



Rejuvenation of surface (Dug) well: One of the solutions to the Arsenic Problem

Buxar and Bhagalpur Districts
Bihar

SaciWATERs
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1 Introduction

1.1 Background

India faces several drinking water crisis, whereas Arsenic and Fluoride are the two major water quality challenges in India threatening 100 million people as a whole in more than 20 states¹. In Bihar, Buxar and Bhagalpur district have around 106 and 207 arsenic affected habitations respectively, they are reported to have >1000 ppb of arsenic in groundwater².

In rural habitations of Bihar, handpumps are the most preferred sources of water. The handpumps are preferred, due to the perception that the ground water is pure and free from contamination. The resolute approach regarding the drinking water had been followed by the Government agencies as well to recommend the handpump technology for drinking. Thereby a strong credibility with regard to ground water quality had been established over other sources of water.

In research, it is found that open wells are found to be an alternative for handpumps or tubewells for arsenic free drinking water. If the wells are constructed, so as to prevent leakage between the upper and lower aquifers, it is likely that they will be free of arsenic (and other undesirables) in future. It has been suggested that one should use deep open wells for drinking with strict adherence to the sanitary standards of the World Health Organization (WHO) and continue to use shallow wells for irrigation, lest the availability of water from deep open wells may cease³. However, due to the ubiquitous presence of handpumps and also the ease of drawing water from it, open wells are being used scarcely.

Most of the districts have been facing recurrent flooding due to their location on the flood plains of the River Ganga. It is likely that the wells may become inaccessible during the times of floods and would also become heavily contaminated. Hence the geography of the area has to be considered for the selection of the wells.

In this background, SaciWATERS with financial support from UNICEF, has identified dug wells in habitations worst affected with arsenic, for intervention of cleaning and rejuvenation of defunct wells. This rejuvenation activity has been done along with support from the community, so that they would take up the ownership of those revived wells. Well rehabilitation (including disinfection) should be applied if the yield of well is decreasing and/or the quality fails to meet drinking water criteria. It is proven that for the well development, simple and basic rehabilitation procedures can be highly effective. Also, they do not require costly equipment and very experienced labour. The variety of different well types and constructions requires tailor-made well development and rehabilitation procedures for every single well. Many such procedures are basic and easy to apply, yet a certain level of care is important as ignoring basic rules can compromise the water quality and long-term functioning of the well.

¹ <http://saciwaters.org/new1/eu.php>

² State-wise and District-wise number of Water Quality affected Habitations which are yet to be provided safe drinking water as on 31/03/2018. (<http://164.100.24.220/loksabhaquestions/annex/15/AU387.pdf>)

³ Arsenic Contamination – State of the Sector Report 2014, Assam State, India. SaciWATERS

1.2 Objective and Scope

- i. The rejuvenation of existing wells which are in poor condition.
- ii. Providing arsenic free source of water for the community along with sense of ownership towards the source.

2 Process of selection of the well to be cleaned

2.1 Survey of existing dug-wells in the region

A recce was done in the region for the preliminary level of listing of wells. The following factors are considered for the selection, major usage of source by a particular population, geography of the location, prone to flooding. The field testing kit have been used to check the water quality in the nearby surrounding areas to understand the contamination of groundwater in that area. Also, community suggestions were taken into account because ultimately they are the end users.

2.2 Situation analysis of the wells

A few wells were selected during the survey process in both the districts and later each well was studied in detail. Several rounds of discussion with community along with budgetary aspect played a major role in finalization of wells. The wells, located far from the habitation and required high maintenance cost, were discarded. The primary aim was to maximize benefit in less cost.

3 Profile of the selected wells

Three wells from each district were selected for the rejuvenation work.

3.1 Buxar district

3.1.1 Buxar Middle School, Dubha, Ward no. 12 (Gangauli Panchayat)

The well has been dysfunctional since 5 years. In the past, the water from this well was being used by approximately 15 families in the area for the purpose of drinking, washing, cooking, bathing and cattle feeding. The nearby temple also used the well water in past. The diameter of the well is approximately 7 feet.



Location map of the well



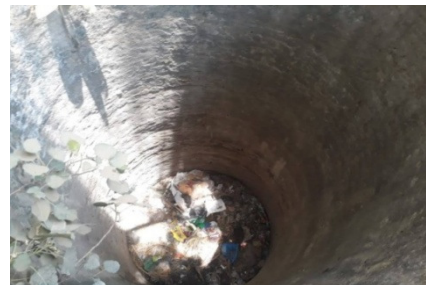
Condition of the well before cleaning

3.1.2 Brambaba Mandir, Majhwari Ward No. 02 (Majhwari Panchayat)

The well is in use but only when there is a shortage of water from other sources. Though, all families do not use water from this well. In the past, around 40 families were using water from this well for purpose of drinking, washing, cooking, bathing and cattle feeding. The diameter of the well is around 7ft.



