) are organized to generate money through savings. During watershed development, wage rates go up 3–5 times and employment opportunities also increase. During that time, it is relatively easy for even the poor to start savings. The savings are circulated among group members who use it for investment or consumption, paying a predecided interest rate (usually 24% per annum). Once these self-help groups are established, a revolving funding of Rs50,000 per watershed is available to support them through matching grants. The watershed in Mallapuram, under RDT implementation, demonstrates the potential of such programs in poverty reduction (Box 6).

Box 4. Impact on Dalits and Tribals in Watershed Villages

- Literacy levels have gone up from 5 to 70%; in the case of girls, from 0 to 60%.
- Households depending entirely on wage labor have now become part-time cultivators.
- Their land values have gone up by 100–300% due to land improvement activities.
- Self-confidence and leadership among men and women (social and political capital) has improved substantially.
- Nonfarm employment of educated youth has increased manifold.
- Health and nutrition status has improved.
- Participation in village development activities has increased along with the villagers, bargaining capacity for better wages, better facilities, and services.

Box 5. Dairy Development and the Poor

Dairy development along with a horticulture development program is expected to enhance the benefit flows from watershed development to the poor. These activities are dependent on water and other common pool resources like grazing lands. While these two programs are being launched in a big way, their impact on poor communities is rather ambiguous, as the prevailing policy environment is not conducive for such benefit flows toward the poor.

Dairy development is actively pursued in some villages. Nationalized banks provide loans of up to 90% of the cost. The total loan amount ranges between Rs20,000 and Rs28,000. Some of the conditions for getting the loan include

- a deposit of Rs2,000 per animal as guarantee;
- ownership of land, irrigated irrigated is preferred; and
- a guarantor; the borrower is expected to repay the loan monthly with 50% of the earnings from milk.

These conditions exclude the poor from participating in the program. The suitability of the feed-intensive murra buffaloes to the local environment is questionable and local varieties may be more profitable. Provision of loans to local varieties will not only be low cost but also accessible to the poor. Even the landless households can maintain local varieties, as their fodder requirement is much lower. Efforts are being made by the Rural Development Trust (RDT) to convince banks to finance local varieties and improve breeds through cross-insemination.

There is a need to inculcate the idea of dairy as an economic activity. This could be done by strengthening infrastructures like collecting centers, cooling stations, and markets, coupled with some demonstration of the viability and profitability of dairy. The latter needs some efforts of selecting the right breeds that suit the local conditions. In fact, RDT has initiated the Gopal Mitra program under which a local person is trained to perform artificial insemination (AI) of local cows and buffaloes with improved breeds and help the households with dairy-related problems.

RDT's AI program is at almost free though it takes about 2–3 years for improved animals to start giving income to the farmers. The AI program is more pro-poor as it is not capital-intensive. Besides, local cattle upgraded through AI survive under low fodder, hot climatic conditions, and water stress conditions, apart from being highly disease resistant.

Institutional Integration

It is clear from our discussion that institutional innovation and sustenance is the key for successful watershed development especially in targeting the poor. Participatory watershed development emphasizes evolution of institutions and strengthening existing ones. While institutional arrangements such as watershed associations, user groups, self-help groups, etc., have evolved to reap the benefits of the program, their sustenance in the long run is questionable. This is because institutional arrangements are imposed from the outside rather than socially embedded. Socially embedded or informal institutions are more sustainable than formal institutional arrangements because they evolve out of a genuine requirement. Evolution of such institutions is a time-consuming and costly (transaction costs) affair and hence their impact is rather limited. On the other hand, the impact of formal institutions could be widespread and effective at the macrolevel. Though it is too much to expect—the evolution or replication of socially embedded institutions in every village—formal institutions should draw lessons from such institutions to sustain them in the long run. Often, the success of socially embedded institutions is critically linked with their financial sustainability and socioeconomic equity in the distribution of costs and benefits. There is a need for integrating market principles with institutional approaches. Marrimakulapalle is an example of such institutional sustainability and provides some useful insights for institutional strengthening and sustenance (Box 7).

