

The Villages Stand Safe with Tap Water

Foreword

The recurrent challenges in the field of safe water supply have put a major set-back to the apparent success in the safe water supply coverage. The most alarming reality is the occurrence of arsenic contamination in groundwater – the principal safe source of drinking water in Bangladesh. As a consequence of the various barriers to the safe drinking water supply and with a view to overcoming those. NGO Forum for Drinking Water Supply & Sanitation, committed to reach the safe WatSan facilities at the doorsteps of people, has been engaged in developing, testing, disseminating and popularizing different new, feasible technologies through research and development (R&D) activities. In doing so, it is a major concern of the Forum to make a harmonious combination between the safety, cost effectiveness, social acceptance, user friendliness, reliability and so on. However, ever since the invasion of arsenic contamination in tubewell water it has become a priority concern for NGO Forum. In this line the Forum has been promoting different alternative appropriate and sustainable technological options to provide pollution and arsenic-free safe water in different geo-hydrological areas.

Pipe-water Supply Scheme is such an innovative option being currently piloted in different areas. The overall objective of the piloting is to design and demonstrate that pipe-water supply scheme can provide a suitable, safe, socially acceptable, affordable, community-managed sustainable alternative source of water for drinking, cooking and domestic use in rural Bangladesh. Nilkanda in Sonargaon and Putia in Daudkandi thana under Narayanganj and Comilla districts respectively are two severely arsenic affected villages covered under this piloting. The two Schemes have been providing safe water for drinking and cooking purposes in the two villages since April 2002. In Putia the Rain-water Harvesting System and Dug-well are used as the source water while in Nilkanda village the source is Deep Tubewell. The alternative water technologies used as source water have previous proven feasibility at household and group level, as experienced by NGO Forum. While installed to cover a whole community with optimal geophysical, technical and socio-economic situation, the Schemes can be proved more effective in terms of its total cost. The implementation of the Schemes conforms to this reality.

This study highlights on the different aspects supporting the success and acceptability of the Schemes at the respective communities. The credit of the success can by no means be NGO

Forum's alone. Rather the implementing agencies, GSBS in Nilkanda and CCDA in Putia, along with the respective community people deserve the credit equally.

I am greatly thankful to Ms. Amina Rahman and to those who have provided their direct or indirect support to make the study a success. My thanks and congratulations also to those who has materialized the study findings into publication.

I hope this Book will be hailed by the potential readers and sector professionals while showing a light on a new rural lifestyle with modern water supply facilities.

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Preface

NGO Forum as a leading national agency in the WatSan sector has been involved in providing safe drinking water at community level considering the upcoming challenges and geophysical peculiarities. Among the various problems in the safe water supply arena, arsenic poisoning in shallow tubewell water poses the greatest threat to ensuring safe water for people.

As a part of its research and development (R&D) activities to innovate and promote different alternative technologies, NGO Forum has designed and constructed Pipe-water Supply Scheme on pilot basis in some of the severely arsenic affected villages. Nilkanda in Sonargaon and Putia in Daudkandi thana under Narayanganj and Comilla districts respectively are two of them. These two affected communities have been provided with arsenic-free safe water for drinking and cooking purposes from the Pipe-water Supply Scheme since April 2002.

The two Schemes have been proven feasible both on technical and socio-economic grounds. Considering the existing situation and facilities in the two villages, Rain-water Harvesting System and Dug-well have been used as source of water for Putia scheme and Deep Tubewell has been used as the source of water for Nilkanda Scheme. As because the villages were severely arsenic contaminated, it was imperative to find out a safe alternative water supply technology. Alongside, the community mobilizing drive in the respective community has very quick and positive results into convincing the villagers to accept the technology. Under the lead role played by the Village Development Committee, formed during the inception of the projects, the facilitating agencies Gono Shasthya Bastobayan Sangstha (GSBS) and Centre for Community Development Assistance (CCDA) helped the villagers out of the crisis into a complete shift of lifestyle as regards water supply and also sanitation, health and hygiene.

The approach taken up has been the Community-managed WatSan Programme approach which organized the villagers under the guidance of the VDC. From identifying the problems, brainstorming solutions to alternative sources of drinking water, disseminating relevant information regarding the pipeline water project as well as sanitation and personal hygiene awareness to the community by the VDC, different promotional activities covering various groups of the community to imparting different skill development training for the community people have been organized. The integrated approach has helped bringing in a desirable change among the villagers' perception and lifestyle. The comforting solutions offered by the Pipe-water Supply

Schemes has encouraged the villagers a lot to shift themselves also from open defecation to using hygienic latrines, maintaining personal and domestic hygiene.

It is obvious that the functionality of the project comes from ownership of the project within the community and the division of tasks among the community members, who have been trained to perform the tasks, i.e. pump operator, caretaker, treasurer and so on.

People are satisfied with the quality and quantity of water and they are agreeable with the monthly payment of Tk. 15 per household per month. Since they are getting safe water at the stand posts, even minor inconveniences like line up at the set-time of water delivery outside their household is considered no inconvenience at all.

Both these Schemes are cost-effective, durable and easy maintainable. Both these systems have proven to be workable and an excellent provision of safe water. It is evident that it has brought a remarkable change in the lifestyle of the respective villagers who are now standing safe against arsenic and other pollution as regards the water supply facilities.