Location map of the well



condition of the well before cleaning

3.1.3 Harijan Tola, Ward No. 05 (Kathar Panchayat)

The well is not being used since very long time because the well water was contaminated with dust and garbage. The diameter of the well is approximately 11 feet. Currently the water is unusable and therefore not used at all.



Location map of the well



condition of the well before cleaning

3.2 Bhagalpur district

3.2.1 Kamat Tola, Ward No. 9, near Shiv Mandir (Sirmatpur Panchayat)

Arsenic contamination beyond permissible limit is reported in nearby tubewells and piped water supply sources. This was the foremost reason along with the location of the well to select this. The nearby habitation has approximately 200 households. The diameter of well is around 6.5 ft and 30 ft. deep. The well was not being used for drinking purposes but it was being used for other domestic purposes like cloth washing and vessel cleaning.

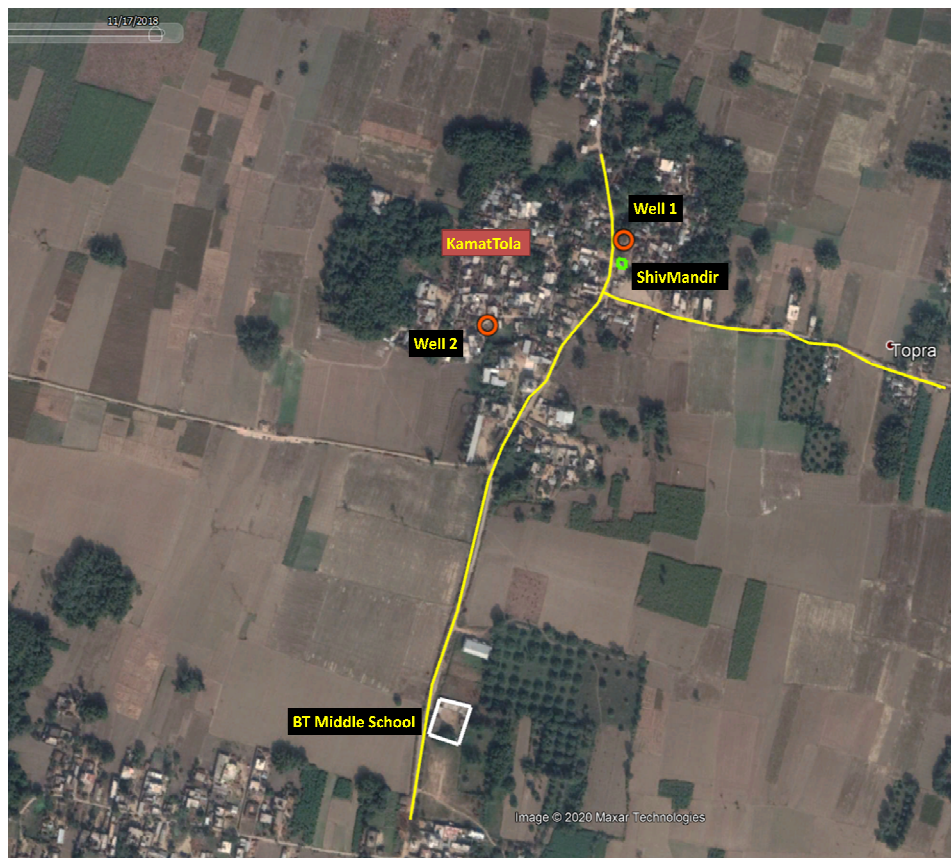


Condition of the well before cleaning

3.2.2 Kamat Tola, Ward No. 10, Near AWC (Sirmatpur)

The well is was function but not being used by the villagers. It was kept covered so that animals/children do not fall in the well. The well depth is roughly 35 feet and has 7.5 feet diameter. In this ward around 200 households are there.

The google map location of wells selected for rejuvenation in Kamat Tola is given below.



Location map of selected well 1 and well 2 of Bhagalpur

3.2.3 Sonu Tola, Kachchariya, (Sirmatpur panchayat)

This well is not in use since 2005. The ground of this well was elevated in 2008 due to safety concerns because it is adjacent to the road. After that also it was not in use because of piped water supply scheme. Now-a-days people feel that water quality of tap water is also not good so they expressed their interest in dug well water. The diameter is approximately 6.5 ft and depth is 30 ft. There were two more wells nearby but the level of wear and tear was high so the same were dropped. Nearly 250 families are living nearby.



