



Enhancing Promotion of Sanitation in Difficult Areas of Bangladesh: Adopting Ecological Approaches



100% Ecological Sanitation Village Initiative by GOB-UNICEF

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DEPARTMENT OF PUBLIC HEALTH ENGINEERING



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A GoB-UNICEF 100% Ecological Sanitation Village Initiative

November-2014



Introduction:

Ecological sanitation (dry sanitation) is a paradigm shift in sanitation that recognises human excreta and household wastewater as resources that can be recovered, treated where necessary and safely reused to generate additional income (von Muench and Winker, 2009). Ecosan systems can help to ensure food security by improving soil fertility through safe excreta and urine reuse in agriculture.

Bangladesh has made significant progress in sanitation under the Sanitation for All by 2013 programme. Coverage and sustainability, however, major challenges remain. The problems relate to sanitation vary between urban and rural areas and among different geographical regions of Bangladesh. Moreover, groundwater contamination risk getting higher as people build individual latrine (onsite sanitation/pit latrine) in congested area. As a result, safe distance maintenance between water points and pit latrines are getting very difficult. Furthermore, in water scarce area such as the barind and the hill districts people break water seal due to lack of water for flushing the latrine. In the high water table and flood prone areas, the low land and haor areas installing latrine pits takes more than six months.

Considering the drawbacks of current sanitation technologies under varying local conditions, the DFID-GoB-UNICEF supported Sanitation, Hygiene Education and Water supply in Bangladesh (SHEWA-B) project undertook an Action Research Project on Ecological sanitation in difficult areas of Bangladesh. Action research was conducted in seven hard to reach and geo-physically difficult districts for 16 months between October 2009 to January 2011 and then extended for another 11 months for up to December 2012, being implemented through a consortium led by Practical Action Bangladesh and its associates (Bangladesh Association for Social Advancement (BASA), Society for People's Actions in Change and Equity (SPACE), and Commitment Consultants) with technical supervision by R&D/Arsenic Management Division, DPHE. After successful completion of the action research, DPHE- UNICEF plan to scale-up innovative sanitation initiative through promotion entitled as 100% ecological sanitation village initiatives in geo-physically difficult areas where previous action research was implemented, characterised by water scarce areas viz. hilly areas. The project was implemented through SPACE with technical support from DPHE Arsenic Management Division from 02 November 2013 to 28 February 2014. The project implemented in four selected village/paras in Alikadam and ThanchaiUpazilas of Bandarban district, where previous Action Research Project on Ecological Sanitation has been implemented under GoB-UNICEF project.

PURPOSE AND SCOPE

The action research was implemented in five types of difficult areas, characterised by:

1. Water scarcity in area hilly areas;
2. Uneven land and clay soils on the Barind Tract regions;
3. Flood prone areas with loamy soils;
4. Urban slums where there is insufficient land to apply normal spacing criteria; and
5. Heavily water logged areas (5-6 months of the year) in the low lying Haor Basin.

In the latter areas, the challenge is that they are important areas for agricultural activities such as rice cultivation and fishing, yet are home to very poor people with scarce land available for infrastructure. Under these conditions, conventional pit latrines become inappropriate because of the risk for groundwater contamination, the need for frequent latrine replacement (or pit emptying), associated recurrent costs, the unavailability of land for construction and land tenure issues, in the case of urban areas.

About 500 eco-toilets of seven different options including 80 vermin compost option adapted to their geo-hydrological and physical context were constructed through the community participation at 16 clusters in the SHEWAB project area, including urban and rural settings. Eleven “ecosan toilet” options (mostly UDDTs) have been developed and tested with modifications addressing anal cleansing, menstrual hygiene, improved access for the disabled, elderly or pregnant women, better ventilation and light, and inclusion of a moveable “compost drum” (for storage and drying) when space is a problem. The research focuses more to the community empowerment, local resource mobilization, ownership through cost sharing and strengthening community organizations; so that, they can manage and continue their initiative by themselves. Demonstration sites are established so people have first-hand experience to see a facility and ask questions.