I feel grateful to mention that the combined effort of all concerned has made this publication possible. Therefore my special thanks and sincere gratitude to the valued resource person for the study conduction. Also my heartfelt thanks to my colleagues for their contribution regarding the publication.

I hope, this Book will be found useful and interesting by its readers.

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Background

Despite having abundant rainfall, readily accessible groundwater and large river systems, many households in Bangladesh do not have access to an adequate supply of potable water. Among the various problems, arsenic contamination in the shallow aquifer level poses an enormous threat to the safe water supply situation of the country. The apparent remarkable coverage in safe drinking water supply which raised up to 97.5% has been lowered down to around 70% especially because of the arsenic intrusion. However, until a certain stage the arsenic poisoning can be reversed by drinking arsenic-free water but it becomes irreversible if arsenic contaminated water is consumed over a long period of time and causes cancer or other permanent damages of vital organs.

As a leading national organization in the WatSan sector, NGO Forum for Drinking Water Supply & Sanitation has been working with various alternative appropriate and sustainable technological options to provide safe water in different geo-hydrological areas, and carrying out research and development (R&D) activities to innovate more feasible technologies.

As a part of its promotion of alternative technologies NGO Forum has designed and constructed Pipe-water Supply Scheme on pilot basis for providing safe and arsenic-free water. Two such Schemes have been installed in two severely arsenic affected villages namely Nilkanda in Sonargaon and Putia in Daudkandi thana under Narayanganj and Comilla districts respectively. The pilot Schemes have been providing safe water for drinking and cooking purposes in the two villages since April 2002. In Putia the Scheme has been operated with Rain-water Harvesting System and Dug-well and in Nilkanda the

system has been operated with Deep Tubewell as sources of safe water.

Feasibility of the Scheme

In the face of the acute arsenic problem a simple, affordable, technically feasible and socially acceptable safe drinking water supply system proved essential. Village pipeline water supply from an alternative safe source has been considered as a possible answer to the drinking water problem. The implementation of the Pipe-water Supply Scheme has been proved feasible on two main grounds.

Technical Perspective

The presence of excessive arsenic in the water of shallow tubewell has made it imperative to search for alternative safe water sources for the affected areas. Technologies like Rain-water Harvesting System, Pond Sand Filter, Arsenic Iron Removal Plant, Dug-well, Deep Tubewell etc. have been considered feasible for community level on the basis of suitability to specific geophysical characteristics. In consideration of their unit cost these technologies are considered comparatively costly and can be used by a few number of people while installed at household level. However, in order to cover a whole community Pipe-water Supply Scheme can be considered as a feasible option as it is a centralized operated system.

In the village Putia, Daudkandi all the shallow No.6 TWs have been proved highly contaminated with the concentration of arsenic ranging from 0.10 mg/L to 0.50 mg/L, and the village ponds and surrounding canals are polluted and completely unsafe for drinking and cooking purposes. Since the villagers were completely dependent on tubewell water a total of four

people have died due to drinking of arsenic contaminated water for quite a long period of time. But there is a big CI sheet made roof, about 300 sq. meter of the Office building of NGO Forum's one of the partner NGOs Centre for Community Development Assistance (CCDA) which is surrounded by a large community consisting of 114 families with a total population of around 600. The annual rainfall intensity is about 2500 mm. Therefore, pipe-water supply with Rain-water Harvesting System has been considered as a feasible option here. The rain-water supply lasts for about six months (April to October) after which it is necessary to use water from the dug-well for another five to six months in the dry season. On the other hand, in the village Nilkanda, Sonargaon all the shallow No.6 TWs have also been found contaminated with high concentration of arsenic ranging from 0.125 mg/L to 1.45 mg/L, suitable pond is not available, no suitable catchment for rain-water harvesting, about 110 households with 667 people live in a compacted place of 0.25 Sq. Km. So Pipe-water Supply Scheme has been designed and constructed with the water source of Deep Tubewell since Deep Tubewell is still free from any kind of pollution and poisoning.

Socio-economic Perspective

Many villages in Bangladesh are now becoming more affluent and they are trying to use the modern facilities such as electricity, biogas/natural gas, TV, mobile telephone, bottled water, etc. There is a demand for better service levels like pipe-water supply by which they can have running water in their houses. They are willing to pay even a bit higher price than what is required to spend for a normal hand tubewell. With the implementation of the Pipe-water Supply Scheme the villagers have now their option as pipe-water is used for drinking and cooking purposes while the existing tubewell water is used for bathing, washing and other external purposes.

With the advent of the arsenic problem, in the rural area many women and children have to spend a major portion of time in a day for fetching water from a common and arsenic-free safe water source in the community or other people's houses. In the Pipe-water Supply Scheme a few households from the covered households are connected with a pipeline stand-post, water is available at a very convenient distance from their homestead, which is reducing the time for water fetching. As a result women can get more time to involve her in the improvement of socio-economic condition of their family and children can get more time for study and recreation.

The Pipe-water Supply Scheme

Each Pipe-water Supply Scheme of NGO Forum has five components i.e. the source of water, intake system, overhead tank, pipeline network and stand post. Every component has been designed systematically and constructed qualitatively.

