2009

"Breaking the Boundaries in Water Management" - A Case Study Booklet

CONFEDERATION OF INDIAN INDUSTRY

CII – WATER INSTITUTE, JAIPUR

Foreword

India's accelerated and continuous growth has led to an unprecedented stress on the finite and fragile water resources that are on the verge of depletion on account of overexploitation coupled with mismanagement. Sectoral demands for water are growing rapidly in line with urbanization, population increase, rising income and industrial growth. The poor management of water calls for action from all categories of stakeholder.

In the advent of water crisis the industry will be seriously hit thereby affecting the economy of the country. The industry which consumes 8% of the water resources has taken various measures both "within the fence" and "beyond the fence" to ensure sustainable management of the depleting water resources.

As a part of CSR activity various industries have implemented water related projects with the participation of the community. It also facilitated capacity building of various stakeholders, bridged the gap between industry and community, and emergence of a unique partnership embarking on comprehensive water management. There is plethora of initiatives undertaken by the industry that have made an effective dent on the livelihood and quality of life of the community through intervention in water sector. However these initiatives are in a state of oblivion due to lack of proper dissemination of information among other stakeholders.

In order to excite, enthuse, propagate and create a mental impact to undertake such initiative in others parts of the country the CII- Northern Region Core Group on Water is publishing "Breaking the boundaries in water management- A case study booklet". The booklet contains eleven case studies relating to – rain water harvesting; rural drinking water; defluoridization; salinity mitigation; direct seeding of paddy; and integrated watershed management. The uniqueness of these projects is the involvement of the community since the inception for ensuring sustainability.

We hope the booklet will provide enough ideas for industry / community to adopt practices that suit their requirement.

Best Wishes

Vipin Sodhi
Chairman – CII NR Core Group on Water
CONFEDERATION OF INDIAN INDUSTRY | CII – Water Institute, Jaipur

Executive summary

Against the backdrop and being a premier industrial association of India CII has always being played a crucial and significant role and duties towards the industries and the social communities around them. CII had motivated the industries to opt the corporate social responsibility (CSR) and make them understand that CSR activities can be business opportunities rather than a charity.

CII's centre of excellence, Sohrabji Godrej– Green Business Centre at Hyderabad is making efforts in all environmental related fields like Energy, Water, Renewable Energy, TPM, TQM, TCM, and Green Buildings etc. This is the very first resource centre in India introduced the green building concept in India with LEED rating system. Over a period of time it has been evolved as the one single source contact point for all green business related activities. Now CII has proactively step forward and focused on the nature's most precious commodity, Water. CII –Water Institute, another centre of excellence at Jaipur specifically looking after all industrial water and waste water related issues at pan India approach.

CII Northern region has also form a core group on water with five sub groups on viz. Aqua Code & Policy Advocacy; Water management Services; Training & sensitization Programme; Water Conclave & Projects beyond the fence line. The leaders and member of these groups have been elected from various categories of industries. The overall objective of the core group is to develop an edge on the integrated water resource management with significant and sustainable growth of Indian industries.

In continuation to the efforts for water management CII has come up with the collection of some case studies on "Breaking the Boundaries in Water Management". The Water sector initiative through above project title is guided by one of the working sub-group of the northern region core group on water chaired by Mr. Vipin Sondhi, Managing Director, JCB India Limited, Ballabgarh. This booklet contains the various steps taken by different category of industries in managing this most vital resource within & beyond their plant boundaries. The purpose of this exercise is to inform, promote & motivate other industries to replicate these efforts and renovate & innovate the present practices to take them to the next level of perfection.

CII - Water Institute, a joint initiative of the Confederation of Indian Industry (CII) and the Govt. of Rajasthan. CII - Water Institute is a centre of excellence focusing on all issues related to water management including Detailed Water Audits for Industry, facilitating Zero Water discharge, Rainwater harvesting, waste water treatment and desalination etc. CII-Water Institute has been very closely associated with various types of industries in conducting a detailed water management study. CII-Water Institute has a team of experienced professionals for conducting detailed water audit, Water management Training Programmes.

Content

Case Study I : Ambuja Cement Ltd – Salinity Mitigation and water management in Junagarh

Project Title: Salinity Mitigation and water management in Junagadh: A case story in water resource management

Industry Profile: Cement manufacturing. The Company possesses 5 integrated manufacturing sites, 6 grinding units and 3 shipping terminals. The gross annual turn over for 2008 was Rs.7090 Crores.

Background of the project: In the villages dotting the coast of Junagadh and adjacent districts the problem of salinity had taken a serious turn about three decades ago. The serious nature of the problem of salinity was showing a detrimental effect on all aspects of rural life making it unnecessarily arduous and reducing the quality of life. The situation became so grave that villagers began seeking solutions and saw the need of taking constructive steps to curtail this problem. Thus the project was started in 2002 and is being implementation presently too. The objective of the project was to reduce the salinity ingress in and around the coastal regions of Junagadh, Gujarat and mitigate the ill-effects of this manmade problem to improve the livelihoods of the rural people.

Problems/ Issues faced: To organize the villagers, convince them and motivate them for cooperation, participation and support for making the same successful was a big task. The other challenge faced was that of land acquisition. For construction of some of the structures required for the project, individual farmers had to sacrifice tracts of private land. Naturally many of them were not willing to do so. To convince them, meetings were held to make them aware of the essential nature of their contribution to the project and the benefits that would accrue to all community. After many rounds of discussion and debate, these challenges were overcome.

Project partners: Besides the Government of Gujarat, Sir Ratan Tata Trust and AKRSP (I) were partners in the project.

