A Way Forward to Promote Ecosan Programme in Nepal

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ABSTRACT

The concept of Ecosan first struck in the minds of policy makers in Nepal after one of the authors of this paper participated in the first International Conference on ECOSAN in Germany, on year 2000. Eventually, DWSS piloted an Ecosan programme in Siddhipur nearby Kathmandu in 2003. Ecosan technology as it was appropriate to the local community was developed, tested and modified. The community overwhelmingly accepted the technology and made application of it mainly for vegetable farming. Simultaneously ENPHO and Lumanti also implemented the Ecosan programme in Khokana and Thimi in the Kathmandu valley. The technology was also further duly modified and tested.

The ground water table is specifically very high during the rainy season in the *Terai* region. The incidence of flooding and water logging becomes rampant and water level raises above the ground level, which causes difficulties to maintain human faeces, dry as needed for the dry Ecosan. Despite this adverse situation, DWSS undertook to pilot the Ecosan programme as appropriate to Terai geography, culture, norms and practices. Sabaithuwa village of Parsa district in the central development region was selected for the piloting the programme. The pan was designed with water seal and connected with twin concrete pits under the ground, yet separation of urine and faeces was there. A single pan can serve the toilet purpose, bottom cleansing can be done in the same pan, flushing can be done after the defecation, cleaning of plan with water is possible. These modifications have helped to lessen foul smell and to maintain neatness and cleanliness. This is a between conventional latrine and dry toilet- a way forward for ensuring a high level of acceptability of sanitation among the Terai people.

INTRODUCTION

Nepal, a mountainous and land locked country, has an area of 147,181 square kilometers with a total projected population of 24.7 millions in 2005. The Terai (the low land area) covers about 23 % of the total land but the population in this region stands at 47 % of the total population. Over 80 % of the total population of the country lives in rural areas. The national sanitation coverage as of 2004 is 39%, whereas, the total coverage in the Terai is only below 20 % [1]. An estimate shows that 10 million tons of urine and 0.6 to 1.1 million tons of faeces are produced in a year in Nepal. The financial value of the nutrients of the urine and faeces based on the existing prices of chemical fertilizers is about NRs 7.11 billion which is equivalent to 50% of the total fertilizers imported every year and the equivalent value of the fertilizer produced by a family of an average size of 6 is estimated at about NRs 2,000, which is about 50% of the cost of the latrine structure up to the plinth level [2]. Considering the money saved from purchasing fertilizers and utilizing it for building Ecosan latrines, the opportunities lies for the remaining un-served 61% of the total population.

The concept of Ecosan first struck in the minds of policy makers in Nepal after one of the authors of this paper participated in the first International Conference on ECOSAN in Germany on year 2000. Eventually, Siddhipur, 7 Km south from Kathmandu was selected for a piloting Ecosan Project for the first time in the history of Ecosan in Nepal in 2003. The pilot project was implemented for one year with financial support from WHO and technical support from Development Network, a research institution with which the second author is associated [3]. The Ecosan latrine was overwhelmingly accepted by the community people and there was a long list of other households seeking support to build such latrines in their homes also.

With the start of the pilot programme in Siddhipur, ENPHO and Lumanti, the two national NGOs, also introduced the Ecosan programme almost simultaneously in Khokana and Thimi in the Kathmandu valley with the financial support from WaterAid Nepal. Interestingly, people also used urine as a catalyst to decompose household garbage along with cow dung. They believed that the decomposition that takes place with the urine was faster and the manure contained more nutrition values. Some people also applied urine as pesticide to kill pest in the vegetables and fruits. The quality and taste of the agricultural products when urine was applied as manure was reportedly good and was particularly liked by the community people.

CHALLENGES OF ECOSAN IN TERAI REGION OF NEPAL

Although the Ecosan latrine was largely accepted in those villages, there were some snags which had to be addressed to make them more user-friendly and acceptable to all kinds of people in the community. The preliminary assessment revealed that there were some flaws in the Ecosan latrines which were initially developed in Siddhipur, Khokana and Thimi. Position required to shift to cleanse the bottom, visibility of fresh faeces through the dropping hole, husk/ash/or lime required to put on the excreta after each defecation and foul smell due to lack of water sealing provision in the pans were some of the major drawbacks which were the challenges and opportunities before the promoters and policy makers to effectively increase the adoptability of the technology and scale up to the wider mass of people in Nepal.

The acceptance level of the dry Ecosan latrine was promising in the Kathmandu valley in the piloting phase. However, in the context that the practice of open defecation is widely adopted by most of the people in the Terai region, it is a big challenge to promote even the conventional type of latrines in this region. People also lack knowledge about the importance of human wastes as manure and of its economic value. They are, as a matter of fact, "Faeco-Phobic" and they consider human waste as a "hatred thing".