In the village Putia, Daudkandi, water has been supplied through pipeline from two alternative water supply sources namely Rain-water Harvesting System and Dug-well. NGO Forum's partner organization CCDA has been facilitating the Scheme. Naturally rain-water is free from bacteria and any kind of chemical elements. Plenty of rainfall takes place which stands on an average 2500 mm per year in the project areas from April to October in each year. In the rainy season rain-water is harvested from the catchment after flushing first foul rain-water for 5 to 10 minutes. Then the harvested water is flown through a filter chamber and stored into an underground reservoir with the capacity of 100,000 litres. The size of the tank is 37 feet long and 13 feet wide. From here water is pumped into an overhead tank by centrifugal pump and then supplied to the community through pipeline network by gravity flow

system. Everyday 6,000 litres of water is supplied to the community. The village people collect water from the community water collection points (stand post) which is released twice a day continuing for 1 hour and 15 minutes each time. There are 26 stand-posts in the village for 114 families.

In the non-rainy days or in the dry season when rain-water is not available in the reservoir, water is supplied from the dug-well. Dug-well water comes from the sub-surface level which is arsenic-free. However, this water has high iron concentration and therefore the water is first pumped from the dug-well by motor into the iron removal plant. From there the water is stored in the reservoir and later pumped in the overhead tank and then to the stand posts.

In case of pipe-water supply with deep tubewell in the village Nilkanda, Sonargaon, water is pumped from the deep tubewell and directly stored into overhead tank and later supplied through pipeline. Deep tubewell extract water from deep confined aquifer which is still arsenic-free. As precaution of leaching of arsenic from upper aquifer to the deeper aquifer which is known as confined aquifer, the bore hole is sealed from above up to the level of clay layer (plastic clay) above the confined aquifer with a mixture of cement and bentonite clay. Thus, the water supplied through Pipe-water Supply Scheme is safe and free from arsenic. The Nilkanda Scheme covers approximately one hundred households with water once per day. Thirteen water collection points have been installed and provided to about eight to ten families per point. The water distribution network is set up through a system of underground PVC pipes of various diameters, that run through the village from the overhead tank, providing water flow to each of the collection points from the Deep Tubewell tank. The water is released everyday at eight in the morning for one hour. A tap is simply opened and closed for water flow.

Women gather at their collection points at the set time, and fill up three or four pitchers (*kolshis*), for their daily cooking and drinking needs.

Mobilizing the Community

Both the villages, Nilkanda and Putia, had been mobilized into urgently seeking a safe alternative drinking source when they became aware of arsenic contamination in their tubewell water. Pipe-water supply is quite a new concept in the rural area in Bangladesh. To make the community people aware and oriented on the use of rain-water and dug-well water instead of tubewell water and to ensure the sustainability of the pipe-water supply scheme the active involvement of the community people is very essential. To involve and make the people aware on the pipe-water supply, safe water use, sanitation and hygiene practice different promotional activities have been organized and conducted in both the villages covering all the villagers in different target groups. The mobilization activities include VDC formation & orientation, VDC monthly meeting, users group formation & orientation, courtyard meeting & community meeting, training etc. while all of these promotional activities have been conducted in community-managed approach.

Becoming aware and oriented on the arsenic problem and being informed about the high concentration of arsenic in their tubewell water, the villagers decided to contact the partner NGOs of NGO Forum, Centre for Community Development Assistance (CCDA) in Daudkandi and Gono Shasthya Bastobayan Sangstha (GSBS) in Narayanganj respectively, which were working locally, and through them NGO Forum whom they had worked with in the past. NGO Forum and its partner organizations encouraged the villagers to be organized under NGO Forum's Community-managed WatSan

Programme approach forming a Village Development Committee (VDC) in order to initiate the overall development of the village with special focus on safe water supply, sanitation and hygiene practices. A meeting was held in each village with participation of the villagers from all corners while they discussed their existing problems in their village and identified the way to mitigate the drinking water problem. The focus was on determining safe alternatives to the arsenic contaminated tubewells they had been using for so many years, but other issues relating to hygienic sanitation and health of the village were addressed as well. The VDC was formed through the meeting and entrusted to represent their community's concerns with brainstorming solutions to alternative sources of drinking water and help facilitate awareness raising among the respective community people. People were chosen for the Committee based on their accessibility, availability and their desire to be involved in the development initiatives at hand as well as the level of understanding they had about the problem. The VDC was formed at each village with around 15 well-respected men and women such as teachers, Imams, and former and present UP members as well as just regular members of the community who have been used to meet once a month or more. Together, the VDC members created several different maps of their village including van diagrams, hazard mapping, and social mapping upon which they laid out details of their entire village such as population, gender, age, and wealth breakdowns, household location, number of latrines, roads, location of tubewells and so on. They also addressed sanitation issues such as closed latrines, personal hygiene, and education.

Torchbearer to Better Days

Mohammad Ainul Shordar is 70 years old and a Nilkanda village elder who is a father of two boys and three girls. He was a labour union leader in Doulatpur Jute Mill, Khulna. Being retired from his Mill job Ainul has been living in this village since Pakistan period. He is well respected because of his seniority and the Chairman position he has with the VDC. He says "This Committee helps keep the village healthy because we deal with issues such as sanitation and health, water and education". Ainul is a conscientious leader. He participates in the Committee "Because it helps make life in the village better and that makes me feel good".