Design and Construction:

The project developed 11 prototype engineering designs by reviewing the designs available at home and abroad, including other Ecosan projects in Bangladesh, and consultative meetings with the beneficiaries and stakeholders to improve the understanding of local conditions and preferences of the potential users. The design factors based on challenges of difficult areas are listed in the below table. However, other factors which have been also considered such as individual site condition; material availability and cost sharing.

Difficult Areas	Nature of Challenges in respect of sanitation	The following factors were considered in design
Urban Slum/low income settlement (Moulavibazar, Raipura&Rangpur)	<ul style="list-style-type: none"> Slum dwellers (about one-third of urban population) are virtually excluded from the municipal services such as sanitation because they are not recognized by law Land scarcity constrains the construction of pit latrines with appropriate distance from water points. 	<ul style="list-style-type: none"> Land Scarcity Problem in use of EcoSan product Problem in cost sharing
High water table/Flood Prone Area (Gaibandha)	<ul style="list-style-type: none"> Pit latrine inundation due to flooding in each year 	<ul style="list-style-type: none"> Flood level Flood duration Rail fall Loamy soil
Hill/Barind Tracts (Bandarban&ChapaiNawabganj)	<ul style="list-style-type: none"> people break the water seal due to lack of water for flushing the latrine 	<ul style="list-style-type: none"> Land Slide Flash Flood Uneven land Clayey soil
Haor (Sunamganj)	<ul style="list-style-type: none"> Pit latrine inundation due to flooding in each year Water logging for 6-9 months of the year 	<ul style="list-style-type: none"> 6-9 months of water logging High current and land erosion Flood Level may be 4-5 feet

Feasible Options according hard to reach area

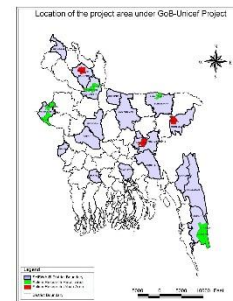
Option no.	Toilet Option	Hilly	Barind Track	Flood Prone	Slum	Haor
01	Fixed Chamber System Using Plastic Fiber Pan	✓	✓	✓	✓	✓
02	Movable Plastic Drum System Using Plastic Fiber Pan (Single Pan)	✓	✓		✓	
03	Movable Plastic Drum System Using High Commode (Single Pan)	✓	✓			
04	Fixed Chamber System Using Modified Traditional Eco Pan	✓	✓	✓	✓	✓
05	Fixed Chamber System Using Traditional Eco Pan	✓	✓	✓		✓
06	Movable Plastic Drum System Using Traditional Eco Pan	✓	✓			
07	Elevated Movable Plastic Drum System with RCC Column			✓		✓
08	Single Pit Urine Diversion Toilet	✓	✓		✓	
09	TwinPit Urine Diversion Toilet	✓	✓	✓	✓	✓
10	Waste Concern Model using Urine Diversion Pan	✓	✓	✓	✓	✓
11	Community Based Urine Diversion Toilet with Biogas Plant	✓	✓	✓	✓	✓
Suitable option depending on site		10	10	7	7	7

Users were free to choose options depending on income level. Users did not choose Option 3 as high commode system is not a culturally preferred option for the poor and lower income group of Bangladesh. Option 6 was disliked due to greater space required. For option 10 construction is technically complicated. Option 11 was designed for urban slums/congested settlement but space was major constraint for the intervention area to promote such kind of toilet option.

Geographic Location

Action research was implemented following project areas:

- Urban Slum/low income settlement-Moulavibazar, Raipura&Rangpur
- High water table/Flood Prone Area-Gaibandha
- Hill/Barind -Bandarban&ChapaiNawabganj
- Haor/water basin-Sunamganj



100% ecosan village initiative was implemented in following villages of Bandarban district:

Babupara and Noyapara villages of Alikadam Upazila and Ailmara village of Thanchi Upazila of Bandarban district.



