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Ministry of Water, Lands and Environment
The Directorate of Water Development

Documentation and Evaluation of EcoSan Experiences in Uganda

~Preliminary do's and don'ts in EcoSan Implementation in Uganda

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Errors and omissions is the responsibility of the lead author.

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LIST OF ACRONYMS

AMREF	African Medical Research Foundation
BUCADEF	Buganda Cultural and Development Foundation
DFID	Department for International Development
DVUD	Double Vault Urine Diverting
DWD	Directorate of Water Development
Ecosan	Ecological Sanitation
EHD	Environmental Health Division
GoU	Government of Uganda
KCC	Kampala City Council
LCs	Local Councils
MoES	Ministry of Education and Sports
MOH	Ministry of Health
MWLE	Ministry of Water Lands and Environment
NARO	National Agricultural Research Organisation
NGOs	Non Governmental Organizations
NSSWG	National Sanitation Sector Working Group
NWSC	National Water and Sewerage Corporation
Sida	Swedish International Development Agency
swTws	South Western Towns Water and Sanitation
SVUD	Single Vault Urine Diverting
UD	Urine Diverting
WSP-AF	Water and Sanitation Programme – Africa
VIP	Ventilated Improved Pit

EXECUTIVE SUMMARY

A. INTRODUCTION

Ecological sanitation (ecosan) was introduced in Uganda as an alternative sanitation system that could solve the problems of traditional means of human excreta management namely difficult soils (rocky as well areas with high water table), need for digging new pits which is expensive and sometimes there may not be enough land for digging new pits in the case of pit latrines; high initial cost as well as high operation and maintenance costs in the case of water borne systems; and potential for contamination of ground water by both systems. Examples depicting the extent of the problem of traditional sanitation systems were twofold. The first was the 1997 hydro-geological study which showed that the veins of the Chuho water source were passing beneath the Kisoro town, suggesting a serious health risk of pit latrines in the town. The other was the difficulty of constructing pit latrines in Muhanga trading center where most toilets were collapsing due to high water table and unstable soils.

Against this background, the Directorate of Water Development (DWD) started constructing ecosan toilets under the South Western Towns Water and Sanitation (SWTWS) Project, a Government of Uganda (GoU) project co-funded by the governments of Uganda and Austria. At the beginning, attempts to introduce ecosan toilets were met with resistance as people felt it was unheard of to re-use human excreta. The very first ecosan toilets were of the composting type. These were inappropriately operated since they resembled ordinary pit latrines and people did not understand and follow the correct procedures of adding carbon bulking materials. Consequently, the toilets were abandoned in favour of urine diverting dehydration toilets.

In addition to Austria Government, more other donors namely Sida and DFID are now supporting ecosan activities in Uganda. Over the last 3 years, DWD has built an ecosan toilet at each of the 56 District Water Offices throughout Uganda. Research co-operation with Makerere University and NARO on issues of ecosan, in particular design aspects, nutrient recycling and pathogen die-off studies has been sustained over the last 2 years. A 5-year programme for promotion of ecosan throughout the country has been developed. It is estimated currently that there are approximately 5000 ecosan toilets in Uganda.

This study '*the documentation and evaluation of ecosan experiences in Uganda*' was commissioned by DWD. The objective of this study was to collect, document and evaluate people's experiences on ecosan; and to use that information to come up with preliminary do's and don't's in ecosan implementation in Uganda. The study was performed in twelve (12) districts in Uganda namely, Kisoro, Kabale, Ntungamo, Rukungiri, Bushenyi, Mbarara, Masaka, Rakai, Wakiso, Mpigi, Soroti and Arua.

B. METHODOLOGY

The method adopted included a desk study which involved a review of literature on sanitation in general but with relevance and emphasis on ecosan and reuse of human excreta, review of project documents, reports, text books, policy documents and other publications. Questionnaires for use in the field data collection were developed for the different categories of respondents. Three categories of respondents were mainly targeted. These were: 1) Key informants - mainly project staff and other implementers, field engineers (contractors and consultants), 2) Households and 3) Masons.

The objective of interviewing key informants was to get information about the successes and/or failures of ecosan, the strategies for wider-uptake of the ecosan concept, costs of ecosan toilets, and their experiences on people's perceptions and attitudes towards ecosan toilets and re-use of urine and faeces.

Households (toilet owners and users) were interviewed so as to get first hand information on the use, operation and maintenance as well as general Knowledge, Attitudes and Practices (KAPs) on ecosan and in particular, the re-use of urine and faeces in agriculture.

Masons were interviewed as they are the actual doers (builders of ecosan) so that they provide information on how many ecosan toilets they had constructed, how they got into the business and how it is performing, the level of training they underwent and what would generally make people like/dislike ecosan.

In addition, faecal samples were collected and analysed for nutrients (N, P and K) as well as microbial parameters (faecal indicators i.e., *E.Coli*, *Enterococcus*), salmonella and *ascaris* eggs.