Project Methodology/ strategy: The over all project plan was developed with the participation of the villagers. Traditional knowledge about the local water resources, the monsoons, the soil quality etc was taken from them and ACF added the latest scientific know-how, technical inputs, trained professional personnel and finances. The actual implementation of the project was carried out by the people and ACF. The villagers contributed to the project in various ways- they offered free labour, gave away tracts of their land, and in some cases even collected money as community contribution towards the project.
Check dams were built in the seasonal rivers of the region to allow for better percolation and recharge of under ground water. Existing village ponds were de-silted and deepened and inter-linked. Goma River, a link channel was excavated from Panch Pipalava bhandara to Jantrakhadi village, and underground pipeline was laid from Shingoda River to recharge Barda bhandara. The used mines of the Company were converted into reservoirs of water. These too were interlinked to maximize water storage. Mine reclamation in this form is a unique feature of this water management project as there has no other interventions like this in the area previously. Following activities done during the project:

S.No.	Activity	No.
1.	Construction / Renovation of Check dam /Causeway / Dykes	153
2.	Well Recharging	902
3.	Percolation Tank/Village Ponds/ tanks/ Renovation/ De silting/Deepening	95
4.	Percolation Wells	100
5.	Construction of Waste weirs / Culverts / Bori Bandh	141
6.	RRWHS Constructed	2103
7.	Drinking water wells /Renovation of Saline Wells	68

Other interventions such as the promotion of micro irrigation systems like drip and sprinkler irrigation, training sessions for farmers, demonstrations of multi and mixed cropping for the benefit of farmers were also organized. These aimed at optimizing water utilization by the community members.

Fig: Inter-linking channel

Fig: Well Recharge

Fig: Mined out Pit with Water

Outcome: The project has given positive results / impacts in all social, environmental & economical aspects of life of local community; few of them are as under:

- Agricultural productivity has increased. Instead of one crop per year, farmers are able to grow three. Over all agricultural productivity has increased by 1.5 to 3 fold with introduction of low water intensity crops and horticulture. Total area benefitted is over 23,000 Hectare and total number of farmers benefitted 15,500.Family incomes have increased.

Table: Yield change for Panch Pipalava village

Crop	***Pre-project yield/bigha***	***Post project yield/bigha***
Groundnut	315 kg	525 kg
Pearl Millet	700 kg	1050 kg
Wheat	-	1050 kg
Sugarcane	18 MT	35 MT
Cotton	-	875 kg

- Improved quality of drinking water has lead to improved health status of the population. Drinking of saline water had caused kidney stones and problems of the bones. It is on the decline now.

Table: Water quality of renovated well in Muldwarka village

S. No.	***Quality parameter***	***Before renovation***	***After renovation***	***Drinking water standard***
1.	pH	7.5	7.5	6.5-7.5
2.	Total hardness	2200	240	300
3.	Chloride	2650	225	250
4.	TDS	5000	600	500

- The mined-out pits that converted into water reservoirs for rainwater harvesting has increased the ground water level in project area by 30 feet.
- The project has harvested 1067 mcft of water and benefited an area of 23,254 hectare.
- Over the years salinity had caused a salty layer to form on the surface of the soil. This layer reduced the fertility of the soil. With improvement in the water quality this layer has dissolved and consequently soil fertility and resultantly yields have improved.
- Higher incomes due to crop intensity & introduction of vegetables and horticulture along with right technology and cattle more productive, better yield due to improved health.

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Case Study II : Bosch Ltd – Safe Drinking Water

Project Title: Safe Drinking Water Facility at Goner Village

Industry Profile: The Bosch group is Germany based MNC. With a turnover in excess of 45 Billion Euro, Bosch is the largest automotive technology provider in the world. In India, it is a public limited company headquartered in Bangalore, with manufacturing facilities at Bangalore, Nasik, Nagnathpura, Jaipur and Goa. Its products range from diesel and gasoline (petrol) fuel injection systems, starter motors and generators, special purpose machines, electrical power tools to security systems. The company employs around 10,000 and recorded a turnover of over Rs 4,800 crores in 2008.

Background of the Project: Jaipur is one of the worst fluoride contaminated ground water district in Rajasthan as ground water is the only drinking water source. Underground rocks (Fluorspar CaF_2, sedimentary rocks, limestone, and sandstone) are rich in fluoride contamination. This causes high fluoride content in the drinking water.

Problem: Fluoride level in ground water varies 2.5 – 6 ppm level in Goner & WHO limits 1ppm level in drinking water. In rainy season, water contaminated diseases occurs but not recorded as any epidemic threat. Many, Fluorosis patients with joint pains, pale teeth and white hairs in early age. Availability of water source in Goner village is:

Description	Existing No.	Quality Status	Availability Period (in months)	Remarks
Pond	1	Poor	6	Rain water dries up in summers
Canal	0	-	-	
River	0	-	-	One nala of contains industrial effluents
Over Head Tanks	2	Poor	All time	
Open Wells	2	Good	All time	
Bore wells/Hand pumps	10	No	12	- -
Public Taps	0	-	-	-
Individual Tap connections	800	Average	All time	High Fluoride

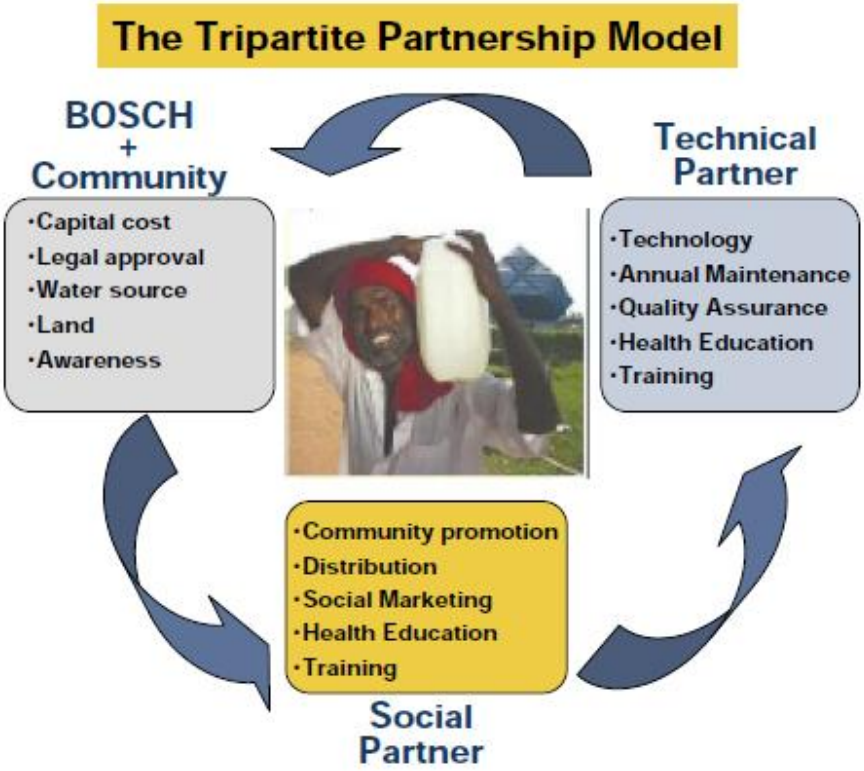
Project Methodology / Strategy: Reverse Osmosis (RO) technique is used to treat ground water. The methodology as follows:

1. Raw water supply from bore well/open well
2. Pressure sand filter cleaning
3. Activated carbon filter
4. Membrane cleaning
5. Blending
6. UV lightening
7. Final supply

Fig. 6 Safe drinking water facility at Goner **Fig.7 RO Plant**

Project Partners: Its tripartite partnership between,

- Bosch Limited, (Financial Partner)
- Naandi Foundation (Technical & Social partner)
- Community (Goner Village Panchayat)



Outcome: Local community is prevented from water prone diseases (i.e.). Dengue, malaria, typhoid etc. and different fluorosis, as they are now getting RO purified clean drinking water.

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Case Study III : Dahanu Thermal Power Station – Water availability for all

Project Title: Water Availability for All – An Approach for Sustainability

Industry Profile: Dahanu Thermal Power Station (DTPS) is a unit of Reliance Infrastructure Limited, a constituent of the Reliance - Anil Dhirubhai Ambani Group, is a fully integrated utility engaged in the generation, transmission and distribution of electricity. The company is India's foremost private sector utility with aggregate estimated revenues of Rs. 13500 crore. The company operates 500MW coal based Thermal Power Plant at Dahanu (Maharashtra).

Background of the project: Dahanu Taluka is a tribal dominated area. The CSR efforts are directed towards improvement of health and education level of the tribal community. DTPS is committed to undertake socio-economic development programs in villages in order to improve the quality of life of people (key community), most of whom (approx 70%) live below the poverty line. For the selection of Area, People, Process and Key Activities, a Key Activities Identification Framework (KAIF) was used. With focus on the basic needs for tribal community Dahanu TPS has started its CSR initiatives. So as to make available

- Potable drinking water.
- Storage facility to collect rainwater, which in turn improves the water table.

DTPS involved Local NGOs like Rotary Club, Govt. authorities, village Panchayat, etc for creating suitable platform for the work. Based on the feedback from these NGO & Govt. Authorities Reliance Infrastructure has taken following types of projects in the field of water conservation beyond its fence.

- Implementation of drinking water system for village community
- Implementation of water shed management projects with community involvement

Problems/ Issues faced: Major challenge was the permission required for the construction of Check Dams from the Block Development Office. The tribals were very afraid of approaching the authorities due their own hesitation were a major hindrance. Land requirement for both construction of check dam and bore wells was a challenge because they were not able understand the long term benefits of the project. Above all Government has its own different schemes for water development, but they were having their own priorities.

Project partners: The core partners were the Gram Panchayats and their residents. Block Development Office was another partner for necessary permissions and community involvement.

Project Methodology/ strategy: In the year 2005-06 a holistic project **"Water Availability for All"** was designed and discussed with the villagers as it was entirely a project with people's participation. A survey of the surrounding villages was conducted. There after; having a joint inspection of many locations, 3 locations [1) Savata-Saravli, 2) Chari-Kotbi, and 3) Asangaon-Wadade were identified based on the need analysis and development index of the local community. Location of Saravali-Savata was approved for construction of check dam for a holding capacity of 0.135 Million cubic meter of water. Along with technical inputs; fund was provided by the Reliance Infrastructure whereas voluntary labour was provided by the villagers themselves. **In the year 2006-07;** check dams at Chari-Kotbi and Asangaon Wadade were constructed along with eight weirs and 145 bore-wells. These bore wells were constructed in 42 villages covering a population of 49,980. **In the year 2007-08;** 225 bore wells; 2 check dams at Chari and Raitali have been constructed. Apart from this an over-head water tank for providing drinking water to the devotees who visited the Mahalakshmi throughout the year. The total capacity of this tank is 60 thousand liters with a height of 40 feet. The 225 bore wells have been constructed in 15 villages.
Campaigning: DTPS did various in-plant campaigns and training programmes with contract labourer them. It made the rapport building in the villages easier. This ensured our penetration in the villages and increased participation. Also we explain the teachers; students and parent – teacher associations about the importance of Water Availability for All projects. The other CSR programme of Health; We passed on

the message to Doctors; Nurses; Community Health Workers; Anganwadi workers; etc. All these support campaigns gave us a larger ground to implement the project in the stipulated time frame.

Fig: Installed Hand Pump

Fig: Check Dam under Construction

Outcome: The community benefits are more qualitative like the people near the check dams have started taking two crops in a year. Secondly the people who had to walk for 3 kms to get a pot full of water now are getting it closer to their houses. This has addressed their health / hygiene and sanitation issues to a large extent. But something that needs a mention is their positive attitude towards developmental issues. Even the gram panchayats now look for a holistic and integrated approach.

