

Experiences with ecosan in Danish allotment gardens and in development projects*

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Abstract

Experiences from four projects dealing with the implementation of ecosan toilets are presented. The projects took place in Denmark, Afghanistan, Burkina Faso and Guatemala. The approaches to implementation and the arguments that "sold" the idea are evaluated. The paper discusses how the experience gained in the four projects can be used in practise when implementing ecosan. In general, the main priority for end-users was to have an affordable and comfortable sanitation facility. In some places recycling of nutrients is already a priority, and in other places it seems to be possible to promote it. Whether or not people experience eco-san positively seems to be dependent on whether or not the eco-san toilets are used correctly. Demand must be created through information and mutual engagement in order to achieve a successful result. It is equally important to ensure involvement of the users in all aspects of the implementation and running of the toilet system. Communication, both before and after implementation, is paramount.

Introduction

The latest WHO/UNICEF assessment (Year 2000) indicates that in Africa, Asia and Latin America, the percentage of the urban population with access to sanitation is 84/78/87%, respectively, in urban areas, while in rural areas the percentage is 45/31/49%, respectively. There has been some improvement in Asia and Latin America since 1990, but in Africa the expansion of the sanitary infrastructure has barely kept up with the increase in population. The daily number of diarrhoea related deaths (mostly children under five), due to poor sanitation, hygiene and water supply, is equivalent to the crash of 20 jumbo jets.

There are also reasons to be concerned about the food production in some of the poor regions. Approximately 800 million people are affected by hunger according to the World Food Programme and approximately 250 million people are directly affected by desertification according to FAO. Exhaustion of land due to the insufficient addition of fertiliser is common in poor regions.

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The resolution from the Earth Summit in Johannesburg 2002 states that the number of people without access to sanitation facilities should be cut down to half before the year 2015. Although in principle the statement is positive and encouraging, implementation projects carried out in practice have faced severe problems in introducing sanitation. There is a great need for looking into better arguments and approaches to “selling” sanitation to local populations.

Dry No-mixing sanitation with urine collection provides a number of benefits that can be used as arguments for implementing sanitation. The hygienic collection of faeces and urine, the reduction of pathogenic organisms in the waste products during storage, the comfortable low-smell atmosphere, the protection of groundwater from contamination, the potential for reusing the nutrients in the fields, plus the resulting increased crop production are some of the main benefits associated with these sanitary systems. These benefits may lead to a higher interest from people without access to or with poor latrines.

The current paper discusses four eco-san implementation projects: one in Denmark, one in Afghanistan, one in Burkina Faso and one in Guatemala. The discussion will focus on the approaches to implementation and the arguments that “sold” the idea. On the basis of these four projects, the paper discusses how the experience gained can be used in the current practise of implementing ecosan.

Methods

The method used to evaluate the experiences with dry no-mixing sanitation with urine collection is implementation and interviews with the users. The extent of implementation and stakeholder participation varies between the projects. The specific conditions for each project will briefly be described in the following.

In Denmark dry toilets with urine collection were implemented in 89 allotment gardens, (Backlund et al., 2003). Eight different models of diverting/no-mixing sanitation systems without water flush for separate collection of human urine and human faeces were established in 1999-2000. The aim of the project was, through user participation in both planning and decision making, to find a more sustainable alternative to chemical and water flushing toilets and to gather the users experiences with the systems. The stakeholders that took part in the project were: the Danish Allotment Gardens Association, the municipalities, local allotment gardener organisations and voluntarily participating owners of allotment gardens. The incentive for the Danish Allotment Gardens Association to initiate the project was the fear that municipal authorities would demand the construction of sewers.

In rural areas of Herat Province, Western Afghanistan, a local modification of the Vietnamese two-chamber urine-collecting toilet was developed and a study of the inhabitants’ sanitation



Figure 1: Moulding of slab and implemented result in Herat, Afghanistan
(Photo: Dorthe Eriksson)

habits was conducted in the year 2000. An interview investigation of 49 questions was made with 55 men and women about their perceptions and practise of hygiene and sanitation and their interest in using ecosan. 17 latrines were implemented in 2000 and evaluated the year after.

An interview investigation was carried out in Sabtinga, a rural community of 3000 inhabitants, 20 km North of Ouagadougou in Burkina Faso. 10 male heads of families comprising a total of 160 people were interviewed regarding their habits and attitudes towards sanitation, hygienic practises and interest in ecological sanitation, using a questionnaire of 44 questions. The investigation was made in preparation for a possible pilot implementation program for UNICEF and a local organisation, CREPA.