Map of Ailmara para of Thanchi Upazila

Action

The action research focused on community empowerment, local resource mobilization, building local ownership through cost sharing and strengthening community organizations. Demonstration sites were established for people to gain first-hand knowledge about the technology. Eleven different “Ecosan toilet” options (mostly, urine diversion dry toilets/UDDTs and urine diversion - UDTs) were developed and tested with modifications to address anal cleansing, menstrual hygiene, improved access for the disabled, elderly and pregnant women, better ventilation and light, low cost hand washing device, and inclusion of a moveable “compost drum” (for storage and drying) where space is a problem. The major innovations of the options design were:

Eco Plastic Fiber Pan: Due to cultural and religious stigma Bangladeshi people use water for anal cleaning purpose. They do not feel comfortable to switch defecation pan to anal cleaning place. The ecopan has been introduced for adaptation of anal cleansing provision using water in the same pan to avoid pan switching for anal cleansing in the conventional ecosan options. So the plastic fiber pan transport anal cleansing water, urine collection and discharging the faeces separately into the evaporation bed, urine container and chamber respectively.



Urine Diversion Pan: The urine diversion pan is used for single pit latrine for which urine automatically separated from the faeces and increase longevity of the pit latrine



Pan Cover Handle: Installed a handle attached to the pan cover to avoid fingers in direct contact the pan cover.

Pre cast slab with Eco-pan: Two types of pre-cast slab were prepared to reduce the slab thickness and construction cost as well as developing entrepreneurship that will make the availability of eco-toilet construction materials in local level.



Pan Cover Handle



Pre cast slab with Eco-pan

Railing and handle: Provision for special needs of women (pregnancy), children, and disabled people by providing handle and railing inside and outside of the toilet respectively.



Ash scoop: Provision of a plastic water-seal bucket to store ash along with a scoop so toilet users do not have to use hand to spread the ash on faeces.

Technological Solution for Menstrual Hygiene:

Due to religious and cultural stigma, women refrain from using conventional ecosan options during their menstruation due to mixing of 'menstruation blood' with the urine. As this blood is thought to have the 'evil spirit' in both hindu and muslim traditions, people avoid using this system. Thus most of family who had traditional/old model ecosan option used to maintain tow toilet in their house (ecosan and conventional latrine, which women use during their menstruation). Under this action research we have increase the foot length (18 inch) so that women can use the 'anal cleaning hole' by turning by 180 degrees for urination which goes to the evaporation bed. In this respect, the evaporation bed's height is also increased with sand and brick chips so that blood cannot be seen.



Option for ventilation and lighting: Provision of two windows in two sides for better ventilation. A light bulb (use toilet at night) or using lighter colour roof helped to improve visibility inside without electric lighting.



O&M of facilities: A pictorial chart on toilet use and maintenance is set in front of the toilet wall. A participatory monitoring system has been established to ensure proper use and cleanness.



Pictorial chart on toilet use

Hand washing device: Low cost hand washing device has been prepared for hand wash after anal cleansing work by using locally available materials.



Hand washing device

Costing is one of the major factors for scaling-up eco-san initiative in Bangladesh. The average cost of conventional eco-san option is about Tk. 30,000 (\$ 428), is relatively expensive for the poorer section of the people. In this regard, the action research adopted variety of measures in the design and tried to use locally available low cost materials in order to reduce the construction cost. Design faeces chambers also based on the number of family members, which also contribute in reduction of cost from the conventional design. Construction cost was also reduced using different construction materials (low cost to conventional brick/RCC) for each options ranging from Tk. 17,500 (\$ 236)—UDD model to Tk. 5400 (\$ 73)—Urine diversion model.

Cost of Different Ecosan Options, 2011

SL No	Name of Options	Total cost for Sub-structure (in US\$)	Total Cost (Super-structure made by Brick Wall) (in US\$)	Total Cost (Super-structure made by G.I. Sheet) (in US\$)	Total Cost (Super-structure made by Bamboo) (in US\$)	Total Cost (Super-structure made by Mud) (in US\$)
1	Fixed Chamber System Using Plastic Fiber Pan	113	173	188	152	147
2	Movable Plastic Drum System Using Plastic Fiber Pan (Single Pan)	105	164	180	143	139
3	Movable Plastic Drum System Using High Commode (Single Pan)	118	178	193	156	151
4	Fixed Chamber System Using Modified Traditional Eco Pan	98	158	173	136	131
5	Fixed Chamber System Using Traditional Eco Pan	105	166	180	144	139
6	Movable Plastic Drum System Using Traditional Eco Pan	107	168	182	146	141
7	Elevated Movable Plastic Drum System with RCC Column	177	236	252	216	211