Previously their village did not have any Committee and the VDC was formed to address the overall WatSan and hygiene issues with special emphasis on the arsenic issue. When asked how big a role the VDC has played in this enterprise, Ainul replies, "The VDC has been created to make things run efficiently. The project could not have run without the VDC, which is crucial in spreading awareness about arsenic". Awareness of the arsenic situation spread through informal gatherings of which he took a major role. The VDC has played the key role in organizing and mobilizing the villagers towards the way to get safe drinking water. "We have shared the idea of Pipe-water Supply Scheme with the villagers and have made them convinced about the benefit of the Scheme", Ainul specified the role the VDC played in relation to promote the Scheme. The VDC is also the central point to which people bring their problems to. It spreads awareness on many other issues in the community as Ainul worries most about open defecation because it makes his village unclean. "I also consulted with NGO Forum on this issue and low-cost latrines were distributed throughout the village on cost basis", Ainul

pointed out. Now there are only five families left who do not have latrines.

Before the VDC was formed, Ainul was engaged in spreading awareness about issues such as safe water and sanitation but did not have much reach on his own. After the creation of the VDC, he was able to address many issues and reach out to more people, particularly in the area of safe drinking water through pipe-water supply. Because of his role as VDC chairman, the villagers heed what he says and together they become mobilized to these issues. The villagers do not necessarily conform to VDC decisions but use the committee to help solve their problems. Ainul feels “The VDC has played an important role in uniting the village towards getting arsenic-free safe water”. He believes strongly in the Pipe-water Supply Scheme as he says, “I am very happy with the system because I trust it. The water is checked every month and so far, the tests have come out well”. “The villagers are now free from the threat of arsenicosis”, Ainul expressed his heart.

The Committee used different venues to disseminate relevant information regarding the pipeline water project as well as sanitation and personal hygiene awareness to the rest of their community. Meetings were also organized amongst different groups of people to ensure strategic targeting of every member of the village, i.e. women’s courtyard meetings, community meetings for men, meetings during Friday prayers in the mosque, and awareness raising among children by teachers at schools. The VDC used some pictures of patients to show people how arsenic affected people, which was proved extremely effective to convince the community people about the risk of arsenic contamination and finding the way out to get rid of it. The respective partner organization participated in and facilitated all of these meetings with the assistance of the VDC and other local allies.

When Sermonizing Spurs the Coveted Change

Mohammad Touhid Mullah is 45 years old. He is the Imam of one of the two village mosques in Putia, Daudkandi, Comilla. He used to work for BRDB until he joined a Madrasha as an Imam because his health was declining of hardworking. He read about arsenic in newspapers and then in 2001, the community began noticing symptoms in their own village. As a part of the community-managed implementation of the Pipe-water Supply Scheme in Putia village, he was selected as a VDC member while the VDC was being formed. When the VDC first spread awareness on how arsenic affected people, the community became scared and wanted solutions to their dire water problem.

Because of his position as Imam and religious leader, Touhid Mullah has a great deal of influence as well as access to the entire community. He has been a strategic person to spread awareness about arsenic and sanitation. People will listen to what he has to say as he has genuine concern for his village and has effectively raised important issues to the community. As a conscious social leader he has been using the mosque as the platform to raise awareness on arsenic contamination in tubewell water, arsenicosis problem among people, and on the importance and source of safe water, where a wide range of people have access. The Imam has disseminated the advantages of Pipe-water Supply Scheme specially in relation to combating the arsenic problem. This has helped popularizing the Scheme among the villagers and the smooth operation of it immensely.

Everyone attends mosque on Fridays, so if people miss a meeting in the village, the Imam updates them on Friday. After being encouraged by NGO Forum's village mobilization and sanitation training, the Imam addresses the arsenic issue as well as the issue of open defecation, another big concern of his, during after prayer meetings. "Now all the households have been enjoying the safe water supply facilities and almost everyone in the village has a latrine and one of the most significant improvement from the campaigns have also been in sanitation. We are very happy with the pipeline scheme and believe the villagers will put their best efforts forward to make it sustained", the Imam states very firmly.

The success of this mobilization has been remarkable. The community has given the VDC their full confidence. Where people were completely ignorant of the effects and presence of arsenic in their tubewells, they are now fully aware of the dangers of arsenic. Villagers in both the target villages have shifted completely from using tubewell water for drinking and cooking to using water from the Pipe-water Supply Scheme. This is an enormous change as they were habituated to using tubewell water from their own individual tubewell for more than twenty years. The pipeline has effectively solved both communities' water problems. It has given them access to arsenic and bacteria free water. They are very much satisfied with the Pipe-water Supply Scheme as it has given them access to safe water all the year round. The pipelines provide the villagers with cooking and drinking water facilities and they continue to use tubewell water for bathing and washing. People afflicted with arsenic have begun noticing a remarkable improvement in their skin once they stopped drinking arsenic contaminated tubewell water. They feel an increase in their health and vigour as well and return to work as normal.

A Ray of Rejuvenated Hope

Mohammad Shamsuddin, 39, from Nilkanda, had been experiencing severe skin afflictions over the last ten years. He noticed eruptions on his hands and feet and itching all over his body. He visited a number of doctors and even tried homeopathic medicine for two years with no cure. He then went to a clinic in Dhaka where the doctor diagnosed his condition as arsenic poisoning and advised him that all their tubewells be checked for arsenic contamination. They discovered that almost every single tubewell in their village was contaminated with arsenic. He had been drinking tubewell water his whole life. So far, arsenic contamination has affected sixteen people and two people died in his village.

