

# Kothapally Watershed: A successful example of Watershed Management based on Participation, Scientific-Backstopping and Strategic Alliances

Creating a proof-of-concept and a learning site for extension agents, NGOs, the national agricultural research system, policy makers as well as for farmers was one of the main objectives of ICRISAT when the institute started its work in the Adarsha watershed in Kothapally village, Ranga Reddy district in Andhra Pradesh, India in 1999. The initial phase consisted of:

- A detailed and systematic baseline characterization of the natural resource base and the socio-economic condition of the local population.
- The formation of a consortium including local and national research institutions as well as government authorities to provide technical support.

In close collaboration with the community, ICRISAT accordingly tested, evaluated and further developed a wide range of management styles and agricultural innovations to improve the living conditions of the people in Kothapally, and to prove that scientific backstopping, participation of the rural population and the collaboration of various institutions in multi-disciplinary consortia can make a difference.

## Kothapally consists of:

- 465 ha of which 430 ha are cultivated;
- 274 households (1492 people) with an average landholding per household of 1.4 ha (70% of the households own less than 2 ha each);
- Predominantly Vertisols and associated soils (90%) (Figure 1);
- An undulating topography with an average slope of 2.5% (Figure 2).

Today, the community manages the watershed independently; the project has proven to be sustainable. The watershed continues to serve as a learning site for all stakeholders in water and

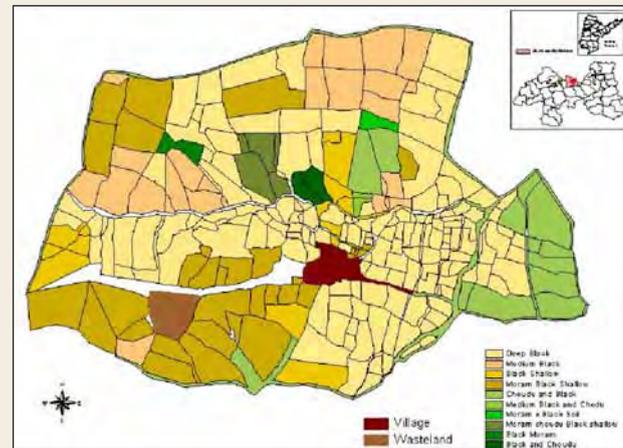


Figure 1. Soil types of Adarsha watershed, Kothapally.

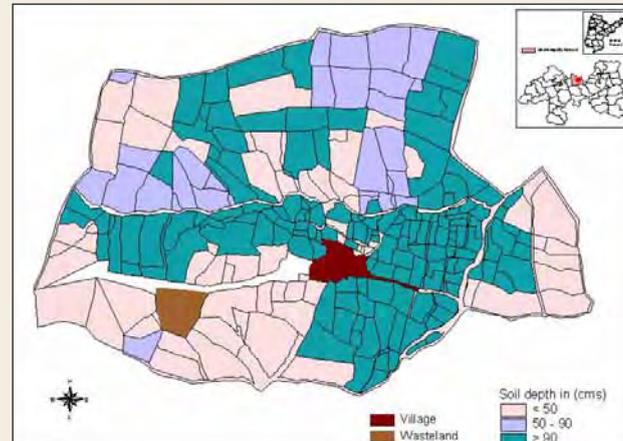


Figure 2. Soil depth map of Adarsha watershed.

land management throughout India and beyond. The following components are some of the technologies and management styles that ICRISAT and partners introduced in the watershed.

**Community Participation:** Active participation is a crucial component for the success of every watershed project. Different organizations such as the Watershed Association, User Groups and Self-Help Groups (SHGs) were founded to decide upon the construction of structures and to handle the maintenance.

**Improved Livestock & Milk Production Center:** In August 2003, a cattle breeding center was started in Kothapally. A professional in artificial insemination for buffalo and cows from a partner institute works in the area and has trained two local youths. An artificial insemination costs Rs 40.

