

Opportunities and Constraints to Community Regulation of Groundwater

Lessons from a grass-roots project in Andhra Pradesh, India



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Hardrock Aquifers of India



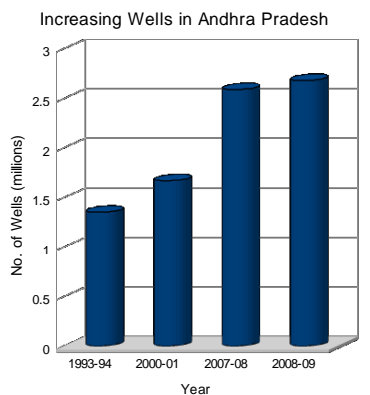
Source: Geological Survey of India



- About 65 % of India underlain by Hard Rock formations
- Hard rock is a generic term applied to igneous and metamorphic rocks with aquifers of low primary intergranular porosity (e.g., granites, basalts, gneisses and schists)
- Water storage and transmission through fractures in the rocks

Increasing wells and Over-extraction in Andhra Pradesh State

- 275,045 sq. km geographical area and 75 m population (2001)
- Number of wells doubled in last 20 years. 2.6 million by April 2009
- Irrigating 50% of total irrigated land
- 37 % of total energy consumption is in agriculture in Andhra Pradesh
- 7 hours of free power supply to most of the wells
- 187 micro basins (out of 1229) classified as over-exploited



Source: Minor Irrigation Census, Gol and website of APTRANSCO (www.aptransco.gov.in)

Location of Project Areas



- 8 Grass-root NGO partners
- 5 Districts in Andhra Pradesh
- Gradual expansion to 19 villages
 - 3 villages from 2004
 - 1 village from 2007
 - 15 from 2008

Major Problems

- Drying up of most of the open wells
- Rapid increase of bore wells due to competitive drilling. Low discharges
- Failure of bore wells leading to huge losses to farmers (40-50% of total bore wells)
- Droughts leading to seasonal drying up of bore wells, in turn trigger drilling more wells
- Wastage of water as well as shortage of water



Existing policies

- Andhra Pradesh Water Land and Trees Act (APWALA) 2002 – A comprehensive legislation to regulate Surface water; Groundwater; Sand mining and Tree cover
- APWALTA – major features:
 - Registration of all wells
 - No new wells in over-exploited micro-basins
 - Permit to drill new wells, if spacing is more than 250 m
 - Technical feasibility and insurance coverage compulsory for drilling new wells

Interventions

- Awareness Building
- Participatory resource analysis
- Water Literacy and Participatory Hydrological Monitoring (PHM)
- Developing "Social Regulations"
- Action research on improving energy efficiency and avoiding motor burnouts

Social Regulations

- ✓ No new bore wells in the village
- ✓ Equitable access to groundwater to all the families
- ✓ Efficient use of irrigation water by demand-side management
- ✓ Collective action in water management



Groundwater Recharge

- 50 dried open wells converted as recharge wells by diverting rain water into wells
- 14 ponds and small tanks renovated by tapping funds from National Rural Employment Guarantee Scheme (NREGS)
- Community contributed labour covering 10-25% of the costs



The Water Sharing Model

- Well owners share water with 2-4 neighbouring farmers. Mutual sharing and reviving kin-ship sharing in some villages
- Receivers promise not to drill new wells and contribute to O & M of shared well
- Sprinkler irrigation kit is a group asset, facilitates saving and sharing of water
- Shift from water-intensive (paddy, banana, sugarcane...) to Irrigated Dry crops (Groundnut, Chilly, Sunflower, Vegetables, Maize...)



Achievement (by 31st March 2010)

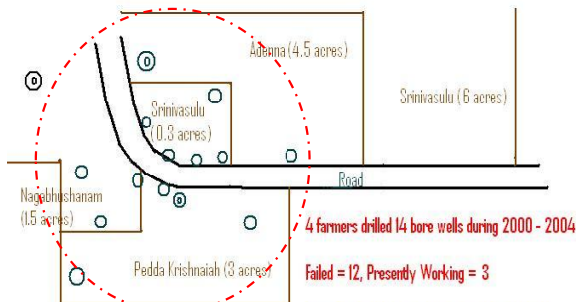
Villages	Total Households	No. of Water sharing groups	No. of non-well owners benefited	Additional area irrigated (Acres)
19	1879	304	551	1003



Case Study

- Village – Madirepalli, Anantapur District
- Average annual rainfall – 495 mm
- Project interventions started in early 2004

	2004	2010
Total Households	156	160
Total Functional Bore Wells	60	67
Families accessing GW due to sharing	60	137
Gross area under GW irrigation (Acres)		
Flow Irrigation -	405.2	170.8
Micro Irrigation -	25.0	454.0
Rainfed land (Acres)	217.8	23.1



4 farmers drilled 14 bore wells during 2000 - 2004
Failed = 12, Presently Working = 3
Now, 3 farmers are sharing water to more than 10 neighbouring farmers from 3 working bore wells