S.No.	Location of the Check Dam	Storage Capacity	Beneficiaries	Population (Approx)
1	Savta – Saravali	13.5 Lac cu.m.	24 villages	70,000
2	Chari-Kotbi	10000 cu.m.	3 villages	12,000
3	Asangaon Vadade	10000 cu.m.	4 villages	10,000
4	Raitali	5000 cu.m.	4 villages	15,000
5	Chari Dam -2	5000 cu.m.	5 villages	15,000
Total			**40 villages**	**122,000**

- ✓ Increase in ground water percolation.
- ✓ Water availability for agriculture purposes – they can take second crop now.

The check dam will provide benefits like,

- ✓ Increase in ground water table
- ✓ Increase in vegetation cover in the near by area
- ✓ Round the year availability of drinking water availability from dam holding
- ✓ Stoppage of salty sea backwater intrusion
- ✓ Commercial fishing in dam holding
- ✓ Dahanu Nagar-palika can lift drinking water from this dam which is only 6 KM away from Dahanu instead of from Sakhare dam which is about 25 KM away.

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Case Study IV : Hindalco Industries Ltd - Land and Water Management

Project Title: Life upliftment of villagers by Land and Water Management

Industry Profile: HINDALCO Industries Limited, Renukoot, UP is a company of the Aditya Birla Group, India. It is an industry leader in Aluminum and Copper. A metals powerhouse with a consolidated turnover of Rs. 600,128 million (US$ 15 billion), HINDALCO is the world's largest Aluminum rolling company and one of the biggest producers of primary Aluminum in Asia. Its Copper smelter is the world's largest custom smelter at a single location.

Background of the Project: HINDALCO conducted a socio-economic study and Focused Group Discussions in villages, which facilitated it to identify 16 villages for making them self sustainable. These villages are situated within the vicinity of its plants in the states in Uttar Pradesh, Chhattisgarh and Jharkhand. In the study it was found that these villages were the most poverty stricken villages and having the domination of scheduled castes, scheduled tribes and backward classes. 70 percent of the population lives below poverty line with low buying capacity. The study revealed that poor land and water management was the crux of the entire situations. Due to poor land and water management around 60% of the land is either unused or underused. The farmers get hardly one crop and heavily depend on uneven rain in monsoon. Apart from this 21% of the land is without any use and it also facilitates the further erosion of the soil from other field. These all factors trigger us to take the land and water management project. Details of villages identified for project were as under:

Name of Units	No. of villages	No of Households	SC/ST	Others	Male	Female	Total Population
HINDALCO, Renukoot	10	4397	17631	8297	13435	12492	25927
HINDALCO, Renusagar	2	1105	5375	2530	4036	3869	7905
Mines Division, Chhatisagarh	2	453	1676	789	1338	1128	2465
Mines Division, Lohardaga	2	476	2275	1070	1660	1685	3345
Total	**16**	**6431**	**26957**	**12686**	**20469**	**19174**	**39642**

Problems / Issues faced: In the initial stage, the community and Panchayats were reluctant to co-operate us. So it was difficult to mobilize the resource from them. Secondly due to natural condition as mentioned before, the access to the project villages was not smooth. The other existing facts were also, which can be delineated as:

- Naxal prone area.
- Political interference
- Hilly terrain and scattered population
- Prevalence of dogmas and social taboos
- Poor infrastructure facilities.
- Huge migration from these villages.

Project Methodology / Strategy: For maintenance part of the running cost for the long and continuous use, we from the very beginning have designed a strategy according to which the village development committee along with the beneficiaries decides the operation cost and payment of the Lift irrigation system, which is accepted by all. Generally the charge is decided based on the hour use and the committee charges Rs.15-20 per hour from the user. They maintain a separate logbook and accounts of

the receiving, which is deposited in a joint account. Thus every VDC has sufficient amount to maintain and repair the system. The committee also approaches to Panchayat and Govt. Officers at block level if the need for different new projects comes in. We on a regular basis monitor the VDC and the project very regularly.

Project Partners: Various categories of partners involve in the project were:

Partner	Name & Title	Institution	Proposed Role
Public Sector Institution	District Horticulture Officer Divisional Forest Officer DRDA Director	1.District Horticulture Department 2.District Forest Department 3.District Rural Development Agency	Providing seeds of High Yield Verities, Fruit bearing plants and Agriculture support.
Private Sector Institution	Secretary	HINDALCO with Adhunik Uttpadak Sahkari Samiti Limited	Campaigning and technical support
Civil Society Institution	NGO Heads.	1.BAIF Allahabad 2.Banwasi Sewa Ashram 3.Shyam Sewa Samiti 4. Nav Chetna Samiti	Technical support and social mobilization.
Other		Panchayat, Village Development Committee and Self Help Groups.	Project implementation and social mobilization

Outcome: The project has intervened in the livelihood of the people. It makes the basis, which affects other important aspect of life such as education, good food and buying capacity. This has impacted 39,642 people in food production, health improvement and control migration. Some indicators are being put forth which can help to understand the impact of the project.

Pre-Project Situation	Post-Project Situation
Mono Cropping	Double Cropping
Food availability for 6-7 months	Adequate food availability for all 12 months
Women involvement is society was negligible	Participation improved by 40%
Average Annual income was Rs. 18000/-	Average annual income raised upto Rs. 41000/-
Development for waste land was negligible	Approximately 155 hectare waste land has been treated under social forestry (3% of the total waste land)
Low agricultural produce	An additional agricultural produce around 7000 tonne.

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Case Study V : ITC Ltd – Integrated Watershed Management

Project Title: Integrated Watershed management Project in Bundi District, Rajasthan

Industry Profile: ITC is one of India's foremost private sector companies with a market capitalization of nearly US $ 14 billion and a turnover of over US $ 5 billion. ITC has a diversified presence in Cigarettes, Hotels, Paperboards & Specialty Papers, Packaging, Agri-Business, Packaged Foods & Confectionery, Information Technology, Branded Apparel, Personal Care, Stationery, Safety Matches and other FMCG products. ITC's commitments in agricultural R&D and knowledge sharing have spanned vital aspects of competitiveness – efficient farm practices, soil and water management. ITC's watershed development initiatives promote two vital objectives – water conservation and soil enrichment, enabling farmers to extend the cultivation cycle and return to multiple cropping. ITC supports 916 water user group (WUGs) in seven states ensuring soil & moisture conservation on more than 43000 hectares of farmland, building over 2500 water harvesting structures.