- Until February 2009 about 2050 inseminations lead to the birth of 36 cow and 321 buffalo calves.
- The cross-breeds enhanced the daily milk production from 200-300 liters per day to 800-900 liters per day.
- In August 2006 a milk production center was founded in the village. More than 60 regular members deliver their milk daily to the center; other households contribute when possible. Every day 300 liters are sold to the Reliance Company and the rest is sold by individuals in Hyderabad.



*Reliance Milk Procurement Center at Kothapally.*

**Income-generating activities:** SHG's (especially women's) were supported with trainings:

- 34 SHGs with (at least) ten members each undertake recycling of organic wastes including weeds through vermicomposting as a microenterprise.
- Participatory evaluation of plots with applications of 3 and 5 t ha<sup>-1</sup> vermicompost resulted in increased tomato yields (4.8-5.8 t ha<sup>-1</sup>) when compared with plots that received normal compost (3.5 t ha<sup>-1</sup>).
- Vermicomposting and vermiwash are the most important income-generating activities for the women SHGs.

Before the watershed project started, only two SHGs existed. Today these groups add significantly to the income of the women and thus changed their social position in the community and in the families. These groups also function as micro-credit institutions for the members and some women have established their own business units such as grocery shops, tailoring and embroidery.



*Vermicomposting by women self-help group members.*

## Soil & water conservation measures:

- More than 250 rainwater harvesting structures such as check-dams, mini percolation pits, sunken pits and gully plugs were erected in the watershed throughout the topo-sequence. ICRIASAT promoted especially low-cost structures such as mini percolation tanks since these constructions are comparatively easy to construct and maintain, local materials are sufficient and they benefit at least 2-3 farmers and hence lead to greater equity.
- The estimated mean rise of the groundwater is between 2-4 meters with an average contribution of rainfall to the groundwater level of 27%.
- Interested farmers were trained in monitoring the ground-water levels in the wells. The estimated additional groundwater recharge per year is currently 4,27,800 m<sup>3</sup> and the groundwater level is continuously monitored by the farmers. Additional run-off water was saved by diverting streams to open wells and through silt traps.
- The irrigated area increased in the rainy and in the summer seasons (50 ha vs 200 ha) and the crop yields increased by 25 to 85%. The increased water availability resulted in a greater area under flower, spices, vegetables and fodder cultivation.



*Low-cost rainwater harvesting structures to benefit more farmers.*

**Crop diversification and productivity:** Due to the increased water availability, the farmers are able to diversify their crops and to grow two crops per season in some areas.

- The watershed has also enhanced the water-use efficiency through the introduction of drip-irrigation and furrow irrigation. In the rainy season, farmers currently grow cotton (240 ha), rice (60 ha), vegetables (40 ha), maize with pigeonpea as intercrop (80ha) and sorghum (20 ha).
- In the postrainy season, rice is grown on 40 ha, vegetables on 180 ha and maize on 40 ha.
- The cultivation of high value-crops such as carrot, cabbage, tomato and chili, as well as flowers, is possible only due to the water conservation structures and the enhanced water-use efficiency.
- Out of all cropping systems in the rainy season in the Adarsha watershed maize/pigeonpea and maize/chickpea proved to be most beneficial (Benefit-cost ratio 2.67).
- Farmers could gain about Rs 19,500 and Rs 16,500 with these systems respectively. Sole sorghum, sole chickpea and sorghum/pigeonpea intercrop also proved to be highly beneficial.
- The application of micronutrients after soil-testing yielded increases between 13 and 29% in sorghum grains and 20 to 39% in maize in the following season.



*Chickpea grown during postrainy season after maize.*

**Hydrological Monitoring:** Since 1999 three gauging stations monitor soil erosion and water run-off in a treated area, in an untreated area and one for the whole watershed. One farmer was trained to operate the monitoring station.

**Weather Monitoring:** An automatic weather station (AWS) was installed in 1999 and daily data on air and soil temperatures, rainfall, wind speed and direction, relative humidity and solar radiation is collected and used for assessing the agro-climatic potential. Several trainings to create climate awareness among students were conducted. Today, students collect and display the weather data in the school on a daily basis.