In Guatemala three villages in Laguna Lachua National Park were briefly examined. 101 Ecosan latrines of the LASF type (Esrey et al. 1998) had been implemented in 1997-1999. The latrines were examined in 2000 by inspection and people were interviewed about their use of and experience with the latrines.

Results

Allotment gardens in Denmark

A successful implementation of diverting/no-mixing sanitation in the allotment gardens was achieved. Personal engagement on behalf of the project management and stakeholder participation in planning and decision making lead to the effective transfer of enthusiasm and knowledge about ecosan to participants, which was key to the success of the project. The majority of the 176 residents who took part in the project were within the age of 41-70 (typical for allotment gardens), and the distribution between sexes was fairly equal. Prior to the introduction of the diverting/no-mixing toilet systems, most of the residents had a chemical toilet.

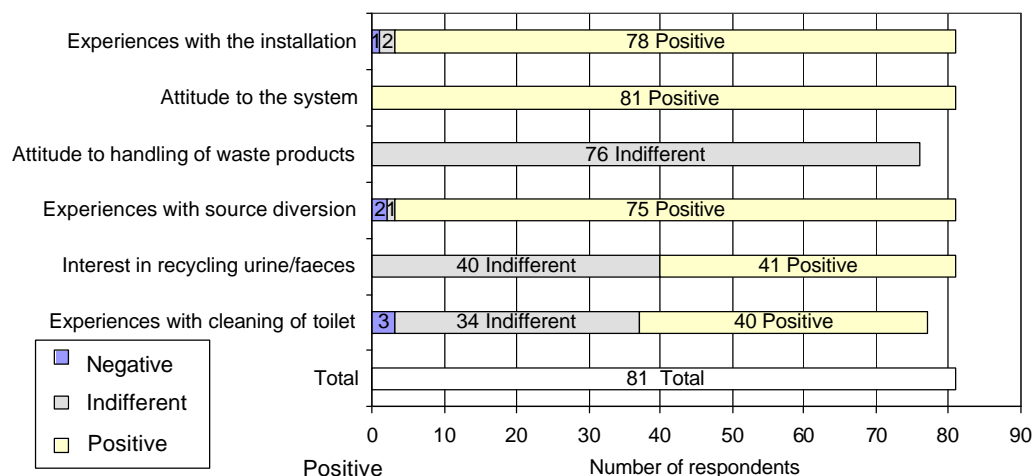


Figure 2: Attitudes towards and experiences with the ecosan systems in allotment gardens in Denmark. The answers have been lumped together in three groups to illustrate whether the attitude or experience was negative, indifferent or positive.

By interviews the participants were questioned about their attitude toward the toilet systems, see figure 2. The installation of the system went very well, there were some minor problems, which was solved with a help from the supplier. Some of the participants would have liked a manual in Danish instead of Swedish. In general the participants were rather indifferent towards the handling of the waste products urine and faeces. The general remark was that it could be a little smelly, but it was not a problem. The source diversion went well; there were two elderly women who had some problem with the urine collection, in that the urine went into the faeces container. Some minor children had to get used to the system. The interest for recycling the waste products to the garden was very high. However, it was not possible to obtain a permit to do so from the Danish authorities. People have therefore been instructed to bury it in the

ground. Regarding cleaning of the toilet, the participants were either positive or indifferent. Only 3 participants found it more difficult to clean the present than the prior toilet, all 3 used to have water closets. The attitude towards the system in general was positive to very positive. Descriptions like clean, nice and brilliant, were used. A few participants mentioned that it could be a problem for visitors to use the system, others that the visitors would like to get one too. In general the participants were happy that they did not have to use chemicals as was the case with when they used a chemical toilet. They thought that it was a very good and cheap alternative to the installation of sewers. The price for the toilet systems varied from 200 to 1.200 US\$. 72 % of the participants chose a solution in the price range of 700 – 770 US\$. The estimated costs for implementation of sewers are around 7000 US\$ per household. Aside from the higher cost, another disadvantage of sewer implementation is that it forces all families to use the same system, regardless of their preferences and lifestyle.