C. EVALUATION AND ANALYSIS OF EXPERIENCES ON ECOSAN

C.1 RESEARCH AT MAKERERE UNIVERSITY (2003-2004)

C.1.1 RESEARCH ON DESIGN OF TOILETS FOR THE CHILDREN AND THE DISABLED

The important finding of this research was that that children suffer from inappropriate facilities such as large squat holes, steep steps and generally an unfamiliar technology. Disabled persons suffered from inaccessibility of toilet rooms, inappropriate facilities (steep ramps, small rooms etc) and lack of provision of extra support. Based on these findings, a suitable toilet for children and the disabled was designed and a prototype constructed.

C.1.2 DESIGN OF AN INNOVATIVE TOILET SYSTEM TO ACCELERATE DRYING

The important findings were:

- All the ecosan toilets visited in the field were operating purely on natural ventilation and often with small diameter ventilation pipes (in some cases less than 100 mm). In other situations, inadequacies were improper and weak materials, inadequate height above the roof, e.t.c.
- By performing calculations to determine the recommended ventilation rate of 20 m^3/hr either achieved by thermal or stack effect, it was found that this requirement could not be met by pipe sizes less than 150 mm. Therefore, it was concluded that a pipe diameter of at least 150 mm is required for effective ventilation.
- To further increase the rate of extraction of evaporated water from the vaults, it was suggested that the pipes be equipped with a rotary vent turbine would greatly. To maximise the rise in temperatures in the vaults, it was suggested that a one-way glass be used to allow in as much direct solar radiation as possible in to the vaults and use of insulating materials within the walls to ensure that the heat is not lost.

C.1. 3 DESIGN OF AN IMPROVED TOILET SYSTEM FOR THE WASHER COMMUNITY

Important Findings are:

- 35% of the interviewed washer communities suggested that a washing facility be introduced within the dry toilets. In areas where dry toilets exist, 24% used the urine diversion point for washing and 50% preferred moving backwards to wash. However over 75% suggested that dry toilet should not be introduced in public places.

- Over 80% of the dry toilets visited did not cater for the washer communities. Those that did cater for these communities had extremely raised washing points making it uncomfortable for the users.
- In areas with washer communities, successful implementation of ecosan should consider their anal cleansing practices by providing a washer area. Otherwise, the toilet use may be abused and a lot of moisture may be found in the vaults. Therefore a dry toilet design incorporating as washer area was suggested for use in areas with washer communities.

C.1.4 DESIGN OF TOILETS FOR IMPROVED OPERATION AND MAINTENANCE

The concept is to have a single vault, but allow for secondary sanitisation of faeces in another compartment in the same toilet structure. It is proposed, in this design, that a single vault is used. The volume of the chamber was designed in such a way that a sufficient sizeable basket fabric is accommodated. A free board area was also allowed for. Hence a vault of dimensions 1.5 ×2× 1.15m is necessary. To facilitate dehydration and emptying, baskets made of loosely woven material will be used to collect faecal matter. The loose fabric enhances aeration and facilitates drying of the faeces. It also cuts on the weight of the container thus facilitating easy handling. After a basket is full, it should be removed and put into a separate chamber and a new one put in place. The filled container should be left in the chamber for at least six months to allow adequate sanitization of the faeces to occur.

C.2 ONGOING RESEARCH AT MAKERERE UNIVERSITY (2004-2005)

Research that is ongoing at Makerere University for the academic year (2004-2005) is focussing on pathogen die-off and nutrient recycling. This research will be completed in July 2005 and the results will be compiled and full-bound reports submitted to the Directorate of Water Development.

C.2.1 PATHOGEN DIE-OFF STUDIES

C.2.1.1 Effect of different additives on die-off of pathogens

Investigations are focussing on assessing the effect of different additives on the die-off of pathogens in human faeces collected from ecological sanitation toilets. Two additives are being investigated, ash and saw dust. Faeces are collected in buckets when ash is used as an additive. The faecal buckets are then transferred to another storage chamber. Sampling is done once in two weeks and measurements are done for faecal bacterial indicators (*E.Coli*, *Enterococus*), salmonella and eggs of *ascaris lumbricoides*. The same thing is repeated in buckets used in the same toilet when saw dust is provided as additive. In addition, measurements are done for the ambient temperature in the storage chamber, the moisture content and pH of the faecal samples. The collected additive (ash or saw dust) for use in the toilet is initially characterised for pH and mineral content. Preliminary results indicate that the die-off of pathogens in faecal buckets where ash is used is far larger than that where saw dust is used as additive.

C.2.1.2 Composting as disinfection method for human excreta

The hypothesis here is that pathogenic microorganisms in faeces thrive under given conditions of pH, moisture and temperature. In these experiments we provide harsh conditions for microorganisms to survive. Compost boxes (350 mm x 350 mm x 350 mm) as well as (600 mm x 600mm x 600 mm) are used. Insulation to reduce heat losses is provided using 25 mm and 75 mm thickness Styrofoam. We investigate three units with different substrates: faeces: food waste = 1:0, 1:1 and 1:3 by weight. The first experiments were done without insulating the compost boxes of size 350 mm x 350 mm x 350 mm. The maximum temperature was about 44°C. The experiment was repeated using the same boxes but provided with 25mm Styrofoam as insulation and the

temperature rose to over 60°C in the faeces:food ratio of 1:1. In another experiment, using 600 mm x 600 mm x 600 mm compost boxes provided with 75 mm Styrofoam as insulation, an even much higher temperature up to 72°C was achieved and maintained for about 1 week. When samples are investigated for microorganisms, the faecal indicators (*E.Coli* and *Enterococcus*) often test negatively in samples that reach over 60°C degrees after composting for 2 – 3 weeks. Preliminary conclusions are that it is possible to sanitise faeces by composting them with food waste in appropriate ratios. However, for the compost to work well and develop and maintain temperatures in and above the thermophillic range, it must be insulated. Other operational requirements include turning the compost, at least once a week and addition of more moisture (water). Faeces may be difficult to compost without mixing with food waste.

