



***Case Study: RO Water Plant***  
***Mission Gagillapur***

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## **List of Abbreviations**

1	APMAS/MAS	Andhra Pradesh MahilaAbhivruddhi Society / MahilaAbhivruddhi Society
2	ANM	Auxiliary Nurse Midwife
3	AWW	Anganwadi Workers
4	ASHA	Accredited Social Health Activist
5	CMRC	Community Managed Resource Centre
6	CSR	Corporate Social Responsibility
7	FC	Functional Committee
8	FP	Finance Partner
9	GGP	Gagillapur
10	GP	Gram Panchayat
11	GS	Gram Sabha
12	IHHL	Individual Household Latrine
13	MGP	Mission Gagillapur
14	MPDO	MandalParishad Development Officer
15	MPTC	MandalParishad Territorial Constituency
16	NGO	Non-governmental organisation
17	OBC	Other Backward Caste
18	PM	Project Manager
19	PO	Project Officer
20	PS / EO	Panchayat Secretary/ Executive Officer
21	RO	Reverse Osmosis
22	RTE	Right to Education
23	SMC	School Management Committee
24	SC	Scheduled Caste
25	SH	Shakti Hormann
26	SHG	Self Help Goups
27	ST	Scheduled Tribe
28	VDC	Village Development Committee
29	VMF	VandeMataram Foundation
30	VO	Village Organization
31	WB	World Bank
32	ZPHS	ZilaParishad High School

## **In the Larger Context**

The provision of clean drinking water has been an important area of focus for the Government of India. The Constitution of India, under Article 47, delegates the duty of providing clean drinking water and improving public health standards of its citizens to the State Government.

AS per 2001 Census, 68.2 % of households in India have access to safe drinking water. The Department of drinking water supply shows that out of the 1.42 million rural habitations in the country, 1.27 million are fully covered, 0.13 million are partially covered, and 15,917 are not covered. However, coverage refers to installed capacity and not the average actual supply over a sustained period or the quality of water being supplied. (Water Aid, 2010, *Drinking water quality in rural India.*)

Till the 10<sup>th</sup> Five Year Plan, the Indian Government had spent an estimated amount of 1,105 billion INR on providing safe drinking water. In spite of this, the problem of scarcity of drinking water still continues to plague different parts of the country, mainly because of the diversity in population density, difference in levels of awareness, socio-economic development, education, poverty, practices and rituals, which add to the complexity of the issue.

It is predicted that by 2020, India will become a water stressed nation. Groundwater is the major source of water with 85% of population dependent on it.

The Government Policies have undergone a change since Independence. Earlier the focus was on setting up physical infrastructure through hand -pumps. Thereafter, efforts have been in seeking participation from the community. A national policy for water was drafted in 1987 and revised in 2002. In order to have a sustainable system in place, community participation was initiated for maintenance of rural water supply. Hence the previous “Government oriented supply driven approach” have been replaced by “People oriented demand driven approach”.

In areas where available water is not safe for drinking, reverse osmosis (RO) has been used for treatment of water.

In coastal areas, where most of the water available is brackish, RO Water Plants designed by the CSMCRI (Central Salt & Marine Chemicals Research Institute) were installed. The lessons learnt from the installation are:

- i. Obtaining a reliable electricity supply
- ii. Villagers did not like the idea of adding chemicals to water, although all chemicals were removed
- iii. Transportation of water to other areas become difficult, in case of insufficient storage capacity in the Plant
- iv. The Plants should be robust & easy to operate so that the community is able to operate the Plant easily

CSMCRI has been engaged in researching & designing of RO Water Plants over the past 30 years and has installed a large number of RO Plants all over India.

### **The story of Tamil Nadu:**

The district of Ramanathapuram, faced an acute shortage of water. Being a coastal area, seawater and brackish water were plentiful. Seawater Desalination RO Plants were setup, but replacement of membranes and maintenance costs were very high. Large centrally located Plants also added to the cost of transporting water to houses. But smaller individual plants were also too expensive to be installed in each village or habitation.