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Background of the project: The agricultural sector is the major supplier of inputs for many ITC's business and farm productivity is therefore an area of vital concern. 67% of India's cultivable land is subjected to server moisture stress for 5-10 months of the year. Ground water depletion is severe due to poor conservation and excessive extraction. Though the country has good precipitation by global standards, nearly 90% is lost as surface runoff and only 10 % is harvested. In the moisture stressed areas from where ITC sources agricultural produce, the protection & development of water resources is therefore an investment for the common benefits of rural communities & its own business lines. ITC's Programme deploys watershed development as a major strategy to achieve two fundamental objectives:

- Water conservation and soil enrichment
- Village based management of water and other natural resources.

Problems/ Issues faced: The project villages are located in an undulating terrain interspersed with small hillock. The soil is stony, sandy clay loam with a depth ranging 30 – 90 cm. The climate is categorized as moderate with an average annual rainfall of 400-600mm. Most of the rainwater is lost as surface runoff and the majority of the water bodies have been dry for a long time, resulting in high agricultural costs and poor agricultural income. The area is rainfed and main source of irrigation is open wells which irrigates about 20& of the land. Diesel-operated pumps and bullock drawn "Chadas" are the main means of irrigation. Ploughing is generally done mechanically while seeding uses bullock or is through broadcast. Crops were harvested manually

Project partners: ITC's integrated watershed development project in Bundi District in south east Rajasthan was initiated in 2005 in partnership with BAIF covering 5 villages in the Hindoli Block

Project Methodology/ strategy:
ITC-BAIF's project mobilizes local communities into water user group and assist them to build revive and maintain micro water harvesting structures and carry out soil and water conservation measures to reserve land degradation, provide critical irrigation and raise agricultural productivity. The main project components were:
1 Soil and water conservation measures including the different type of water harvesting structures:

- Water Harvesting Structures
- Irrigation Tanks (Talai)
- Gully Plugs
- Chain Linked Gabion
- Loose Stone Check Dams
- Field Bunding

2 Adoption of improved agricultural practices including crop diversification and organic composting

- Package of Agronomical practices

- Vermi and Super Composting

3 Capacity building

- Training
- Farmer Meeting
- Exposure Visits
- E-Choupal Sanchalak Sammelan
- Kisan Goshti

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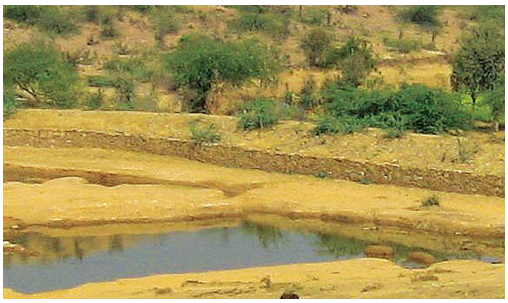

Fig: The Mamadev Talai in Vijaygarh

Fig: The Kharad Giwan Check Dam in Salavatlya

Outcome:

- In the span of 4 years, 5 village watershed committees with 75 members and 15 water user groups have been formed for management of the constructed structures.
- 16 Water Harvesting structures – 6 check dams and 10 irrigation Tanks have been constructed between 2005-08
- 607 gully Plugs, 28 GI-Chain linked Gabion, 58 loose stone check dams were constructed. 22,011cubic meter of field bunding was carried out, benefiting 4,044 households and generating 31,300persons-days of employment.

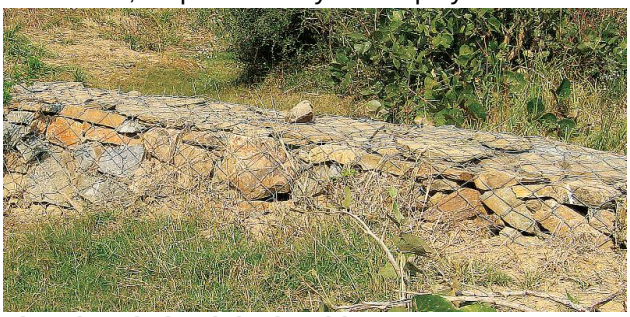

Fig: The Chain Linked Gabion

Fig: The Palambar Anicut at Fatehgarh

- 75 Vermi-compost, 45 Super Compost and 60 IPM demonstration were completed in the villages.
- 15 watershed management related training programme and 7 exposure visits have been organized.
- The structures provide critical irrigation directly to more than 400 hectares in the command area
- The creation of dead storage potential of more than 5 Lakhs cubic meter of water contributes to the recharge of numerous well downstream, thus increasing the command area significantly.

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Case Study VI : Lupin Ltd – Rain Water Harvesting Project

Project Title: Rain Water Harvesting Project, Roopwas Block of Bharatpur District – Lupin Case

Industry Profile: Lupin Limited, India has successfully positioned itself as a transnational Pharmaceutical Company, with a wide global footprint. The company has an onshore and offshore presence with its products available in close to 70 countries. The company seeks the opportunity to serve society through the Lupin Human Welfare & Research Foundation (LHWRF). It was set up on October 2, 1988 with the objective of providing an alternative model of rural development in the country, which is sustainable, replicable and ever evolving. Initiating the programme of rural development within a small number of 35 villages, LHWRF has now succeeded in revitalizing, revamping and recreating life in 2,200 villages in several of India, which has led to LHWRF emerging as one of the largest NGOs in the country.