People did not think his disease was contagious, which is an added burden faced by many arsenic victims. "Although, once people realized it was arsenic related, they were not afraid of contagion but feared for my life", Shamsuddin expressed. He disclosed himself, "My condition was making me weaker and preventing me from working". As the community became more aware of where arsenic was coming from, they decided to take action to find an alternative water source. Shamsuddin said, "Since I began drinking water from the deep tubewell, my condition has remarkably improved. Now I am cheerful and full of hope for my community. I am extremely confident of our new deep tubewell based pipeline system since my health is returning and I feel rejuvenated. The lesions on my hand have softened and reduced and my strength has come back". He feels he has a new lease of life and that this system works well for his village and has improved the quality of their lives not just by providing them with safe water but also helping them to organize better and making their village a healthier and cleaner environment to live in. The fact that his health had

been so bad but he solved it with his community has given him the greatest happiness.

Not only have the villagers changed fixed habits in a remarkably short period of time, they have also incorporated new lifestyle changes in personal hygiene and sanitation. In the past, before they became aware of water-borne diseases, these communities used water from canals or ponds in the village for cooking. Through previous campaigns more than twenty years ago, they shifted to shallow tubewells to minimize the impact of bacterial diseases from unclean surface water. Unfortunately, this led to the current problems associated with arsenic. When they first became aware of arsenic, the community again switched to pond water and canal water for a short while. They also tried rain-water collected in *motkas*, large clay containers, but could only get a six-month supply of water from that. Moreover, people were suspicious that preserving water in a closed container might breed harmful germs, as the quality of rain-water would not be preserved if it stayed for long in a tank or jar. They were cautious about drinking rain-water and they were not used to the taste. However, because of the awareness campaigns by NGO Forum and its partner NGO, they have changed their attitude towards rain-water in a surprisingly short span of time. Users mentioned that they strongly believe that rain-water is clean and free of arsenic and any other harmful content. Many of them also believe that rain-water is a gift from God and so, pure and clean. It is not only arsenic-free, but it is also good for their health. Some users claim that they have been cured of gastric problems after drinking rain-water supplied through the Pipe-water Supply Scheme.

The awareness campaigns by the VDC and the partner NGOs of NGO Forum on the issues such as personal hygiene and sanitation alongside safe water use have also encouraged

people to use covered pit latrines where before they used open hanging latrines that emptied into the canal and habituated to open defecation.

According to the female members in Nilkanda village the water supply and sanitation situation in their village has improved simultaneously. Though the villagers had suffering much due to arsenic contamination in tubewell water and they became aware about the use of rain-water, the sanitation issue has got the same importance to them. Almost every household has sanitary latrine in the village and the environment is much cleaner. The women have specially been oriented on health and sanitation topics at Courtyard Meetings, which take place once a month in their homes. The women claim that their village environment used to be dirty and children had a habit of open defecation. During the awareness campaigns, people have learnt a great deal about health and hygiene, food preservation and children's sanitation with emphasis on arsenic-free safe water use with the provision of Pipe-water Supply Scheme. They have learnt how to wash their hands with soap or ash, after going to the latrine and before eating and food handling or to wear sandal during latrine visit. Incidences of disease and children's illnesses have gone down quite significantly. Aside from flu, there are no longer ailments such as diarrhoea, which their children used to suffer from very frequently. The implementation of this Scheme through community-managed approach has brought multiple benefits to their community beyond just access to safe water. Moreover, now people love drinking rain-water. Now they drink more water than the quantity they used to drink from tubewells. Because the water tastes better than the foul odoured (smelling of iron) tubewell water.

Women and Water: A More Secured Bond

The village women of Putia, Daudkandi, Comilla realize that their lives have improved significantly with the orientation they have received from the Courtyard Meetings, organized every month in a village household. "Now we have access to safe water, our village environment is cleaner, diarrhoea related diseases have gone down significantly, and arsenic incidences have stopped completely. This has improved the quality of our life as well as educated us on many new issues", Rahima Begum, a very enthusiastic member of the women group expressed her feeling. The other female members remark in relation to collect water from the Pipe-water Supply Scheme that having to collect water once a day outside of their home is not an inconvenience, even though they used to have direct access to tubewells at their homes.

Another woman Kohinoor commented, "Drinking rain-water is drinking something tasty now. We are very happy with the Scheme and so is the case for all of our family members and ultimately the villagers". If they drank two glasses of tubewell water previously they drink four glasses of rain-water now because of its good taste. They have adjusted remarkably well to the new system and are very happy about it. They believe that the fact that it provides them with safe water cancels out any minor inconveniences such as standing in line for half an hour. In fact they seem surprised when asked if it is an inconvenience and say, "We have taken it so easily since it is saving our lives".

Besides the awareness campaign, initiatives for capacity building of people have also been taken. In order to improve community people's knowledge and skill on Pipe-water Supply Scheme different types of trainings have been organized i.e. training for private mason, caretakers training,

training for the plant operator and plumber etc. As a result of these training courses people's knowledge and skill on the Pipe-water Supply Scheme has increased significantly leading to proper operation and maintenance of the system.