With the understanding of social norms, behaviour, attitudes, and prevailing in the socio-economic condition and in the light of the participatory discussion made with the selected farmers of the Terai, DWSS launched in 2005, with the financial support of WHO and in collaboration with a national NGO-Community Development Forum (CODEF), a Pilot Ecosan Programme in Parsa, one of the Terai districts. The pilot programme was launched to assess the technical, financial and cultural acceptability of ECOSAN and hence to develop appropriate ECOSAN technology and approach to further replicate and scale it up in the country [4]. The pilot programme was designed in such a way that it would overcome the problems being faced in dry Ecosan in the previous piloting programme and also to save the losses of under-utilization of the urinal in the conventional type of latrines.

CHOICE OF TECHNOLOGY

As the project area happens to be located in the Terai region, the ground water table is specifically very high during the rainy season. The flood occurs rampantly and the water level raises above the ground which makes difficult to maintain human faeces dry as needed for the dry Ecosan. It is commonly believed that pathogens (*Ascaries*) die when the faeces are kept dry for about six months; otherwise it takes about two years for the pathogens to die if the faeces are wet and soggy. As such any latrines to keep faeces dry in the Terai area require a considerably elevated chamber which involves high cost. Alternatively, a chamber can be constructed below the ground surface that can keep the human faeces for two years and make the wet faeces free from pathogen.

Therefore, a unique type of wet Ecosan latrine was designed particularly for the Terai, in such a way that human faeces are simply disposed of alternately in twin pits lined with concrete rings. Once one pit is filled up, faeces are then disposed of in another one, and the cycle goes on. In such latrines, as the volume of the sludge is reduced due to the provision made for soaking action of liquid, the cost of this type of latrine is less. In the case of urine, it is stored in separate plastic jars. In this model, bottom cleansing can be done at the hole of the pan itself, which is more user-friendly as compared to that of dry latrines. Pan being water sealed, people can clean the pan with water and hence the latrine can be maintained clean and odorless. Moreover, the use of wet latrine is also simpler than that of a dry latrine. Besides, occasional visitors and guests can also use the latrine easily with a little instruction.

In conventional latrines, urine gets mixed up with faeces. In this process a large portion of nutritious content is likely to get lost in the soak pits. Studies have shown that urine contains about 85 % of manure value whereas, human faeces contains only about 15 %. As such the faeces after storing it for two years can be taken out from the pit just before the rainy season so that the gets dried up for using it in the agricultural land. The urine which is separately stored can be used at any time with or without dilution as highly nutritious organic fertilizer for vegetables and fruits.

Therefore in the typical context of the Terai where maintaining faeces dry is almost impossible due to the flood and the high level of ground water, water sealed pan with provision made for separation of faeces from urine could be an ideal from of latrine option acceptable to the communities in terms of technology.

METHODS

Household selection for latrine construction

A local club working at the project site was selected to mobilize the people. Once the club was selected, it started calling the attention of those who would be willing to build the Ecosan latrines. The club also put up a notice in a public place and on the club's office inviting application for latrine construction. There were responses from over 100 households expressing willingness to build latrines. The club followed a certain criteria to select the households among applicants.

The criteria used for selection of households were:

i) household that have having agriculture land and vegetable garden,

ii) willingness to afford for superstructure,

iii) acceptability to handle decomposed manure, and

iv) readiness to apply manure in the agricultural field.

Then 20 households were selected based on "first come first served" among the households who met the above criteria.

Door to door visit

The club members made door to door visits to promote Ecosan latrines particularly to aware on importance and use of the latrines, nutrition value of human faeces and urine, agriculture use, operation and maintenance of the latrines, etc. During the visit, they were also discussed with latrine options, types of superstructures, unit cost for each type and their willingness to pay.

Mason's training

There was obviously a challenge before the project to introduce an affordable and culturally acceptable Ecosan technology in the community. Engineers and technicians of CODEF were first oriented at Kathmandu on the construction of the Ecosan pan and then were mobilized to work for the community. Then they provided training to the local masons to build Ecosan pan, concrete rings and superstructures.

Modification of design and construction of pan

The Siddhipur Ecosan pan was cast-on-situ in the concrete slab over the chambers (Figure 1). Later, separate units of pans were developed by ENPHO so that each of them had a mosaic surface with non-sticky materials (Figure 2) and it was installed in the same way as the conventional pans in the latrines. The pan was made to dispose of the excreta to the direct pit, and the urine to the plastic jar. The modified pans were then used in Khokana, and later in Siddhipur where ENPHO expanded the Ecosan programme with financial support from UN Habitat.

The pans were again significantly modified in Parsa to suit the requirements and willingness of the Terai people and also to rectify the problems faced in Siddhipur and Khokana models. After imparting on-site training to the local masons to build pans, a mason from the same community made some pans and showed the villagers for their suitability. The pans were experimented by men and women in the community for a few days. Then the pans were modified to ease bottom cleansing and stop back splashing of urine. The mason kept modifying the pan until the users were fully satisfied (Figure 3).