Summary and Conclusions

It is clear from our preceding analysis that watershed development is necessary for strengthening the ecological resource base and improving the carrying capacity of fragile environments. But watershed development in itself is not sufficient to

Box 6. Self-Help Groups and the Poor

Under the watershed program in Mallapuram there are eight self-help groups. These groups are organized around occupations and there are two tailoring groups (women), two groups of cane workers (women), two groups of masons (men), one group of carpenters (men), and one group of cobblers (men). Membership ranges between five and ten. Most groups are very active and have generated substantial savings. They not only lend for their own vocational activities, but also lend toward new activities such as petty business, etc. One of the women groups has about Rs150,000 in savings, and they have lent out money for the purchase of two auto-rickshaws. The main reason for the success of these groups is that they concentrate on individual-based lending rather than community-based activities. While collective activities can be very profitable, most of the time they are dogged by the classic collective action dilemmas. The real strength of self-help groups lies in identifying activities that match local resources, skills, and needs, and are economically profitable.

achieve the broader objective of poverty reduction or eradication. Being a land-based technology, it is more beneficial in the midterm and long term to the households with access to land and water. In the short term, it is highly beneficial to laborers. A well-implemented watershed development program enhances sustainable agricultural employment opportunities in the long term and thus provides indirect benefit to labor and might reduce seasonal migration as well. Nevertheless, watershed development should be viewed and pursued as a major sectoral policy in these regions, as agriculture development still holds the key to the overall development of the region. Still more than 70% of the population depends on agriculture or agriculture-related activities. More importantly, our analysis has also brought out that watershed development can be translated into a pro-poor strategy with complementary or supportive policies. Here we discuss some weaknesses of watershed development in its present form and indicate the complementary policies to make it pro-poor.

In general, the watershed development program in Andhra Pradesh is considered successful when compared with other states, especially in spread and magnitude. The main reasons for this relative success include

- a wide public debate on droughts and political determination to do something about it;
- relatively good governance and efficient administration translating political intentions into action;
- a state-level political process that creates an environment for innovation and reform;
- active support from funding agencies, because of the flexible and effective government approach;
- NGOs interested in watershed development and working together with the government; and
- the realization that there is no immediate alternative to watershed development in rain-fed areas.

Given this policy environment, it becomes easier to understand and rectify the weaknesses of the program. The weaknesses are identified in the context of the comparative situation between the best-implemented watersheds (our case study

Box 7. Socially Embedded Institutions and the Poor

While the formal watershed committee was established only in 1998, Marrimakulapalle had 20 years of experience in maintaining traditional institutions. About 20 years back, the village elders, with the help of the Rural Development Trust (RDT), initiated three institutions, the Anjaneya Swamy Committee (ASC), Peerla Swamy Committee (PSC), and Vidya Committee (VC). The committees have proportional representation from all the caste groups in the village. The ASC has 11 members and looks after the law and order issues in the village. The PSC also has 11 members and works as a community bank. The PSC generates money from various common resources such as income from temple lands, sale of dung in the streets, fines from punishments by ASC, etc. The PSC has constructed quarters for schoolteachers to rent out. Money thus generated is distributed among community heads, proportionately to their population. This is given as loans to the needy within the community at a 24% per annum interest rate. The PSC has accumulated savings of Rs300,000.

The VC has 30 members representing all the caste groups and collects voluntary funds from members. Donated money is used for extension of the school building, employing assistant teachers, etc. Since the construction of quarters, most teachers stay in the village. The needs of the landless are taken care of in a unique fashion. The village council has acquired 10 ha of land with the help of RDT, on which a bore well is drilled for irrigation. This land is auctioned to groups of landless households on a yearly, rotational basis. Usually, a group of 4–5 households take the land for cultivation. In this manner, equity issues are resolved to some extent as far as land is concerned. However, inequity in water distribution is yet to be resolved. Some economic and equity principles of these informal institutions could be useful for strengthening formal institutions.

watersheds) and the general picture in the region or the state. Detailed studies (Reddy et al. 2001) on the Andhra Pradesh watershed development program have identified the following operational weaknesses:

- strict adherence to a maximum watershed size of 500 ha, irrespective of the reality on the ground;
- number of watersheds that one PIA can cover is too rigidly defined as between 10 and 12, where some PIAs can do with much more, while for others, even 10 is too much; and
- there is a need for new watershed committees to have training and exposure visits to successful watersheds to learn from their past experiences.