Background of the project: The Bharatpur district poses a challenges to human settlement because of extreme temperature, erratic & deficient rainfall, very deep, scarce and saline water sources. With highest density of population and prevailing high growth rate of population the per capita water availability is going to further reduce to alarmingly low levels implying that the challenges for water sector are much more and severe in the area. So far, household needs are being fulfilled by individual efforts in the district. Roopbas block of Bharatpur district is the most vulnerable in availability of safe drinking water. It was alarming time to demonstrate how to harvest rain water that is going worthless from their roof tops. It was decided that one Rain Water Harvesting (RWH) Structure should be established in schools, so that people may replicate the same for their household purposes. At the same time Schools (Students) will get safe drinking water for several months. Against the background the RWH project was initiated with following socio-economic objectives:

- To develop proper social, cultural, scientific and spiritual attitudes amidst the rural community.
- To instill in villagers, especially women, children, youth and older people an urge and keenness to work for their own development.
- To develop an attitude towards living a healthy life and taking concrete steps in that direction.
- To help create more job opportunities particularly for unemployed youth and women. To strengthen primary occupations like agriculture and animal husbandry through higher output and value addition.
- To strengthen secondary occupations such as cottage industry, handicrafts and service sector through quality enhancement and wider market acceptability.
- To create basic infrastructure facilities for the community such as:
    - Provision for drinking water
    - Building internal roads
    - Basic sanitation
    - Formal education
    - Community centers
    - Electrification
    - Training cum Production Centers etc.

Problems/ Issues faced:

- Non-availability of potable water.
- Depletion of Ground water table.
- Sub soil water table of brackish water contains high percentage of salt.

Project partners: CAPART (Council for Advancement of People's Action and Rural Technology, New Delhi) supported the construction of Rain Water Harvesting Structure in the schools. Lupin foundation has contributed in terms of technical & financial support & the local community contributed by free labour service etc.

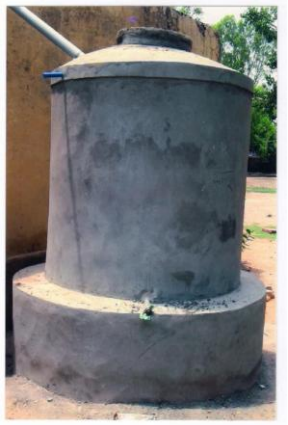

Fig: Rainwater Storage under construction

Fig: Complete RWH Structure

Project Methodology/ strategy: Project methodology can be divided into following phases:

Awareness Phase

- Demonstration of Rain Water Harvesting Structure in the village.
- Awareness generation among villagers regarding Water Management, Water Harvesting and value of safe drinking water and women.
- Awareness creation for school

Planning Phase

- Collection of list of villages/schools.
- Village Level Committee constituted for proper management and future sustainability of structure so created.
- Awareness creation for school teachers and students on safe drinking water and maintenance of structure.
- Strategic involvement of PRI's, Government departments and local leaders in the construction work.

Construction Phase

- Selection of site
    - Close to school buildings but away from trees.
    - Having good drainage facility.
    - Accessibility to teachers and children.
- Casting and plastering of water tank of 3000 litres water storage capacity.

Outcome: The project got a grand success and impacted in social, environmental & economical life of the surrounding community. Now Lupin is extensively focusing on water management and demonstrating water harvesting all over the Bharatpur district. Few of impacts are as under:

- 42 schools and villages benefited by provision of drinking water facility.
- Awareness creation amongst community regarding the importance of water.
- Contamination free safe drinking water for school children.
- Motivation of community for sustainability of Rain Water Harvesting
- Structure and its management.

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Case Study VII : Lupin Ltd – Rural drinking Water Supply

Project Title: Sustainable Development of Taal Maharaja Badan Singh for Drinking Water Supply in Sinsini village of Kumher Block of Bharatpur District

Industry Profile: Lupin Limited, India has successfully positioned itself as a transnational Pharmaceutical Company, with a wide global footprint. The company has an onshore and offshore presence with its products available in close to 70 countries. The company seeks the opportunity to serve society through the Lupin Human Welfare & Research Foundation (LHWRF). It was set up on October 2, 1988 with the objective of providing an alternative model of rural development in the country, which is sustainable, replicable and ever evolving. Initiating the programme of rural development within a small number of 35 villages, LHWRF has now succeeded in revitalizing, revamping and recreating life in 2,200 villages in several of India, which has led to LHWRF emerging as one of the largest NGOs in the country.

Background of the project: The water was scarce and difficult commodity for Sinsini people. The villagers used to drink water from 5 open wells located on the shoreline of the shallow pond which retains water only for 8-9 months. During each summer, pond gets dried up which leads to drying of open wells. The drinking water facility in the village was mainly from tube wells, tanks and hand pumps. These wells located on the shoreline of Taal Badan Singh has sweet potable water, but poses a problem of water during summer and monsoon due to drying and submergence respectively. The project was selected based on the specific problematic location and need. Therefore, a need based project for harvesting rainwater with prime objective of drinking water facility.

Problems/ Issues faced:

- Village was lacking potable drinking water.
- Most of the deep aquifers below 50 feet upto 350-400 feet were brackish and unpotable.
- The shallow aquifer dried up during each summer.
- Burden on village on women on bringing water on their heads from distant wells.
- Animal population also faced scarcity of water during summer when pond gets dry.
- Open wells along shoreline of ponds was having no platform, hence proper facility of open lifting water.
- During monsoon wells got submerged in pond water and later the pond water got mixed with well water.

Project partners:
United Nations Development Programme (UNDP)
Community

Fig: Work in progress by engagement of heavy equipments and village tractors

Fig: Maharaja Badan Singh Taal, Sinsini Village at FTL after project work

Project Methodology/ strategy: Project methodology can be described under following steps:

People Participation

- Creating Mass Awareness
- Benefits of project discussed in open meeting.
- People participation invited.
- Village amenities and land use pattern studied.
- Removal of encroachments.
- Constituting of Work Organising Commitee

Material & Method

- Project Sanctioned at right time when the pond was dry
- Encroachment issues dealt and removed
- Machines & Equipments engaged because of engagement of labour in farming practices.
- Village tractors used and JCB utilized for the task of excavation.
- I.T.K (Indigenous Technological Knowledge) approach was given importance like catchment area and inflow channels learnt from villagers and improved as per their suggestions.
- Dykes were made heavy and wide to accommodate plantation.
- Open wells raised beyond submergence level and their platforms constructed and protection bundhs prepared for safety of structure with stone pitching to ensure proper working of aquifer and for prevention of contamination of well water.
- Wells renovated to give added importance.
- Safety of Structure was given importance to ensure overflow and inflow working harmoniously..
- Operation and Maintenance committee designed and formed to ensure that the benefits of the project are reached uniformly to the target group without any discrimination.
- Formation of Women SHG for rational usage of water and to raise funds from the community.
- Plantation and Fish Culture group created for sustainability and improvement in terrestrial and aquatic environment.