Figure 1. First Ecosan pan developed in Sidhipur.

Figure 2. Ecosan pan modified by ENPHO.

Figure 3. Ecosan pan modified in Parsa.

Figure 3 pan was modified in such way that urine and faeces could be separated and the bottom cleaning could be done in the same pan's hole without shifting the position.. The pan consisted of water seal which allowed flushing and thus avoided foul smell. The pan is connected with twin off-set pits made up of with concrete rings with the provision of a junction box. Hence a single pan could serve the purpose unlike the dry Ecosan which needed double pans.

Construction of concrete rings

The size of a pit was designed to accumulate the faeces of a family of six members for two years. With some this design, a pit needed concrete rings at least there in number, each of 40 cm height and 100 cm diameter. The local masons built the rings after they received training. People realized that the quality of the rings was also far better than that of those ones available in Birgunj Bazaar. This increased more participation and ownership of the community towards replication and scale up of the Ecosan project.

Construction of superstructures

People were given different options for making superstructures on their own. The most discussed options were structures made of bamboo and bricks. The cost for one superstructure made of bamboo was calculated almost to be one fourth of the brick-made structures. However, as it was the off season, they could not harvest bamboo during the construction period and hence all of the 20 households built the structures made of brick masonry.

Exposure visit of the farmers

An exposure visit by the farmers of the project site was arranged to Siddhipur and Khokaka to share their experiences on latrine use, maintenance, agricultural application of urine and faeces. After the visit, they were highly convinced about the value of applying urine on vegetables, fruits and wheat, etc. They were also convinced of the valuable use of urine as a pesticide and also to use it as a catalyst to make compost from household wastes. The farmers were also excited as they observed the process of borrowing and lending urine as an economic commodity.

Financial supports

The local club was supported with an amount of US $ 2800 to build 20 units of Ecosan latrines. As they massively mobilized local resources in every component they made themselves such as pans and rings, they saved some amount. The financial support was provided only up to the plinth level, the cost of which was about US $ 85. An additional US $ 14 was also provided to subsidize the cost of the building the superstructure, as they could not get to harvest the bamboo during the project period. . The farmers managed to cover the remaining cost for superstructures on their own. The club has a plan now to build additional 10 units of latrines with the money saved amount. The farmers will be provided with pan and rings, the cost of which will be about US $ 42 only and the remaining expenses will be borne by them.

Dissemination workshop

At the end of the project, a dissemination workshop was organized in the project site to disseminate the learning, success stories, technology, acceptability and agricultural use of the Ecosan project. The participants were farmers from the neighboring districts; Bara and Rautahat including Sabaithuwa villagers. After the workshop, the participants made commitment to the fact that they would also build latrines, provided Ecosan pan and concrete rings worth of about US $ 42 were made available to them free of cost.

Agricultural Application

In order to design the doses of urine for various vegetable and fruits, purposive five samples of urines from male and female representing various castes and economic status were collected and tested for obtaining value of nitrogen, potassium and phosphorous (N, P, K). Similarly, five purposive samples of soils were also collected and tested for their N, P, K values. The total Nitrogen (N) varied from 744 to 6776 mg, Phosphorous (P) from 216 to 1603 mg and Potassium (K) from 257 to 1171 mg per liter of urine. The variation might be due to the difference in the levels of quality & quality of food and liquid consumptions of people. Similarly total Nitrogen (N) value varied from 1176 to 1386 mg, Phosphorous (P) from 535 to 1074 mg and Potassium (K) from 7.33 to 87.33 mg per kg of soil. However, while calculating the urine dose, mean N, P, K values of urine and soils of all the samples were taken (Table 1).

Table 1. N, P, K values of urine and soil samples.

a. Urine Samples				b. Soil Samples			
Sample No.	Total Nitrogen (N) mg/L	Phosphorous (P) mg/L	Potassium (K) mg/L	Sample No	Total Nitrogen (N) mg/L	Phosphorous (P) mg/L	Potassium (K) mg/L
Person 1	6048	1325	425	Soil 1	1386	576	9.16
Person 2	6776	1603	1171	Soil 2	1330	535	9.11
Person 3	3696	470	257	Soil 3	1176	793	25.44
Person 5	744	506	259	Soil 4	1288	1074	87.33
Person 5	3048	216	713	Soil 5	1316	691	7.33
Mean	4062	824	565	Mean	1299	734	27.7

Based on the lavatory analysis of the urine and soil samples, the dose of urine was calculated at about 32 liter in each plot of 4 m² for potato. The dose was applied in four splits at the interval of ten days, with about 8 liters of urine at each split. It was suggested to use the mixture in a dilution ratio of urine and water as 1:3. For the purpose of comparison, three plots, each of 4 m² were developed as demonstration plots; one plot without any fertilizer, the second plot with chemical fertilizer and the third plot with urine application. The on-going monitoring has shown that the growth of potato in the plot where urine was applied is better. After the potato crops are harvested, the yield (weight) and taste of the potato grown in each plot will be assessed. Farmers have been oriented on precautions to be taken on the dosages and timing while applying urine.