CSMCRI solved these issues by developing an alternative two stage desalination process

### **The story of Gujarat:**

The first plant was installed in Gujarat in the village of Mocha in 2000, used a single step Plant to desalinate brackish groundwater. The plant has been in operation since then, with an output of 1800 litres per hour and caters to the need of 2000 villagers. The installation cost of this Plant was around 12,000 US Dollars, and the product water cost was 0.90 US Dollars per thousand litres.

In rural Gujarat, RO technology has proved to be a boon for a number of households. Treatment plants with a capacity of 10 litres per hour to 6000 lph, are supplying water to hundreds of villages, while individual plants with a capacity of less than 20 lph, and medium plants with a size of 10 lph. The large Plants have been installed with the support of

affluent non-resident Indians, who setup the Plant for their native villages. As per Krishnan S. et al (2010), the outreach of treated water depends on the following:

- i. Mode of ownership
- ii. Cost of treated water
- iii. Local norms (cross-subsidization for families that are unable to afford regular prices)

The reasons for the success of RO Plants in Gujarat could be attributed to the following:

- i. Poor quality of regular supplied water
- ii. Multi-purpose use of RO water
- iii. Better taste of RO Water

(Krishnan et.al, 2010, *Reverse osmosis plants for rural water treatment in Gujarat*)

Gujarat was the first State in India in which community based RO Plants spread drastically, mainly due to donations made by Non-Resident Indians for achieving healthy lifestyle in their native villages. An estimated 325 RO Plants were functioning by 2010.

The Plant at Obha village is run by the Pani Samiti (Water Committee) and is open to anybody buying water at Re. 0.25 per litre. The plant also supplies 1000 lpd to neighbouring villages, through a delivery system. The Pani Samiti identified 62 families that are below the poverty line and unable to purchase water. The Samiti decided to provide them water free of cost as the Plant makes enough surplus water.

At the same time, the Plant in Navsari was installed specifically for one community of 30 residents. The treated water is restricted to one community and sold at a highly subsidized price of Re. 0.11 per litre.

As studied in Gujarat, Plants have been functioning in 3 ways:

- i. Purely business: these are business oriented Plants that supply water to rural & urban areas. For example, Unjha.
- ii. Purely community: these Plants are operated, managed and owned by the community. For example, Manikpura.
- iii. Exclusive: these are domestic Plants exclusively owned & managed by a single household. These are also smaller in size & capacity.

But other than these, combinations of these models are also found, such as the community-business model and community-exclusive model. The former has a medium cost per litre and balances between wider reach outside and focused reach within the community, whereas the community exclusive model has a low to medium cost per litre, but a focused & limited reach to an exclusive community.

The paper concludes the need for focus on the following areas in order to expand RO Plants in other parts of India:

- i. What is the technology required for specific areas
- ii. Ensuring local institutions are strengthened for proper maintenance of the plant
- iii. Maintaining a balance between cost recovery and community orientation so that both sustainability and maximum outreach is achieved
- iv. Proper disposal of effluent from Plant

### **The story of Rajasthan:**

In the Kisari village of Rajasthan, the single step RO Plant improved the quality of drinking water by manifolds. Not only was there a drop in the Total Dissolved Solids (TDS) in the water, but also, hardness of water, nitrogen content and turbidity were brought down. The number of ailments in that area has gone down drastically, esp. for school going children.

## **The story of West Bengal:**

At the request of Public Health Engineering Department of West Bengal, an animal powered RO Plant unit was setup in Feb 2004 in North 24 Paraganas district, to treat saline pond water. It was reported that the unit has reduced salinity, iron & arsenic content of the water, making it safe to drink.