Outcome:

- Became a guiding factor for formulating water policy.
- Discovery of S & T solution for an abandoned resource.
- Participatory approach successful.
- Lesson of Small grant utilization for redressal of big issues and problems.
- Optimum use of resources – Land, Labour, Capital, Entrepreneur,
- Supply of Quality Water in all seasons well from meeting health safe guards.

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Case Study VIII : PepsiCo India – Direct Seeding of Paddy

Project Title: Direct Seeding of Paddy to improve agricultural & environmental sustainability and improve farmer incomes

Industry Profile: PepsiCo India is the Indian subsidiary of PepsiCo Inc, a US based company manufacturing food and beverage products. The company came to India about 20 years back and its operations have grown rapidly. It is the fourth largest FMCG company in India.

Background of the project: As per FAO, agriculture uses over 85% of India's water resources. In a year of low rain fall the water table gets further depleted due to large water withdrawal by agriculture. Amongst the various crops, paddy alone uses about half the water used in Indian agriculture. Hence, in order to reduce rapid depletion of the water table, it is critical to reduce water consumption in paddy cultivation.

India grows about 130 million tons of paddy over about 108 million acres and is amongst the largest rice growers in the world. Traditionally, India paddy is cultivated by sowing seeds in a small nursery, where the seeds germinate into saplings. The saplings are then transferred manually into the main field and then grown with 4 - 5 inches of standing water at the base of the crop for the first 6 - 8 weeks, mainly to prevent weed growth. Direct seeding of rice (DSR) avoids three basic operations, namely, puddling (a process where soil is compacted to reduce water seepage), transplanting and standing water, thereby saving about 30% water (0.9 million liters of water / acre).

Problems/ Issues faced: Since the direct seeding of rice was a complete departure from the current practice of rice cultivation, PepsiCo India wanted to be absolutely sure of the results, before taking the innovative technology to the farmers. Hence, the company carried out trials in their own R&D fields for two years during 2004 and 2005, and then gradually expanding the trials in the farmer fields. During 2006 - 2009, the direct seeding acreage was gradually increased from 20, acres to 6500 acres after being absolutely sure of the performance. It was important to train the Field Executives who would regularly visit direct seeded farmer fields and guide the farmers on direct seeding.

As direct seeding of rice in the main paddy field would be extremely laborious, PepsiCo developed a tractor driven direct seeding machine. PepsiCo bought many machines and offered farmers free access to these machines to carry out direct seeding. PepsiCo has put in considerable financial and people resources behind direct seeding of paddy to make it a success and is currently carrying out direct seeding in 5 states, including, Punjab, Rajasthan, Karnataka, TN and Pondicherry.

Project Methodology/ strategy: The critical success factors for direct seeding are:

- Proper seed germination, plant population and its geometry
- Nutrition & management of micronutrient deficiency
- Management and control of weeds

The various developments made during PepsiCo's R&D trials to manage above and farmer's fields were demonstrated with precise & scientific agriculture of direct seeding of paddy under following actions:

- **Proper seed germination, plant population and its geometry**
  - **Development of Direct seeder:** PepsiCo has developed a tractor driven direct seeding machine locally with a specific seed-metering device used for sowing the paddy seeds. PepsiCo buys these machines, and gives farmers free access to these machines.
  - **Seed Priming:** Demonstration of paddy seed priming performed by soaked in solution having fungicide and antibiotics (Emisan and Streptomycin) for 15-20 hours. The seed thus treated is dried for 1-2 hours in shade so that it can be dispensed efficiently from the machine.

Fig: Direct Paddy Seeder

Fig: Sowed Paddy in Row by seeder

- **Nutrition & management of micronutrients deficiencies**

Paddy specific fertilization schedule as mentioned below has been followed:

Time of Fertilization	Fertilizer (in Kgs / acre)				
	Urea	DAP	MOP	Librel Zinc	Librel Fe
At the time of sowing	15	25	20	0.5	0.5
20 days after sowing	15-20	0	0	0	0
35 days after sowing	10-15	0	0	0	0

- **Management and Control of weeds:** Selection and application of post-emergence herbicides depends upon the weed flora in the field. Timely application of post emergence herbicide is extremely critical to get good management of weeds.
- **Methane emission reduction through direct seeding of paddy:** Paddy cultivation with traditional flooded irrigation is one of the main reasons for Methane emission in the country. The presence of biomass immersed in water over an extended period leads to about 4.5 million tons of Methane being emitted from the paddy crop in India annually. Since in direct seeding there is no water at the base of the crop, there is a substantial reduction in Methane emissions.

Project partners: PepsiCo India worked closely with International Rice Research Institute (IRRI), Indian Agricultural Research Institute (IARI) and Punjab Agricultural University (PAU) on direct seeding of rice and kept them briefed on progress / performance. IRRI has provided useful inputs based on their international expertise on direct seeding. The farmers have been the major partners on the direct seeding initiative, and PepsiCo has worked closely with various herbicide companies to ensure no weed growth in direct seeded fields.