Location map of selected well 3 of Bhagalpur (Sonu Tola)

4 Rehabilitation and cleaning of well

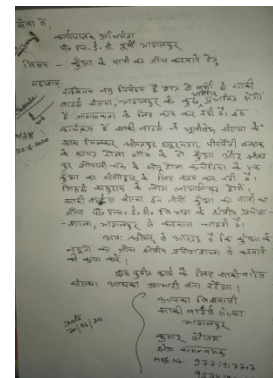
4.1 Assess the type and extent of damage

The preliminary assessment had been done to understand about the extent of cleaning and repairing. Accordingly, the material was arranged and labourers were hired.



4.2 Water testing before the process of cleaning

Samples of the all 6 wells have been taken and sent to the lab for testing.



Water samples sent for testing for all the six wells.

4.3 Removing dust, weeds, algae and sediments

The dust, weeds, and algae from inside and around the surface of the wells were removed. Mud and waste material were removed using bucket. Outer and inner surfaces cleaned completely. Wet mud was removed from inside the well by digging upto 2 feet depth for recharge of water from the aquifer.



Using bamboo ladder to go into well



scratching green rigid algae from the inner wall



Laborers stated cleaning process



Waste material removed from well

4.4 Use of disinfectants

After well cleaning and mud removal, bleaching powder will spread all around the wall surface of the well (inside and outside of the well) and has been kept unused for atleast 24 hours.



Application of bleach powder

4.5 Repair of the damaged part

The damages in the inner face of the well were repaired. The relining of wall sides of the inner face has been done to reduce contamination. The well has been repaired in places where it was broken and needed patch up works.

4.6 Dewatering the well

The electric pump was used to remove the chlorinated water. The pumping has been done, until there is no smell of chlorination. Surrounding areas were also cleaned to ensure clean approach to the well.



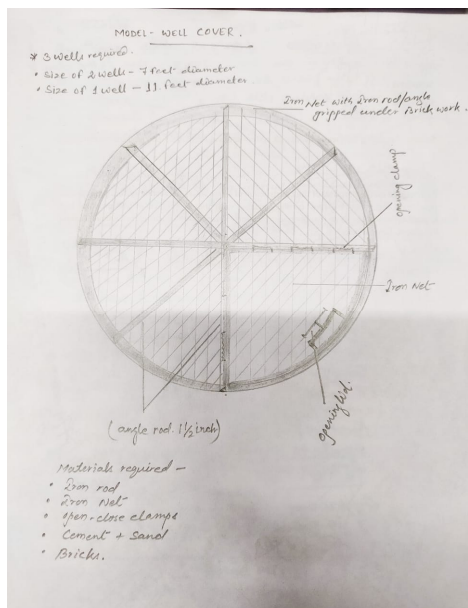
Dewatering of Well

4.7 Post cleaning quality check

The water samples were again sent to the PHED laboratory for testing.

5 Covering up the well with iron net

As per study, open well water source had arsenic free water as open wells found outside the home remains in contact with sun always in day time. However to overcome the problem of water contamination, due to dust and other garbage, use of covering with net on top of the well was made. This arrangement would help the sunrays to pass through and would also keep away from heavy dust and weeds to enter in the well from the nearby areas also.



Iron Net to Protect and Cover the well

6 Community engagement at all levels

The community was involved at each and every step of well cleaning. Community helped in finalizing wells. Then, permission was sought from the Gram Panchayat. Villagers have supported in arrangements of the required sources and supports in respect of cleaning of wells items like buckets, mugs, ropes, brooms, bamboos etc. Also, the local transport was arranged by villagers. They also have arranged food packets for the workers. About the well cleaning, elderly people mentioned that they use to do the well cleaning regularly at one point of time but later all these practices stopped. While the younger generation was excited about the process since they have never ever seen yet.

7 Wall painting and awareness creation among community

The key-hygiene messages were displayed in form of good quality banner since wall painting was not possible due to unavailability of artist at present. The objective is to make people aware of conservation of water and also that the well water is cleaned hence safe to use.

8 Sustainability plan

One of the key aspects in the long-term sustainability of any water supply system is the full and enthusiastic involvement of the community in all phases of the water supply process including operation, maintenance and management. The management of a water supply system is interdisciplinary in nature. Hence, operation and maintenance both include structural (i.e. technical) tasks and hygiene/health considerations.

Structural maintenance includes checking the apron for cracks, securing the inspection cover, improving the yield by deepening or removing infiltrated sand particles and the maintenance of the lifting device. Although no skilled worker is required to accomplish these tasks, regularity and accuracy is vital and has to be guaranteed. Equally, securing hygienic operation is essential. This involves the protection and cleaning of the area (e.g. fencing and covering), checking water quality and disinfecting if necessary, monitoring the effects of withdrawal on environment and surrounding areas, and constantly educating water users in proper operation of the well and in the links of water sanitation and health.