Community Acceptance and Management of the Scheme

Once the villagers knew that all of their tubewells were contaminated by arsenic, they realized that their lives were in danger. The social mobilization activities and the awareness campaign facilitated by the partner NGOs of NGO Forum contributed change their suspicious attitudes about rain-water and helped them get used to drinking rain-water in a remarkably short period. Now they feel that the pipe-water supply is crucial to their existence and take its management and maintenance very seriously. Therefore, they have agreed to pay Tk. 15 per month as monthly fee for electricity charges and operating costs against getting water everyday from the Pipe-water Supply Scheme. Extra cash goes into the bank savings account in the community's name. If a person fails to pay one month, he/she is supposed to pay next month. The hardcore poor families have also been addressed with special consideration to get the benefit of this Scheme. In Putia village two households have been found too poor to pay the monthly charge, so the VDC in consultation with the Forum's partner NGO, CCDA has decided not to charge them as they do not have enough food or land to afford the fee. Through careful planning, NGO Forum, its partners and the communities with the representation of VDC have come up with such positive scheme that is functional for the community and allows the system to run smoothly for everyone involved.

The key to its functionality comes from ownership of the project within the community and the division of tasks amongst community members. The VDC acts as the key actor for proper operation and maintenance of the Scheme. Each step of the process is apportioned out to an individual within the village. As part of it, the job of operating the pump and releasing the water is given to an 'Operator', who in both these projects are older teenage boys. They are in charge of keeping the systems clean, turning on the pump, releasing the water, checking the water points to ensure everyone has water and reporting any problems. They are also in charge of collecting the monthly fees from each household using pipeline water, and handing this to the treasurer. The operators are paid a monthly salary.

Administering Responsibility for a Community Cause

Mohammad Kawser is the 16-year-old son of a farmer in Putia village, Daudkandi, Comilla and the eldest of five brothers and sisters. He has completed school up to Class five. Kawser tells, "My job as the operator is to keep the roof clean where rain-water is first collected, clean the filter, release water twice daily and make sure everyone receives water". He received his training as operator from CCD A over a period of two days and was trained on how to release the water, how to fix the pipes, clean the roof and generally take care of the whole system. Most importantly, he keeps the key to the whole system. He cleans the catchments, gutters and filter chambers for the rain-water harvesting system on a need basis as well. He checks each water point every day and makes sure the pipes are clean. "I wait ten minutes after it rains before opening the catchment system so that any debris on the roof is washed away. I also put the water engine pump on and make sure the water goes up and then check to make sure everyone receives water", Kawser narrates his job. He is responsible for collecting Tk. 15

per month from each household and taking that to the treasurer. He has not had any problems with that either. Each family gets a receipt and he receives his salary during the first week of every month. He is paid a salary of Tk. 1,000 per month, provided by the villagers from their monthly charge.

Kawser says that the VDC chose him because of his sense of responsibility and his conscientiousness. "I enjoy my position because I am helping my community as well as gaining respect from everyone", Kawser expresses himself very happily. He used to work at a store before but left the job when the store closed down. "I love this present job because of the sense of responsibility it gives me. I work hard because everyone depends on me for their water - drinking water", Kawser said very firmly. So far there has been no shortage of water and no problems at any of the distribution points, he says.

The treasurer is in charge of taking the monthly sum of money from the operator. He is also responsible for paying utility and operator fees and depositing extra sums into the bank in an account under the villages' name to be kept as a future safety net.

Each water collection point is 'manned' by two women from neighbouring households. They are selected by the community members, trained up as caretakers and give honorary service. They are in charge of releasing the tap and making sure everyone gets water at the daily collection times. They also collect Tk. 15 from each household once a month, which they give to the Operator. They are performing the responsibility for reporting any problems.

Protecting People's Property

Bakul, 45, has four sons. She bears the responsibility as one of the two caretakers of a water point in the Putia village, Daudkandi. She says that she along with other caretakers has been trained on the operation and maintenance of the water points prior to her appointment as the honorary service provider. Three households get water from the tap she takes care of. Each house takes about four *kolshis* of water everyday. She says that it takes about half an hour to get water and she waits until everyone has their share. She is also in charge of taking money from the households, which she gives to Mohammad Kawser, the Operator. Bakul says, "So far I have had no trouble at the collection point and no shortage of water. I enjoy my role as a caretaker because it gives me responsibility and I am proud to be a part of something that has helped our village out of a crisis". She mentions that she also educates women on the importance of safe water use and sanitation and hygiene practices. "The collection point has become a social venue for people to discuss their issues and catch up with each other. If a household is too busy to collect water, I collect the water for them and keep it aside", Bakul expresses herself as a very responsible caretaker. She feels that the pipeline system is manageable and sustainable in the future and believes that together as a community, they can maintain this system.

These different responsibilities have ensured that the village feels complete ownership of the Pipe-water Supply Scheme. They have been involved in every step of the way, from discussing which system works best for them, to attending dozens of awareness meetings, using their own land and labour to lay out the pipelines and paying for its maintenance and operating costs. There has been complete social acceptance in these two communities and a sense of ownership of the pipeline schemes. The village women feel confident about their

new water supply system and work hard towards maintaining it. They feel complete ownership towards the Scheme because their village laid it down and pay for its operation, maintenance and overall sustainability. They are happy because they receive safe water consistently and that fact alone takes away any inconvenience they may face in their daily routine. Through first-hand observation, it is easy to see that the systems are working smoothly and people have become habituated completely to those. There is a sense of relief as well as a certain sense of achievement within the community that they have managed to solve their problems, have access to a safe water supply during a crisis period and have a greater sense of unity as a community.