**Rainfall, runoff and soil loss from Adarsha Watershed, Kothapally, Ranga Reddy district, AP, India, 1999-2007.**

Year	Rainfall (mm)	Runoff (mm)		Soil loss (t ha <sup>-1</sup> )	
		Untreated	Treated	Untreated	Treated
1999	584	16	*	*	*
2000	1161	118	65	4.17	1.46
2001	612	31	22	1.48	0.51
2002	464	13	Nil	0.18	Nil
2003	689	76	44	3.20	1.10
2004	667	126	39	3.53	0.53
2005	899	107	66	2.82	1.20
2006	715	110	75	2.47	1.56
2007	841	115	82	4.50	2.09
2008	1387	281	187	8.94	4.50
Mean	802	99.3	72.5	3.48	1.62

\* Not installed



*Training students in managing a weather station.*

## Impacts:

The watershed project resulted in impacts on the livelihoods of the community and on the natural resource base.

Average maize equivalent grain yield (kg ha<sup>-1</sup>), cost of cultivation (Rs ha<sup>-1</sup>), total income (Rs ha<sup>-1</sup>), net profit (Rs ha<sup>-1</sup>) and cost benefit ratio for different cropping systems at Adarsha Watershed, Kothapally, 1999-2006. (Figures are rounded to full values.)

- Community-based organizations were strengthened and led to greater social capital for the rural population
- Incomes and employment opportunities were increased. Outbound labor migration was decreased subsequently.
- Water availability was significantly increased (2-4 m);
- Soil run-off was decreased as well as the use of pesticides;
- Increased greenery and C-sequestration.

Scaling up: Kothapally serves as a nucleus watershed for a wide range of stakeholders: farmers, NGOs, NARS, policy-makers and scientists. Other learning sites that follow the Kothapally example, including a thorough and scientific monitoring of relevant data, have been established in several Indian states. Until February 2009,

- 5500 farmers from different parts of India;
- 500 agricultural officials;
- 600 government officials;
- 35 research scholars have visited the watershed.
- 2000 farmers/extensions agents/scientists

were trained on integrated watershed management at Kothapally.

- Several TV-programs (regional, national, international) portrayed Kothapally including the first live telecast on agricultural information from a village in India.

Capacity building measures and the empowerment of farmers, NGOs, extension workers and SHG members continues at Kothapally, while many technologies were adopted (without any support from the consortium) in the neighboring villages.

### Increased crop productivity and incomes with different cropping systems in Kothapally.

Cropping systems	Average maize equivalent grain yield (kg ha <sup>-1</sup> )	Cost of cultivation (Rs ha <sup>-1</sup> )	Total income (Rs ha <sup>-1</sup> )	Net profit (Rs ha <sup>-1</sup> )	Cost benefit ratio
1. Improved sole maize	3580	5230	16410	11170	2.16
2. Improved maize/pigeonpea intercrop system	5850	7550	27870	22010	2.88
3. Improved sorghum/pigeonpea intercrop system	5500	7240	25620	18380	2.57
4. Improved sole sorghum	3330	5000	15070	10070	2.11
5. Farmers practice sole maize	1830	3870	8350	4480	1.11
6. Farmers practice sorghum/pigeonpea intercrop system	2900	6320	13680	7360	1.13
7. Hybrid cotton	5880	15190	23950	8760	0.57
8. BT cotton	5900	16360	35240	18880	1.15
CV%	18	18	16	18	17.10
SE+	780	1300	3380	2500	0.336

## About ICRISAT



The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that does innovative agricultural research and capacity building for sustainable development with a wide array of partners across the globe. ICRISAT's mission is to help empower 644 million poor people to overcome hunger, poverty and a degraded environment in the dry tropics through better agriculture. ICRISAT belongs to the Alliance of Centers of the Consultative Group on International Agricultural Research (CGIAR).

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