At the same time, a similar model used in Bhavnagar of Gujarat, showed the negative aspects of the animal powered RO Plants. Frictional energy caused by a wooden roller attached to the mechanical link, increased the load on the animals.

Animal -powered plants cost around 5000 US dollars for installation, producing water at 1.20 US dollars per thousand litres, including the cost of feeding animals and operator expenses.

The paper talks about the initial problems faced by CSMCRI, such as:

- i. Poor plant maintenance leading to frequent breakdowns
- ii. Inadequate training of local operators
- iii. Village politics, leading to change in the trained personnel with people chosen by local politicians
- iv. Lack of proper monitoring by Institute staff
- v. Cynicism regarding the success of such a technology
- vi. Lack of trust of people
- vii. Need for financial support from government, local administration, and involvement of village council

(CSMCRI, 2008, *Reverse osmosis: India*)

## **Water scarcity issues of Gagillapur, Telangana**

Gagillapur, a village from Dundigal Mandal in the recently allocated Medchal-Malkajgiri District of Telangana, is set in a peri-urban landscape. The village has been clamped with a number of industrial establishments that makes it difficult to connect the image of a typical village environment with it.

Gagillapur comprises of the five habitations, namely, Main Village, Church Gagillapur, Rajiv Gandhi Nagar (or 214 Gagillapur), Thanda & Chaitanyanagar. The village has about 840 Households spread over five habitations. With Migrants moving in and out, it is difficult to estimate the exact population size in the village.

Some of the important issues of the village were that of lack of proper roads, housing, sanitation, safe drinking water, employment, etc. Due to severe droughts, the ground water levels have drastically decreased, leading to a scarcity of safe drinking water and water for domestic consumption in the habitations.

In this context, the Reverse Osmosis Water Plant concept had been gaining popularity in villages of AP & Telangana where quality drinking water is not available to the common people. The Rural Water Supply Department has taken the initiative to promote and install RO Plants in selected villages, to spread awareness on the importance of consuming clean & safe drinking water. Donors from different backgrounds have come forward to support the cause, in order to make clean & safe drinking water available to the public.

One such donor was Shakti Met-Dor, a Company that came forward to establish a Water Plant in the Main Village of Gagillapur, with the technical and operational support of Nandi Foundation in 2013.

The RO Plant was established in 2013, by Shakti Met-Dor & Nandi Foundation, opposite to the Gram Panchayat. The Plant was setup with the aim of making Clean Drinking water available for 250 Households within the vicinity of the Main Village. The Nandi Foundation had appointed an operator and successfully run the plant for a year and a half. With the groundwater depleting, the plant had remained defunct until 2016. Until then, no measures were taken by Grama Panchayat to revive the Plant. With time, the motors slowly got damaged, and electric connection was disconnected due to unpaid & pending electric bills.

## **Rationale behind reviving the RO Water Plant**

In 2016, Mahila Abhivrudhi Society (MAS) partnered with the Shakti Hörmann Group to transform Gagillapur into a model village, in partnership with the Government of Telangana under its flagship programme called Grama Jyothi, over a period of five years, through a community led development process. The initiative is called Mission Gagillapur.

A needs assessment study was conducted in August 2015 by a team from MAS. One of the recurring problems identified was the scarcity of safe drinking water in the village. With the commencement of Mission Gagillapur project in January 2016, the issue was prioritised in the Gram Sabha and a request was made to revive the RO Water Plant, as the infrastructure already existed.

MAS agreed to revive the Plant on the pre-condition that the Gram Panchayath will facilitate the operational aspects of the Plant by providing a letter of undertaking to the Village Organisation for regular maintenance. The GP would not be interfering in the day to day maintenance of the water plant. The Prime Responsibility assigned to the Village Organisation<sup>1</sup> was to run the plant and supply product water to the villagers at affordable price. This was to be further monitored by the Water & Sanitation Committee, one of the functional committees in the village, facilitated by MAS under the umbrella of the Village Development Committee. The VDC works under the guidance of Gram Panchayat.