Scope of Replication of the Scheme

Once the initial capital for the systems have been put in place, running and maintaining the system is affordable so far the community people have said about the Scheme. These technologies are costly when considered in terms of its per unit cost and used only by a few people. The same is true of deep tubewells in non-shallow areas where more expensive technologies such as deep-set pump and deep tubewell are used. However these pipe-water supply options are viable if those can be used through pipeline by an optimum number of people, the community pays enough to support an operator as well as the electric bill, and have enough left over to put savings in the bank. For instance costs for the deep tubewell system was totaled at Tk. 276,000 of which NGO Forum supplied the capital cost. The community provided land and labour for the construction of the overhead tank and installation of the deep tubewell, as well as a hundred percent of the operation and maintenance costs. Each household pays a monthly Tk. 15 as maintenance and operation fee that provides for the salary of the Operator of the Pipe-water Supply Scheme

as well as extra money for the community to save in the bank for emergencies. People are very agreeable with the fee. The logic is that bottled water costs Tk. 10 to Tk. 12 per bottle and in one *kalash* several bottles of water can be collected for just 50 paisa per day. There are still some arsenic-free shallow tubewells used by a few families that are tested every two months for arsenic. Although people no longer drink from contaminated tubewells, they still use them for bathing and washing. Therefore, the supply of only drinking and cooking water is enough to meet the community's demand of water. Both of the systems are cost-effective, durable and maintainable. Both these systems have proven to be workable and an excellent provision of safe water - a valuable commodity in Bangladesh.

Money That Matters

Mohammad Romizuddin, 60, is a retired Adamjee Jute Mill Manager. He is the VDC Treasurer in Nilkanda village, Sonargaon, Narayanganj and responsible for depositing the monthly fee collected from each beneficiary household under the Pipe-water Supply Scheme. Romizuddin narrates his responsibilities as the Treasurer in very brief "From the monthly collection, I pay utility and operator fees and deposit extra cash into the bank to be kept as a safety net". He discloses "The VDC decided that Tk. 15 was an amount that worked because it covered all charges, left extra over and was still an affordable amount for the community".

This payment plan began last July as a trial when the VDC first charged Tk. 20. They lowered the fee once they realized that Tk. 15 could cover everything, including savings. The Treasurer says, "I collect about Tk. 2,475 per month from sixty-five families, out of which I pay Tk. 300 to the Operator and approximately Tk. 150 to Tk. 160 goes into the electric bill for

the water pump". The caretakers give the money they collect from the households at their collection point to the Operator. The Operator then gives the total amount to Romizuddin, who pays all bills and deposits the rest in the bank. The village has now saved over Tk. 1,500 in the bank. He says "The system is working smoothly and we have had no financial problems". "Being the Treasurer I feel myself very much proud and that encourages me to perform my duty with due responsibility" Romizuddin expresses himself with a smiling face.

New villages will require outside financial support for the initial hardware, but with land and labour donations, costs can be kept down. Geographic analysis must be conducted initially in order to determine location and level of ground water or amount of rainfall in a particular area. In case of Rain-water Harvesting System, more than 2000 mm of rainfall should occur. On the other hand, in case of Deep Tubewell, the area should have a shallow water table area, a good aquifer (water bearing strata) should be within 12m and salinity must be less than 500 mg/L.

Experience of Implementing Agencies

NGO Forum's partner organizations Gono Shasthya Bastobayan Sangstha (GSBS) and Centre for Community Development Assistance (CCDA) have been delegated with the responsibility to implement these two Pipe-water Supply Schemes at the community level. The approach adapted by the organizations on behalf of NGO Forum is community-managed approach where the community play a lead role in overall management of the scheme as well as a concomitant addressing of integrated hygiene and sanitation issues in the community. Through formation, empowering and entrusting the task to the Village Development Committee (VDC), the facilitating organizations, CCDA and GSBS have been running

the Schemes smoothly while spreading awareness and new information in a short period in the organized and united villages. So far, the users have been positive about the Schemes and no major inconveniences have arisen.

So far, there has been no shortage of water with the Scheme based on Deep Tubewell water. The system is maintained throughout the year by the Operator and cleaned once a month. Arsenic cannot leach in as the water table has been sealed off. There may be future problems with the amount of water in the water table but nothing has arisen yet. Both these systems have proven to be safe and feasible alternatives to combat the existing arsenic and pollution problems. The only time water has not been available is when the main tank is being cleaned over a period of two days or so. However, the villagers are forewarned and advised to collect rain-water individually or use boiled water during that period. The rain-water harvesting system is cleaned twice a month and water is regularly tested for quality. The most difficult period in this system is when the rainy season is over for which time Dug-well water is used. The Dug-well water need to be filtered before use due to turbidity and iron concentration. Before using the Dug-well water the Dug-well water filter chamber need to be cleaned for a few days due to the high iron content and lack of use during the rainy season, in which time people collect water from other sources. Everyone has been satisfied with the system so far and has confidence that it is sustainable and are inducting their children into the process because they know that they will be its future custodians. Some people even have become so much familiar with the pipe-water that they no longer enjoy the steely taste of tubewell water and have problems drinking other people's tubewell water. Many carry their own bottled rain-water when visiting other areas. There are no new arsenic patients and other diseases such as diarrhoea are very low in this village.

Considering the community acceptance and overall response both the implementing agencies, CCDA and GSBS, are optimistic about the sustainability of the Schemes. They feel that through capacity building of people, institution development (formation of and community management by VDC), awareness raising, community participation, cost-sharing the Schemes are ways ahead towards sustainability.