Figure 3: A+B: Backlund H1; C: Separett Villa 9000

Regarding implementation, it is very important to meet the expectations of the participants or, if it is possible, to go beyond their expectations. Good and continued communication can eliminate unrealistic expectations and secure that the more realistic expectations are fulfilled. Such extensive communication is very time consuming, but essential for success. The basis of the project was the free choice of the participants. Participation was voluntary, and a range of flexible solutions at different prices, was presented to fit individual needs. This promotes decision-making and self-management of the participants. It was often the woman who took the initiative to be part of this project. Here, as in many other countries, women often take the initiative to change the living conditions of the family. The participation of the woman in the family can, for many projects, be important in order to secure a new technology gets deeply rooted in the society.

The personal experiences of the users are of the greatest importance for the development of the technology. They contributed personally to the development of new technology by their evaluation of the systems and comments to sitting heights, design etc. The development of the new toilet "Separett Villa 9000" is partly based on the experiences of the participants of this project. "BACKLUND H1" is directly based on experiences from the project.

Overall, the response is that dry ecosan systems are excellent inexpensive alternatives to traditional systems. The advantages of establishing diverting toilets, as opposed to solutions with sewers, are among others water savings and recycling of nutrients. Furthermore, the economical advantages for the allotment gardens are considerable.

Vault latrines in rural areas in Afghanistan

The typical sanitation system in rural areas in Western Afghanistan is a raised single vault latrine, which can be emptied when full, or a pit latrine, which is not emptied. In this investigation 55 people were interviewed in 2000, before the implementation of ecosan systems started, hereof 29 males and 26 females. The people interviewed were chosen to cover the diversity within the community and they are representatives of >10% of all families in 9 villages in Herat

Province, Western Afghanistan. Males and females were interviewed by an interpreter of their own sex. 62 % of the respondents had a latrine, see figure 4. 65% of the latrines were of the vault type and 86% of families with vault latrines used the mixed excreta as fertiliser. Thus, approximately 35 % ($62\% \times 65\% \times 86\% = 35\%$) of the population in Herat are already applying excreta on the fields according to this investigation. After emptying the latrines the excreta is either buried (53%) or stored in a heap covered with earth (47%) for an extended period of time before it is applied on the field. The main risk of disease transmission is therefore on the men who empty the latrines, which contain some fresh excreta.

Out of the 21 families without latrine, 19 would be interested in having one, the two others were migrants who were not motivated to invest in property they didn't own. All 19 would contribute labour and 63% also materials, but cash payment is a problem among the poor people. All respondents were asked about their attitudes towards using urine collection and recycling of faeces and urine on agriculture. As it can be seen from figure 4 practically all of the respondents supported this method of recycling nutrients. However, for religious reasons, it was considered problematic to mix urine (considered unclean) with water (considered clean). The diverted urine could therefore not be applied by sprinkling on the fields.

The main reasons for having a latrine were that: It provides a visual shelter from the public (65%), it isolates the dirt in one place (58%), it is clean/hygienic (compared to bushes) (42%) and it yields fertilizer (16%). Vault latrines are usually used for depositing all kinds of dirt from e.g. sweeping (but not food waste) because it helps to keep smell reduced. 73% could not see any disadvantages of having a latrine, but 22% mentioned smell and 5% emptying as adverse effects.

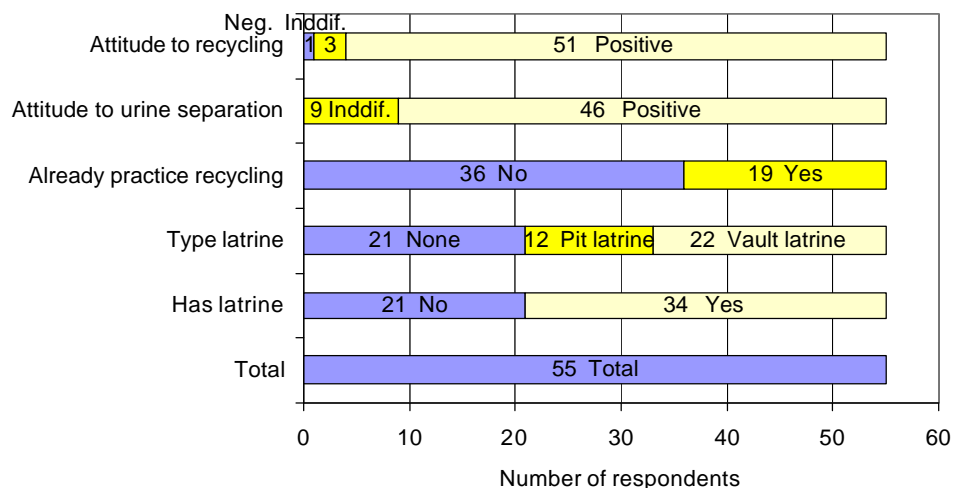


Figure 4: Latrine types and attitudes towards recycling of urine and faeces among 55 families in Herat, Western Afghanistan.