COMPARISON OF VARIOUS LATRINES

Based on the experiences, four parameters (cost, uses of urine and faeces, technology and applicability) were assessed and they were compared with the conventional latrines (two pits with pour flushing), dry Ecosan and wet Ecosan latrines (Table 2). The comparison shows that the wet Ecosan can be very effective technology to convince farmers, especially the poor, to promote sanitation.

Table 2. Comparison of various latrines.

Parameters	**Conventional latrines Off-set two pits, pour flush)**	**Dry Ecosan (developed for Siddhipur/Khokana)**	**Wet Ecosan (developed for Terai)**
Cost (up to plinth level)	• Rs 5,000	Rs 7,000	Rs 6,000
Use of Urine	• No	• For vegetable, wheat and fruits • Decomposition of cow dung and household garbage	• For vegetable, wheat and fruits • Decomposition of cow dung and household garbage
Use of faeces (as a manure)	• Sometime used	• Used after one year • Used for vegetables. wheat and fruits	• To be used after four years • Used for vegetables. wheat and fruits
Technology	• Faeces and urine mixed, flushed and decomposed to pits • Pan with water seal, flushing the pan after defecation, • Cleansing the bottom in the pan itself • Sufficient water needed • Off set pits • Users friendly O&M, No odor	• Faeces and urine separated; • Faeces kept dry, husk, lime and ash put on the faeces after each defecation • Cleansing the bottom by shifting the position • Only little water required; Water required only for bottom cleaning • Direct pit • Emits some foul smell and difficult to maintain clean	• Faeces and urine separated; • Pan with water seal, flushing the pan after defecation, • Cleansing the bottom in the pan itself • Sufficient water needed • Off set pits • No foul smell due to water seal pan and easiness to clean the pan
Applicability	• Hills and Terai where water is adequately available	• Hill and Terai where water is scarce	• Hill and Terai where water is water is adequately available

DISCUSSION AND CONCLUSIONS

Acceptability

One of the objectives of the project was to assess the level of cultural accessibility of the Ecosan latrine. In this aspect the community people were found to overwhelmingly accept to adopt and use the Ecosan latrines. They used urine in their vegetables, cereal crops and fruits. They started replacing chemical fertilizer with the use of urine, thereby saving money on the procurement of the fertilizer. It is expected that the nutrition intake of the farmers will also be subsequently increased due to the high level of nutrition contents in the organic vegetables. The hundreds of households that are waiting to build Ecosan latrines in the Sabaithuwa village testifies acceptability of the project.

Technical aspects

The dry Ecosan latrine as developed in Kathmandu was modified by the local community people themselves. The pan was provisioned with water seal which helped to minimize foul smell. Bottom cleansing was possible without shifting the position. Operation and maintenance was more user-friendly. These were the positive aspects which contribute to the sustainability and acceptability of the technology.

Replication

The local CBO-Jyoti Yuba club committed to scale up the Ecosan programme throughout the VDC within three years. The DDC and other district level agencies have also shown interest to replicate in other VDCs. The farmers from Bara and Rautahat also made commitment to replicate the Ecosan concept provided a support in the form of pans and rings. The cost of the ring and of the pan to build latrines is insignificant as compared to the benefit expected to gain. It is advisable to make a provision to support poor farmers in the beginning of advocacy and piloting phases as it is given in the bio-gas programme. There is high potentiality of replication throughout the country if the programme is properly marketed.

RECOMMENDATIONS

The followings are some of the major recommendations:

- Piloting of the Ecosan programme should be continued further to develop Ecosan modalities.
- The awareness programme on acceptability of the Ecosan concept should be developed

- Effective advocacy and campaigning programme on ECOSAN should be launched to sensitize the community people on Ecosan to help them decide on their own compatible to their own situation through development and dissemination of appropriate IEC materials.
- Options of both the dry Ecosan and wet Ecosan should be offered to the community people.
- Low cost options of the Ecosan latrine should be further promoted.
- Exposure visits should be encouraged to motivate the people and make them more knowledgeable about the Ecosan..
- Government, donors and NGOs should establish networks with finance institutions for providing soft loan to promote sanitation.
- Some sort of support should be provided in the beginning to encourage farmers as it is given for bio-gas plants.
- Local latrine-entrepreneurs should be encouraged to build Ecosan pans through marketing, training, exposures, incentives, etc.

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