The goal was to have the community take responsibility for the Plant, so that the process is community led. The main objective of this action was to promote human development, by ensuring the basic necessity of healthy living.

MAS took up the issue in the meetings with the Village Development Committee, SHG members & Gram Panchayat. MAS began its strategic interventions to solve the problem of drinking water scarcity in Gagillapur by providing technical assistance to the VO.

## **Interventions taken up**

To resolve the issue and renovate the water plant, a number of steps were taken:

MAS approached a technician to assess the then current status of the plant and all necessary repairs were undertaken.

The carbon filter, sand filter, and other membranes of the Plant were replaced. About INR 150,000 was spent to revive the water plant and the financial assistance was given by Shakti-Hormann Ltd.

In order to appoint a RO Water Plant operator, the MAS team discussed with the Village Development Committee<sup>2</sup> and Village Organization (Neha Grama Paraspara Sahakara Sangam) to identify and appoint a suitable VO member for the post.

The 'Any Time Water' (ATW) Machine was installed to keep track of the water being dispensed and to maintain transparency in accounting.

On May 7<sup>th</sup> 2016, Martin Hormann from Shakti Hormann visited the village, inaugurated the RO Water Plant. A team from MAS was present along with the Sarpanch, MPTC, the then Executive Officer, four VDC members, VO leader and SHG members.

MAS facilitated the construction of the sump cum harvesting structure in May, in consultation with the GP & VDC, for collection of the waste water, of 3000-4000 litres capacity, with an estimated cost of 30,000 INR. The waste water will go directly into the sump from the Plant, which once filled can be used for plantation & cleaning purposes by residents. On overflowing, this water will be soaked into the ground, to recharge ground water levels.

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<sup>1</sup>A Village Organization (VO) is a primary federation of Self-help groups of women, usually comprising of 8 SHGs, each of 10-15 members each. The role of a VO is to provide technical assistance to SHGs, solve problems, review their functioning, prepare plan of action, etc.

<sup>2</sup> Village Development Committee (VDC) is a voluntary association formed by the residents of the village for local administration and development of the village, under the Grama Jyothi Scheme. The VDC of Gagillapur has 23 members from all the five habitations in the village.

A sump was constructed by the GP for storage of raw water, with a capacity of 12000 litres, from the GP funds with an estimated cost of 100,000 INR in July, after much coordination between VDC & GP, facilitated by MAS.

The residents can use the service depending on their preference, access, and location. In order to make it affordable for all, and to not lose buyers to private water suppliers, a cost of 5 INR was charged for 20 litres of water cans, which was lesser than the rate at which the local private sellers made profit, i.e., 7 to 12 INR for 20 litres.

## **Management of the Plant**

Before declaring it open for all on June 15<sup>th</sup>, 2016, the responsible Village Organisation was oriented & trained on the operation of the Water Plant, maintenance, financial transactions, and ATW. The Plant, once fully functional, was handed over to the Village Organization and is currently maintained by an appointed Plant Operator, G Lakshmi, who is paid as per the income being made by the RO Water Plant. The Operator is available at the RO Water Plant for supervision, 7-11 am & 4-7 pm, all days of the week.

Currently, the VO has expressed their lack of expertise in managing the Plant. Hence, after discussions with the GP & VDC, the VDC has agreed to take responsibility of the RO Plant and its operations.

## **Bottlenecks Encountered**

Since its inauguration, the Plant has encountered a number of challenges, which have been resolved with the support of the VDC and Gram Panchayath.