SL No	Name of Options	Total cost for Sub-structure (in US\$)	Total Cost (Super-structure made by Brick Wall) (in US\$)	Total Cost (Super-structure made by G.I. Sheet) (in US\$)	Total Cost (Super-structure made by Bamboo) (in US\$)	Total Cost (Super-structure made by Mud) (in US\$)
8	Single Pit Urine Diversion Toilet		73			
9	Twin Pit Urine Diversion Toilet using Urine	103	151	151	155	
10	Waste Concern Model using Urine Diversion Pan		337			
11	Community Based Urine Diversion		1206			

Key Challenges

- Ecosan in peri-urban and urban areas has its challenges as high population density factors leave little physical room for the immediate use of manure as well as the inadequate supply and marketing chains for manure
- In rural area the issues of reuse of urine and excreta in the absence of near-by gardens
- Technology Cost is a barrier for scaling up
- Inadequate technical back-up support and opportunities for reuse of urine and manure particularly in terms of hygienic handling and absence of supply chains also major challenges in scaling of ecological sanitation in Bangladesh
- Unavailability of skilled masons and construction materials in the project areas.
- Ensuring participation of toilet owners in making superstructures due to their extreme poverty.
- Changing expected behavioral pattern and optimum use, operation, maintenance and excreta management for reuse in productive activities.
- Religious and cultural stigma women was refrain using conventional ecosn option during their menstruation due to mixing of 'menstruation blood' with the urine.

Key Result

- 500 ecological sanitation options and 80 vermicomposting are successfully operated by community management
- Two villages in AlikdamUpazila of bandarban district will be declared as 100% ecosan village (first ever in Bangladesh) by the Ministry of Local Government, Rural Development and Cooperative (LGRD&C)
- The 11 Ecosan options got provisional approval from the Design division of DPHE. It was mentioned in the provisional approval that successful piloting would be essential for formal approval. A formal approval by GOB would be critical for scaling up the technology. Then it can be advocated at the Ministry of Local Government, Rural Development and Cooperative level to incorporate ecological sanitation options as a part of GOB's ongoing sanitation promotion campaign strategy.
- To mitigate the potential health risk that may arise from the use of composted excreta and urine, a systematic study was undertaken through the Institute of Epidemiology Disease Control and Research (IEDCR) and the nutrient of the eco-sanitation products was analysed by the Department of Soil, Water and Environment of the University of Dhaka, the positive findings were disseminated (national and international) for advocacy purposes.

Scaling-up of eco-san initiative:

- The 11 ecosan options got provisional approval from the Design Division of DPHE. It was mentioned in the provisional approval that successful piloting would be essential for formal approval. A formal approval by GOB would be critical for scaling up the technology. Then it can be advocated at the Ministry of Local Government, Rural Development and Cooperative for incorporation of ecological sanitation options as a part of GOB's ongoing sanitation promotion campaign strategy. However, LGRD&C Ministry is already interested in Ecosan initiatives as they have tried some out earlier in each Union.
- Costing of the technology is another barrier for scaling up. The traditional hard-core engineering solutions do not allow for low cost options. As a result the eco toilet cannot compete with mass sanitation options. However, this project for the first time tried out a low cost option at \$73.
- Knowledge products (toilet catalogues/manuals) were distributed to all local DPHE offices and PS at SHEWA-B project areas so that they can be used for future promotional activities and SHEWA-B project could be a platform for scaling up. The current 7 piloting areas could be used as demonstration centres and knowledge hubs for replication of Ecosan initiatives.
- Opportunities to link 100% ecosan village initiative with Community Approach of Total Sanitation (CATS)/ Community-led total sanitation (CLTS), Sanitation marketing approaches potentially expanding uptake of sanitation, especially in areas where conventional technologies (toilets with pits) are difficult to implement.