8.1 Buxar

A. Well at Middle School, Dubha, Ward no. 12 (Gangauli Panchayat)

Around 45 families have agreed to use the water from cleaned well at Dubha Ward.

Mukhiya – Anuj Kumar Gond and Ward member – Babban Ram, Vishram Chauhan have agreed to monitor the maintenance and upkeep of the wells usage too.

Villagers- Ramjesh Thakur will also be helping in maintenance of the well and keeping it clean in the days to come.

B. Well at Brambaba Mandir, Majhwari Ward No. 02 (Majhwari Panchayat)

Around 50 families have agreed to use the water from cleaned well at Brambaba Mandir.

Mukhiya – Mukhiya – Manti Devi and Villager – Anil Kushwaha have agreed to monitor the maintenance and upkeep of the wells usage too.

C. Well at Harijan Tola, Ward No. 05 (Kathar Panchayat)

Around 30 families have agreed to use the water from cleaned well at Harijan Tola.

Mukhiya- Lalan Paswan and Villager – Mahavir Prasad, Santosh Thakur will be monitoring and the maintenance and upkeep of the wells too.

8.2 Bhagalpur

A. Well at Ward no. 9, near Shiv temple, Kamat Tola, Srimatpur

Around 50 families, agreed to use the well water and assured that the cloth washing etc will not be done near to the ground of the village. Ward member Sulekha Devi has also assured that monitoring will be taken care at regular interval.

B. Well at Ward no. 10, near AWC, Kamat Tola, Srimatpur

Nearby 45 families will use the water from now onwards. Vijay Das being a ward member have come forward for the awareness generation among villagers. Kamat Tola Mukhiya – Uttam Kumar was also met and informed about the cleaning work.

C. Well at Sonu Tola, Kachchariya, Srimatpurat Harijan

Here around 30 families will use the well water.

Table: Details of the contact person

District	Location of Wells	Name of the person	Contact number
Buxar	Well at Middle school, Dubha, Ward no.12 (Gangauli Panchayat)	Vishram Chauhan	9135758378
	Well at Brambaba Mandir, Majhwari Ward No. 02 (Majhwari Panchayat)	Anil Kushwaha	9931837031
	Well at Harijan Tola, Ward No. 05 (Kathar Panchayat)	LalanPaswan	7250375806
Bhagalpur	Well at Ward no. 9, near Shiv temple, Kamat Tola, Srimatpur	Arun kumar Mandal	6299049361
	Well at Ward no. 10, near AWC, Kamat Tola, Srimatpur	Beema Kumari	7369000704
	Well at Sonu Tola, Kachchariya, Srimatpur	Sanjay Kumar yadav	9006478042

9 Major Challenges

The major challenges faced were the availability of labourers for the intervention due to the lockdown. This in turn affected the time duration to finish the required activity. The community participation activities were also affected due to COVID. Heavy rainfall and thunderstorm obstructed work for a while. The artists for doing the wall paintings have to come from long distances.

Annexure- Expenditure summary

1. Buxar

EXPENDITURE SUMMARY FOR BUXAR WELL CLEANING		
Sl.No.	Description	Cumulative Amount for 3 wells (in Rupees)
1	Pumpset hire for 3 wells @ Rs. 1000/day	3000
2	Chemicals (Bleaching Powder)	99
3	Iron rod/angle (in 1&half inch depth)@0.75kg/per feet (Rs. 70/kg)	4593.75
4	Iron rod strip (Patti) (in 1&half inch size)@0.44kg/per feet (Rs. 70/kg)	1372.70
5	Iron Net @Rs. 27/ sq.ft	4641.43
6	Sand & Concrete	1500
7	Cement	1260
8	Bricks	3000
9	Transportation Fare	1200
	Total Material cost	20666.88
10	Mason Charge	1500
11	Labour Charges (6 labours)@ Rs. 400/labor	7200
12	Matter writing by painter on Wall & Top cover Painting	3000
	Total labour cost	11700
	Grand Total	32366.88

2. Bhagalpur

EXPENDITURE SUMMARY FOR BHAGALPUR WELL CLEANING		
Sl.No.	Description	Cumulative amount for 3 wells (in Rupees)
1	Pumpset hire for 3 wells @ Rs. 1000/day	3000
2	Iron cover fabrication cost	13095
3	Transport of iron cover for the well	600
4	Chemicals (Bleaching Powder)	500
5	Cement	2000
	Total Material cost	19195
6	Labour cost (4 persons @ Rs.600/day) - 3 days	7200
7	Cementing work labour charges	2800
8	Painter charges	600
9	Labour for mason	600
	Total labour cost	11200
	Grand Total	30395