- i. **Limited cooperation of community:** In the initial phases of Mission Gagillapur, the residents and VDC members were suspicious of the benefits of the revival of the Water Plant, as it had remained defunct for almost 2 years. The general concern was regarding the quality of drinking water. The continuous efforts to build the confidence among the community by the MAS team, led to the community's cooperation & trust in the decision to revive the plant.
- ii. **Source of water:** Input water was another problem in the village, due to dearth of groundwater levels. Water was being supplied by tankers for the village. Initially, the Gram Panchayath workers were hesitating to draw water from the main storage sump, as they felt it might lead to some confusion in supply of water and the transparency of water availability. They suggested arranging a separate storage facility for the raw water for the Plant. On taking this issue up in the Gram Panchayath, the Sarpanch agreed to construct a separate sump for the plant. After following it up with the Gram Panchayath, the sump was constructed with the storage capacity of 12000 litres.
- iii. **Incurring Losses:** The Plant has to be dependent on water tankers of 5000 litres each per day, as a source of raw water. This sometimes went up to two tankers per day, with a monthly average of 20 tankers. Hence, the Plant was incurring a loss. This issue was taken to the notice of the Sarpanch, Executive officer and the VDC. One of the VDC members came forward to assist by giving an advance payment for the tankers to support the Plant.
- iv. **Village Politics:** The Plant Operator (G. Lakshmi) is not fully satisfied with the present honorarium of 1000 INR per month. The honorarium was to be fixed at an amount of INR 1000 on sales of 3000 cans on an average per month, which if crossed would be calculated as INR 1 per can per month. As the plant is still in losses, and it will take some time to breakeven, it is difficult to promise her a hike immediately. Hence, it requires constant consultation, encouragement and orientation from MAS team to continue her services.
- v. **Electric charges:** Pending arrears of the Electric bill amounting to 34,000 INR was served by the Electric Department. The Supply to the Plant was disconnected. The MAS team approached GP and the district officials, requesting them to solve this issue. A temporary solution was arranged to restore the electric line from the GP source and the plant was functional again. Further, the GP agreed to pay the arrears from



their own funds and settle all electric bills henceforth from January 2017, as per the funds generated by the plant.

- vi. **Old Machinery:** A recurring issue in Gagillapur is the operational aspect of the Water Plant. Because of the machinery and the pumps being old, they required constant repairing. In order to overcome such mechanical challenges, new motors and pumps would have to be procured and installed at the earliest.

With the monsoon season being favourable, the ground water level increased enough for the adjacent GP bore well to be able to supply raw water for the Plant. After consultation with Panchayat Secretary & Gram Panchayath, the connection for raw water was setup from the GP Bore well on October 26<sup>th</sup>, 2016. Since then, the Plant has been drawing Water from the GP bore well, free of cost.

As decided in the water & sanitation committee meeting, from the month of January 2017, the honorarium for the Operator has been increased to 2500 INR from 1000 INR per month.

### **Current Status of the Plant**

A comprehensive overview has been given below-

<b>SL No</b>	<b>Month</b>	<b>Number of cans sold per day( average)</b>	<b>Number of cards sold( in total)</b>	<b>Number of tankers purchased per month (Avg)</b>
1	Jun	60-70	175 cards sold out of 200 cards	20
2	Jul			20
3	Aug	90		20
4	Sep	100		20
5	Oct	110		20

The loss being incurred per month was 5000 INR on an average. Since June, the total deficit amounted to around 22,000 INR as per accounts of the water plant. At present, having established the raw water source from the bore well, the over burden of having purchased 20 tankers at INR 750 each, amounting to INR 15,000, is expected to be covered by January 2017, other things remaining constant.

## Future Plans to improve production & distribution

In order to improve the performance of water plant, we are concentrating on the following aspects.

### Door to door delivery system:

- a. Assess the feasibility to initiate the door to door delivery and its cost-effectiveness
- b. Identify suitable persons who are having auto-rickshaws to engage them in doorstep delivery or people who would be interested in investing in an auto, funded by one of the SHGs as a mini enterprise under SHG Bank finance.
- c. Assess the need of drinking water supply at schools
- d. Deliver a fixed number of cans to the anganwadi centre per day at a fixed time
- e. Assess the demand for drinking water in surrounding habitations and companies
- f. Facilitate to supply canned water on monthly contract basis to the companies

In a VDC Orientation Programme on 21<sup>st</sup> Jan 2017, a number of decisions were taken on the door to door delivery system of water from the Plant. It was decided to purchase an auto as an Entry Point Activity for improved distribution and outreach of clean & safe drinking water from RO Plant.