Based on the positive attitudes a design for a double vault latrine with urine collection was developed, inspired by the Vietnamese type (Polprasert et al. 1981). The design was developed together with the NGO Danish Committee for Aid to Afghan Refugees (DACAAR), and implemented by 17 families in 2000.

The latrine has a slab with two sets of holes and two vaults, to be used one at a time. The two units share a common urine collection system. Unlike the Vietnamese system, urine is led to a soak pit outside the latrine. The idea is that the soil in the soakpit could collect most of the nutrients from the urine and be used as fertiliser regularly.

In 2001 a follow-up survey was carried out. The main findings were that:

Latrines were being used by all household members and the users found them to be an improvement over their old type in terms of being of a good size, not as smelly as the old latrines, and the numbers of flies are less.

The separation of urine from faeces seemed to be working as it should.

The urine recycling method had not worked at all. It is not clear if it was because they did not receive sufficient instructions, if they did not understand the instructions, or if they are not willing to follow the instructions given.

The latrine was not replicated. This is exactly the same situation as with the DACAAR single vault type of improved latrine, which was also very seldom replicated. The problem seems primarily to be that the cost was found to be too high, but also that the latrine takes up too much space in the compound.

A lot of efforts have been stalled by the war and poor weather conditions, but the design is still being considered as an optional design in DACAAR's water supply, sanitation and health education program.

Interest for ecosan in Burkina Faso

Out of the 10 families interviewed in Sabtinga, Burkina Faso, 7 were Catholics, 2 Muslims and 1 animist. Only a few households in the whole village had pit latrines, but none of them were included in the interviewed sample. 90% of the interviewed were dissatisfied with not having a sanitation facility, and they argued that they lacked the money for constructing latrines. The reasons for wanting a latrine were 1) Improved health conditions, 2) privacy, 3) fear of snakes in the bushes and 4) the fact that certain animals eat faeces and people later on eat the animals.

The family chiefs saw no conflict with their traditions in handling human excreta and using it as fertiliser. Their interest for ecosan was high, mainly because of the fertilizer it provides. People showed by words and by delivering building materials that they were interested and ready to participate in the construction, but they would not contribute money for it. A double vault latrine design was developed, and UNICEF Ouagadougou was interested to carry on with the idea.

Double vault latrines with urine collection in Guatemala

Our final investigation in Guatemala was an examination of previously implemented double vault latrines with urine collection of the LASF-type in villages in the Laguna Lachua National Park. It was found that the majority of the latrines were either not used or in a very poor state. Those in use were stinking, the faeces vaults were wet and disgusting, and faeces ran out on the ground from open lids behind the latrine. According to the villagers, they did not receive proper information, or in some cases any information at all, about the use of the latrines when they were constructed. Some families did not participate in a capacitating course. Two single well functioning latrines showed that there were no fundamental technical or climate barriers for a proper functioning of the LASF-latrine. People were just not interested or did not know e.g. how to add soil and lime to keep them working.

Discussion

Motivation for procurement of ecosan

The most well-known arguments for procurement of ecosan toilets has to do with advantages of recycling nutrients to agriculture and avoidance of pollution of the environment with pathogenic organisms via wastewater. For people without sanitation or with very poor sanitation facilities these may however not be the "selling" arguments.

In Burkina Faso and Afghanistan, where many people have no sanitation facilities, shelter/privacy was the main argument for procuring a sanitation facility. Improved health/pathogen control and cleanliness also had high priority. These arguments may sound

trivial to people who already use toilets, but should be included as prominent messages when selling Ecosan in these areas.

In Afghanistan recycling of nutrients in agriculture was also mentioned as an argument by 16% of the people, due to the fact that it already is a habit for some people in the area. Even though the fertiliser argument may not have the highest priority, it is still important to many people. In these countries the recycling aspects can be directly used as part of the selling argument to people without sanitation facilities and as a main argument in upgrading from e.g. a pit latrine.