CCDA: The Helping Hand out of Crisis

The Centre for Community Development Assistance (CCDA) has been working with the NGO Forum as partner in Daudkandi, Comilla since 1992. The organization has been involved in implementation of WatSan programmes through awareness raising on safe water, sanitation and hygiene practices. With the intervention of CCDA in Putia, and other neighbouring villages, almost every family has installed hygienic latrines. The area is almost hundred percent covered with water-seal latrine. The safe water coverage also reached to 100% with the installation and use of shallow tubewell. But during the period when arsenic was first detected in these areas, CCDA tested out the bucket treatment unit to treat arsenic affected water on an emergency basis. However, working with NGO Forum, CCDA eventually developed the rain-water harvesting system with capacity of 2000 litres and 3200 litres, of which they have made thirty-seven so far. With the implementation of household-based Rain-water Harvesting System the village people have been aware and habituated to drink rain-water which has appeared as groundwork to implement Pipe-water Supply Scheme using rain-water. The community-managed Pipe-water Supply Scheme has been very popular in Putia. The only problem the community people face with the Scheme is shortage of water during the dry season; the dug well is used at that time as source.

Md. Samad, Executive Director of CCDA, prefers using rain-water because he believes that “It is risky to use groundwater, which is becoming dangerously low and environmental assessments should be made first. On the other hand, rain-water is plentiful and if access to appropriate technology is available then rain-water is a rich source of safe water”. On the positive side of things, Md. Samad believes that the village has become very organized and united, making it easier to spread awareness and information about the Scheme in a short period. He tells “This project has been very prestigious for CCDA and has helped us address our genuine concern for this community with whom we have been working for a long time with various development initiatives”.

Monitoring of the System:

Pipe-water Supply Scheme is a new inclusion in the rural water supply options. So, since installation different aspects of the Scheme are closely monitored by NGO Forum and concerned partner NGOs, CCDA and GSBS, such as quality of construction, general system management, water quality, water use, finance management etc. Participatory approach of monitoring techniques and tools has been introduced for data collection. Data is being collected on monthly basis. Visual method i.e. community mapping is used by Village Development Committee (VDC) to analyze the situation before and after inception of the Scheme. Beneficiaries also collect data using pictorial monitoring tools. The project staff collects data through conventional interview and focus group discussions on changes and impacts. Water quality is monitored by field kit at field and cross-checked in the laboratory.

Major Observations

- Considering the different geo-hydrological & geographical situation, settlement and socio-economic condition of different part of the rural Bangladesh, it is possible to construct *Pipe-water Supply Scheme*.
- Villagers are found very enthusiastic about this new option (piped) of water supply at the village level. They regularly pay the bill of supplied water to the respective persons willingly.
- The community people are using pipe-water for drinking and cooking purposes and arsenic contaminated TW water for other household purposes.
- Villagers are found organized and capable for the operation & management of the Pipe-water Supply Scheme.
- The quality of the supplied water (Deep tubewell, Rain-water Harvesting & Dug-well) is good and taste of water is quite acceptable to the users.

Advantages

- Less danger of the over-exploitation of groundwater.
- Investment cost per capita is less because the source is located nearer to the supply region and it provides town facility at the village level.
- Community is willing to own and maintain this System by sharing the capital and maintenance cost because the size is small, technology is simple, well known and affordable, and above all, there is scope of ensuring reliable performance.
- Simple design, easy to construct and easy to operate and maintain.
- Cost-effective compared to household water supply options.

- Negligible maintenance cost.

Disadvantages

1. Can be supplied only through pumping.
2. If not properly managed and monitored the Pipe-water Supply Scheme may become a failure.
3. Initial capital investment cost is high.

Conclusion

Till date the technologies have significantly been contributing in ensuring safe water to a number of households through the Pipe-water Supply Schemes. The Schemes have been undertaken with a view to mitigating the sufferings of the rural masses and innovating safe, affordable and alternative water supply options in relation to the arsenic contamination in the shallow-tubewell.

The improvements both these Schemes have brought are not just in terms of safe water but also in terms of mobilization, organization, action and sanitation has made an immense difference to these respective villages. The projects have been a success because they have delivered on their promise of a safe, consistent water source that the community has come to rely upon. There is a remarkable improvement in people's lives, illnesses are down, the threat of arsenic is at bay, and the village environment is so much more pleasant compared to how it used to be.

Each of the two communities feels full ownership of their respective pilot Pipe-water Supply Schemes. Because they have donated their own land and labour for the construction of the Scheme and its maintenance, they feel a strong sense of

ownership and pride for it, which is crucial for the maintenance and sustainability of these systems. Since they believe in the benefits the Pipe-water Supply Schemes give them, they have invested in its upkeep and will do their best to ensure its works in the end. The community members are determined to sustain this project to the fullest of their ability as long as they have the strength and ability to mobilize, they will and pass this responsibility on to the next generation.

It is apparent how crucial a role NGO Forum's partner organizations have been playing who are already present in the villages to ensure the progress in safe water supply. An important aspect to the success and survival of this project is how well information was disseminated in the village as well as the user-friendliness of both Schemes. The Village Development Committees are a crucial ingredient to village integration and awareness spreading. Having responsibilities shared out amongst the villagers, such as operator, caretaker and treasury duties as well as people's participation at every level ensures the ultimate survival of new alternative technology projects in rural Bangladesh. It may be well assumed that the upshot efforts would come to be of help to fight against the menace in the country's water supply. It may bring considerable change to the pattern of rural water supply system and encourage the systematic settlement than the present scattered settlement.