Outcome: The harvesting of direct seeded paddy fields sown during 2008 has shown that output from direct seeded paddy fields is comparable to traditionally irrigated paddy fields. With lower cost of cultivation, direct seeding results in higher income to the farmers. PepsiCo has put in considerable financial and people resources behind direct seeding of paddy to make it a success and is currently carrying out direct seeding in 5 states, including, Punjab, Rajasthan, Karnataka, TN and Pondicherry. PepsiCo will look at consolidating Carbon Credits for all direct seeded fields and pass these on to the individual farmers, after recovering its own costs. Study revealed that:

- Direct seeding over 6500 acres has enabled saving of about 6 billion liters of water, and has enabled improvement in agricultural sustainability.
- Since direct saving reduces need for pumping of water and reduces labor requirement, the farmer saves about Rs1500 / acre in cultivation costs.
- Since in direct seeding there is no water at the base of the crop, IARI studies are indicating that there is a reduction in emission of Methane by about 70%. Hence, direct seeding will also help clean the environment.

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Case Study IX : Tata Chemicals Ltd – Integrated Watershed Development

Project Title: Integrated Watershed Development for community of Okhamandal Taluka of Jamnagar District

Industry Profile: Tata Chemicals Limited (TCL) is a global company with interests in chemicals, crop nutrition and consumer products. It is the world's second largest producer of soda ash. Established in 1939 at Mithapur (in Gujarat, India), TCL is a part of the Tata group. The company is a pioneer and market leader in the Indian branded iodized salt segment and India's leading producer of nitrogenous and phosphatic fertilizers. Tata chemicals established and promoted "Tata Chemicals Society for Rural Development" (TCSRD) in 1980, initially conducting programs for relief and welfare.

Background of the project: Okhamandal Taluka of Jamnagar District in Saurashtra Peninsula is one of the most drought prone regions of the country. Tata Chemicals accepts the entire Taluka as its home and has over the years worked with the community, especially in times of stress. The project has followed an integrated approach towards water management. The objectives were:

- To improve economic conditions of people through improved availability of water
- To improve underground water quality and availability
- To arrest ingress of salinity
- To increase irrigated land area
- To improve availability of drinking water.
- To build capacities of the local people
- To promote suitable low water use crops/cropping techniques
- To improve green cover and promote indigenous species.

As a proactive strategy to make Okhamandal survive and grow, a comprehensive project on Water Management has been taken up under the aegis of Natural Resource Management (NRM) Theme. Tata Chemicals itself has pioneered water management in its plant and township focusing on reuse, recycling and substitution by seawater.

Problems/ Issues faced: The project area was covered on three sides by seawater; hence underground water is saline in nature, Soil strata was impervious in nature, percolation of rain water was difficult, lack of awareness among the community & poor socio-economic conditions of the community.

Project partners:

	Name	Institution	Proposed role
Public institution	DRDA	District rural development agency	providing funds for micro water shed project
	WASMO	water & sanitation management organization	Providing funds for drinking water project
Private sector institution	Tata Chemicals Ltd	Tata Chemicals Ltd	Providing funds for support activities like capacity building, training contribution, funds, dedicating volunteers for the projects
civil society institution	Sir Ratan Tata Trust	Sir Ratan Tata Trust	Providing funds for salinity ingression mitigation
Others	Community		support activities, & funding

Project Methodology/ strategy:

1. Awareness about the project, its objectives, and concept of participation were created through village meetings, awareness and exposure visits and training programs.
2. Participatory rural appraisals (PRA) were conducted to identify the needs of the villages and creating village action plans.
3. Village level executive committee, were formulated with representatives from each community including women members.
4. Capacity building trainings to the user groups and the committee members on account keeping, decision-making, and project planning were imparted through implementation of a pilot entry point activity.
5. Water harvesting structures, water supply structures/ systems and structures for mitigating salinity ingress were constructed. These include: check dams, water storage structures, Village ponds, diversion channels, sub-terrestrial dams and bandharas, farm ponds and farm bunds. Groundwater recharge is carried out through recharge pits and recharge of wells. Additionally, roof rainwater harvesting structures were constructed to collect quality drinking water. Drinking water distribution systems, construction of new wells, constructing bore wells fitted with hand-pumps and creating structures that were exclusively for drinking purpose also form a part of this.

The last step was appropriate use of water and awareness drives, exposure visits to ensure sustainability have been taken up in earnest. A process to establish water codes in the villages has also been initiated.
TATA chemical's mass awareness camps, workshops, gram shabha for creating awareness among the villagers. It takes the full responsibility of training the employees & building the capability to handle the project once it gets completed

Outcome:

- Social Impacts were as under:

Description	Physical Achievement	Economic gain / year (approx.)
Construction, repair and strengthening of medium water harvesting structures (check dams, ponds, channels)	135 Structures in 30 villages. water storage capacity created – 175 million cubic feet.	@Rs.10000/Beneficiary. Avg. Net gain in the region ~ 200 Lakhs/year
Construction of farm ponds and farm bunds	796 farm ponds /bunds in 17 villages	@Rs. 7000/Beneficiary Avg. Net gain 25 –30 Lakhs/year
Recharge of ground water through wells	463 wells in 19 villages	@Rs. 6000/ Beneficiary. Avg. Net gain 23-30 lakhs/year
Roof rainwater harvesting.	Completed 624 households resulted in Saving of time for other work	
Plantation	9000 saplings last year.	
Drip irrigation	24 hectare completed this year	
Drinking water infrastructure	8 villages as a comprehensive approach that includes pipe water supply to each household, setting up hand pumps in 11 villages & 1 no of RO plant was provided to bhimbarana village(2000LPH)	

- Increase in yield from the agricultural lands, animal husbandry. & more areas were tapped for irrigation
- By availing drinking water at door step instead of collecting water from more than 1 km far (~ 3 hours/ day is wasted collecting water from 1 km away). Women use the spare time to educate the children. This was implemented in 8 villages
- By implementing Rooftop Rain harvesting projects, villagers near coastal area were relived from usage brackish water for drinking
- Increase in plantation of 9000 plants (FY 07-08) & bio diversity plantation in 75 acres (till date)
- Improvement in the health of animals by regular cattle camp

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