The reduction in bad odour and flies due to the source diversion was another feature of ecosan that was appreciated in the Afghanistan implementation project, and this would presumably be a useful argument for people that are used to more smelly latrine types.

In the Danish project the selling arguments were different, although the main interests were similar. People saw the ecosan option as a cheap alternative to the very expensive solution with sewers.

The price argument is exactly opposite in Afghanistan and will be the same in other poor rural areas of the world; ecosan is generally more expensive than other options, such as various types of pit latrines. Here the additional arguments of less smell and flies and improved production in agriculture have to be conveyed carefully together with the arguments of health/pathogen control and privacy.

Generally the people of e.g. Denmark, Afghanistan, Burkina Faso and Guatemala seem to share the desire for an affordable and comfortable sanitation facility.

Implementation of ecosan

The experiences in implementation differ widely in the four examples we have looked into. This is natural because of the extreme differences in settings and cultures. However, one similarity is that whenever ecosan toilets were used properly, people perceived it as a good solution. In addition to this, there are also lessons to be learned from the ways the projects were promoted.

The importance of how the message is delivered is illustrated by the differences of success in Guatemala and Denmark. In Denmark the marketing of the ecosan toilets was combined with participation of the users and other related stakeholders in both the planning and decision making, and was followed up by continuous contact with the users after implementation. The project even resulted in development of a modified design based on user preferences. This is in total contrast to the Guatemalan project where the toilets were implemented without even explaining the daily operation procedures to all households.

Although ecosan is not too complicated, the daily operation is important for the well-functioning of the toilet and user satisfaction. In the simpler models for developing countries, operation involves adding an appropriate amount of dry material, while experience show that this is not necessary for odour removal in the Danish models furnished with ventilators. Follow-up after implementation makes it possible to correct mistakes and answer small and large questions, and will raise the satisfaction with the project.

Simple solutions adjusted to the needs and interests of the participants, based on a source diverting technology and local materials and manpower, should be developed and implemented. The point of departure could be based on already existing relations, and the establishment of local demonstration projects.

Cost recovery aspects of implementation also play an important role. Both the Danish and the Afghanistan project involved partial subsidisation of the facility. In Burkina Faso people stated that they were mainly able to provide labour and some materials for construction. It is in all cases motivating that prices are low or lowered and has contributed to the success. Considering the general difficulties in selling sanitation in rural areas of developing countries, it may in fact be necessary to subsidise in order to get implementation started. However, when the campaign

is over, there is not necessarily a spreading effect. This was demonstrated in Afghanistan where people continue to construct pit latrines because they can be constructed for free. It will continue to be a problem among poor people, but when the benefits of ecosan for agriculture, and thereby income, have been more widely demonstrated in an area, it may result in larger demand.

The use of urine as fertiliser seems to be a difficult task in certain areas, even though most of the nutrients in the toilet waste are found in the urine. In Afghanistan people didn't use the urine, perhaps due to poor information, lack of tradition, or the labour involved in emptying the urine pit. The same rejection of the urine has generally been found in projects in Latin America (Esrey et al. 1998). More demonstration and information work should be done in this field, because of the high fertiliser value of urine.

Conclusions

The four different projects have illustrated that people can have a positive attitude toward the use of ecosan whether they are Danes, Guatemalans, Africans or Afghans. There is a lot to be learned from the successes and failures of these projects. Whenever the sanitation facility is used correctly, it has been shown that it can work in practise, and that people in general have a positive experience from, and attitude to, the use of ecosan. The success depends largely on whether or not the demand is created through information and mutual engagement, and on whether or not people are involved in the design of their own facility through a close communication. Involvement of relevant organisations and economic support in the establishment phase is important as well. More success stories and engagement from sanitation implementing agencies in ecosan solutions is needed for the continuous spreading of the system.

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References

- Backlund A., Eilersen A., Larsen I., Hagelskjær M. and Jensen G. Ecological Handling of Urine and Faeces in Allotment Gardens by means of No-Mix Toilet. (2003). Submitted to the Danish EPA.
- Esrey S.A., Gough J., Rapaport D., Sawyer R., Simpson-Hébert M., Vargas J, Winblad U. (Ed.): Ecological Sanitation, Swedish International Development Cooperation Agency, Stockholm, 1998.
- Polprasert C., Lohani, B.N., Chan C.B.: Human Faeces, Urine and Their Utilization. (1981). ENSIC translation Committee.