Increased Access to Groundwater : 2004 to 2010

Year	Season	Total BWs	Functional BWs	Shared BWs	Water Givers	Area Irrigated (Acres)		Water Receivers	Area Irrigated (Acres)	
						Total	Micro Irrigation		Total	Micro Irrigation
2004-05	Kharif	67	60	0	0	0.0	0.0	0	0.0	0.0
	Rabi	67	60	0	0	0.0	0.0	0	0.0	0.0
2005-06	Kharif	67	56	24	24	80.0	70.0	25	37.0	30.0
	Rabi	67	52	20	20	59.5	35.0	20	29.0	22.0
2006-07	Kharif	67	64	51	51	174.7	68.7	54	88.5	44.5
	Rabi	67	68	56	56	174.0	78.8	59	66.0	36.0
2007-08	Kharif	67	65	51	51	196.8	125.5	54	70.0	26.0
	Rabi	67	65	56	56	158.8	127.3	59	63.0	23.0
2008-09	Kharif	67	64	51	51	224.6	203.6	54	60.0	34.0
	Rabi	67	67	67	67	211.1	144.1	70	73.0	41.0
2009-10	Kharif	67	67	67	67	266.6	187.6	70	73.0	40.0
	Rabi	67	67	67	67	217.8	165.5	70	79.0	61.0

Kharif – Crop season from June to September
Rabi – Crop season from October to January
BW – Bore Wells



Cropping pattern - Madirepalli

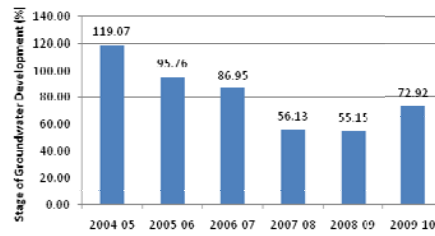
Crop	2004-05		2005-06		2006-07		2007-08		2008-09		2009-10	
	FI	MI	FI	MI	FI	MI	FI	MI	FI	MI	FI	MI
Groundnut	106.8	9.0	43.0	106.5	60.9	165.5	0.0	174.8	0.0	292.6	0.0	332.8
Paddy	146.9	0.0	79.5	0.0	114.4	0.0	100.3	0.0	46.0	0.0	69.0	0.0
Sweet Orange	100.0	16.0	53.5	36.5	73.0	86.3	0.0	167.5	0.0	172.6	0.0	121.3
Vegetables	8.1	0.0	4.5	0.0	67.5	0.0	101.0	0.0	31.0	0.0	101.8	0.0
4 Major crops	361.8	25.0	180.5	143.0	315.7	251.8	201.3	342.3	77.0	465.2	170.8	454.1
All Crops (Flow+Micro)	430.2		409.9		579.5		543.6		542.2		636.4	

FI – Area of crop under Flow Irrigation in Acres
MI – Area of crop under Micro Irrigation in Acres

Over-all Trends (2004-2010):

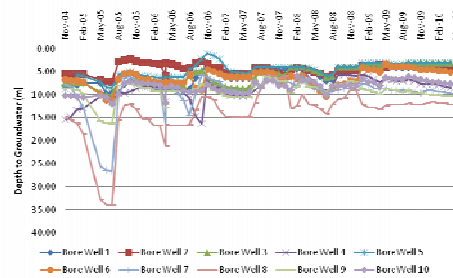
1. Groundnut area tripled from 115 to 333 acres, by a complete shift to Micro Irrigation
2. Paddy area reduced by 50%
3. Entire 122 acres of Sweet Orange shifted to drip irrigation
4. Vegetable cultivation area increased by 100 acres
5. 206 acres additional area got life-saving irrigation due to Sharing and Micro-Irrigation

Groundwater Budget - Madirepalli Village



Gradual decline in over-exploitation of groundwater with increased use of micro-irrigation

Groundwater Levels in Observation Wells - Madirepalli



More stable summer water levels due to the shift from water-intensive crops to irrigated-dry crops

Over-all Achievements

- Community regulations on new wells
- Sharing and mutual sharing of groundwater
- Area under micro-irrigation increased and rain-fed area reduced
- Crops diversified and water-intensive crops reduced
- No increase in groundwater extraction irrespective of increase in area irrigated
- Crop yields and incomes increased due to 3-4 critical irrigations through sharing
- Integrated energy efficiency with groundwater management



• Opportunities:

- Building on the existing traditional regulations
- Integration with Conservation and Recharge programs (such as, Micro-watershed development, Joint Farming Societies...) and their local institutions

• Constraints:

- Institutions of local governance (such as, *Gram Panchayats*) not empowered
- Policy gap in institutionalizing local regulations

• Key Consequences to the policies / policy makers:

- Recognize equity as one of the key concerns
- Incentives to share groundwater discourage illegal drilling as well as save water
- Success of local regulations through providing access to non-well owners, not denying access to them

Thank you !