At a design and policy level, five main weaknesses have been identified:

- the need for a more equitable distribution of benefits;
- the need to improve implementation;
- the need to exercise caution while scaling up and speeding up watershed development;
- the need to ensure mutually supportive, poverty reduction-oriented policies; and
- the need to delink land and water rights.

Improved implementation, particularly of participatory aspects, is needed if interventions and their impacts are to be sustainable. Around 85% of watersheds are implemented through government line agencies. These are normally not well geared toward a participatory and bottom-up approach. Participatory watershed development is found effective (especially when done by NGOs), but the work is slow. This process has become the main bottleneck for scaling up the program. Scaling up gets further complicated when poverty reduction and other

issues are integrated into the watershed development approach. At the same time, ad hoc scaling up in a targeted fashion is neither effective nor sustainable. Hence, attempts should be made to achieve effective scaling up through appropriate policy design, tuned to the demands of the community and to enhance the capacity of implementing agencies.

A two-pronged approach is needed for scaling up. First, the capacity of smaller NGOs should be strengthened so that NGOs can implement a large proportion of the watersheds. To facilitate the process of selecting good PIAs (NGOs) and strengthening the smaller NGOs, district resource development agencies should identify a nodal PIA (NGO) in each district, which will identify the right PIAs. These nodal PIAs along with state-level and district-level officials and other stakeholders will form as a network at the state level. This would facilitate exchange of views on policy matters. Second, involving the panchayati raj institutions in the whole process needs to be looked into afresh (Bandhyopadhyay, Yugandhar and Mukherjee 2002). They could play an important role as PIAs, as well as play a catalytic role to the NGO PIAs. This institution needs to be properly reassessed before discarding it.

Equity in the distribution of economic gains among community members is as important as the equity in coverage. While the former is concerned with equity in access, the latter pertains to equity in outcomes. Equity issues pertain to the neutrality of technology in terms of location (different geographic locations of the watershed) and well-being (economic status) of participants. Inequity in the former case is purely technical while the latter is structural and institutional. No technology has a built-in bias toward a particular class/caste. The bias is always due to the existing institutional structure (agrarian structure, water markets, credit markets, social structure, etc.). In both cases, inequalities could be minimized through institutional arrangements. In other words, technical inequalities can be corrected by compensating the participants from disadvantaged locations. Also, the distributional bias in distortions in land, labor, water, and credit markets needs correcting. Failure to recognize problems of inequity is fatal in understanding the process of watershed management. Equity aspects are also important from the collective action point of view. In this context, access to water by the poor can only be guaranteed if the present link between water and landownership is removed. This may seem impossible, but experience with the *Pani Panchayat* (Maharashtra) and in South Africa show that it is possible (Reddy 2002).

Furthermore, there is a need to ensure that various government policies, such as in agriculture, power, credit, etc., become mutually reinforcing and are aimed at poverty reduction. Without an integrated package of supportive policies, watershed development will yield suboptimal results and its poverty reduction impact will be minimal.

To have a more poverty-focused approach, watershed development should be complemented and supported by policies and programs that directly benefit the poorer sections of rural society. Our case study identifies some potential areas like strengthening the common property resources and promotion of horticultural and dairy activities. These activities need to be supported by institutional arrangements for collective action such as self-help groups and thrift societies.

Such interventions, in the form of “watershed plus,” are being promoted under the APRLP. To make these activities economically viable and sustainable, policy support is needed in infrastructure such as markets, transport, processing units, etc.

Recommendations

The following recommendations can be drawn from the case study.

- Continue and expand the process of experimenting with watershed development at the grassroots level and ensure that lessons learned (weaknesses) are taken on board in policy design,
- Develop and test interventions that particularly benefit poor men and women, through watershed development and complementary development activities,
- Build the capacity of government agencies, NGOs, and panchayati raj institutions involved in watershed development and management,
- Develop a package of poverty reduction-focused policies, including a watershed policy that is mutually complementary and reinforcing,
- Minimize inequities through more egalitarian institutional arrangements and legislation.

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