### Supply of safe drinking water through an auto:

A detailed exercise was conducted on how to initiate and sustain. The Plant is to be managed by the Water sub-committee and Sk.Yusaf, Treasurer of VDC. Monitoring of water supply & maintenance of auto is to be done by them. It was assumed that the Plant will supply 300 cards per day, where each 20 liter bubble is fixed at 7 INR for door delivery, out of which 4 INR will be paid for auto maintenance and 3 INR for the plant's income. Besides the bubbles delivered by the auto, the plant is expected to produce 50 bubbles at the cost of 5 INR.

Auto will be handed over to a driver identified by the sub-committee and the driver has to pay INR 25000/- as caution money.

The budget predictions per month are given below:

SL No	Details of Income	Amount (INR)	Details of Expenses	Amount (INR)
1	Door to door delivery of water bubbles (300 bubbles at 7 INR per day)	63000	Salary to operator	5000
2	Sales at Plant (50 bubbles at 5 INR per day)	7500	Payment to Auto operator (300*4*30)	36000
3			Electricity charges	8000
4			Other consumables	5000
5			Surplus in a month	16500
	<b>Total</b>	<b>70500</b>	<b>Total</b>	<b>70500</b>

### Follow Up Actions:

SL NO.	ACTION	Persons Responsible	Timelines
1	Purchase of Auto	MBS Reddy	27 <sup>th</sup> Jan
2	Identification of Auto Driver cum water delivery boy	Yusuf (VDC)	26 <sup>th</sup> Jan
3	-Signing MoU with Auto Driver at CMRC -Preparation of marketing & distributing plans	Yusuf (VDC)	28 <sup>th</sup> Jan
4	Guide to Auto Driver cum water delivery boy	Yusuf (VDC)	1 <sup>st</sup> Feb
5	Delivery follow up	Yusuf (VDC)	2 <sup>nd</sup> Feb

The expenses in a month estimated for auto maintenance:

SL No	Details	Amount (INR)
1	One driver (400 INR per day)	12000
2	Two assistants (250 INR per day)	15000
3	Fuel cost (6 liters * 65 INR)	2000
4	Bubble caps (30 INR per 100 caps)	2700
5	Miscellaneous expenses incurred for maintenance of auto	4300
	<b>Total</b>	<b>36000</b>

### Conclusion

The provision of safe drinking water is a milestone in the transformation procedure into a model village. It cuts across a number of aspects such as sanitation, health, community participation, involvement of SHGs, self-sustainability, etc. In the long run, this could turn into an entrepreneurial model for supplying water at an affordable price, with the Panchayat's Support.

With the VDC slowly coming forward to take responsibilities, the outreach of clean drinking water is expected to increase to other habitations of Gagillapur.

### Voices of the stakeholders

*“The scarcity of water is the major problem in our village. In order to solve this issue the supply of water from tankers is the temporary solution, but there is an immediate need to initiate construction of Soak or recharge pits and rainwater harvesting structures to address the water problem of the community. With the RO Plant being revived, a number of families in the vicinity have been relieved of the issue of access to safe drinking water.” - Sanjeev Reddy, (Husband of the MPTC).*

*“Even though we have a building for women self-help groups, there is no office space for us to conduct the meetings for SHGs because of bad functioning of the existing building. With the RO Plant being entrusted to us, it gives us more credibility to stand up for ourselves & fight for issues.” - Lakshmi. G, (Plant Operator).*

## Photographs

Inauguration of Plant with Martin & VO



Connection to GP Bore well established