C.2.2 NUTRIENT RECYCLING

Urine has been investigated as a fertiliser in the green house and in laboratory bucket experiments. Results comparably agree in that both experiments have shown the urine in the undiluted form may be unsuitable for use as fertiliser. A concentration of 20% urine (80% water) has shown good results that are even better than commercially available NPK fertilisers.

Full reports of the research mentioned above as well as on other topics such as investigating the effect of improved ventilation on the die-off of pathogens will be available in the middle of July 2005.

D. FACTORS INFLUENCING HOUSEHOLD'S CHOICE OF SANITATION TECHNOLOGIES AND EXCRETA RE-USE (ECOSAN)

Important findings are:

- People build sanitation facilities to improve sanitation in their homes and avoid diseases related to poor excreta disposal,
- People who have chosen the ecosan toilets do so because of the added advantages of durability and permanency, convenience, economy on space, hygiene and suitability in poorly drained areas,
- Project interventions – community sensitization, mobilization, promotion and marketing have played a very big role in influencing households to adopt ecosan toilets.

E. MINUTES OF ECOSAN COALITION MEETINGS

Important points noted:

- Privately owned ecosan toilets are mainly found to perform better than public toilets due to better maintenance of the former,
- Single vault ecosan toilet systems seem to work better than double vault toilet systems, especially in pubic places and institutions,
- A urinal and hand washing facilities are essential parts components that should be incorporated at all ecosan toilets especially those in public places.

F. KEY INFORMANT INTERVIEWS

Key informants mentioned that in general, the geology of the area (rocky formations making it difficult to excavate pits), and the need to protect the water source from contamination were the major reasons for ecosan implementation in South western Uganda, particularly in Kisoro district. However, a few people were aware of this linkage (i.e., between excreta from pit latrines and water contamination) and therefore repeated sensitization by the project staff on the dangers of pit latrines and hence the superiority of ecosan in this regard

as compared to pit latrines had greater impact on the success of ecosan implementation. In general, it was reported that ecosan toilets at household were managed well. Communal toilets were also managed well.

Costs and payment for ecosan toilets

Key informants reported that the users paid for the costs while in some cases the project, water board, or the district paid for the costs. It was reported that a single household ecosan unit cost between Ug.Shs 80,000/= for the lowest cost made up of low cost materials (mud and wattle), up to Ug.Shs. 1,200,000/= for a very good household unit with a tiled floor. It was reported that depending on the size of faecal chambers and the toilet rooms, between Ug.Shs. 600,000/= to Ug.Shs. 750,000/= is sufficient to construct a double vault household ecosan toilet. Institutional toilets and communal toilets of 5 stances (10 vaults), a shower and urinal for men were reported to cost between Ug.Shs. 12,000,000/= to Ug.Shs. 18,000,000/= depending on local site conditions.

In general, the following lessons were learnt from the key informants

- The concept of ecosan works very well in communities where people are sensitized and educated on how it works and how it is beneficial.
- The option is more easily adopted in areas with difficult soil conditions where people can be easily sensitized to understand the problem they face
- There is need for more resources to promote ecosan technology. This calls for increased sensitization and training of communities. Ecosan requires intensive sensitization before implementation
- There is need for more promotion of ecosan in schools
- People with water logged and termite infected areas are increasingly interested
- Ecosan should first be implemented at household rather than communal level.

G. EXPERIENCES OF THE MASONS

The majority of the masons reported that ecosan toilet construction contributes a little bit of their business, meaning that they don't get much business from construction of ecosan toilets. The masons reported that are other people involved in the business and these include rich people in the area, households themselves, water department, local NGOs, local contractors, and other community masons. This means that competition is high.

From the observations and experiences of the masons, people want ecosan toilets because of the following reasons:

- Use of human wastes in gardens
- Space economy
- Provision of better sanitation than the pit latrine
- No bad smell
- Permanency of ecosan toilet structures
- Can be constructed on any ground e.g. hilly/rocky or water logged.

However, the masons also mentioned that there are people who dislike ecosan toilets. From the masons' experiences, the following were the reasons why people dislike ecosan:

- Fear to remove human wastes
- The cost of constructing ecosan toilets

- The idea is new and not yet well exposed
- Some people do not know how to use ecosan toilets

H. LESSONS LEARNT AND EXPERIENCES FROM HOUSEHOLD INTERVIEWS

- Respondents report a wide range of reasons for having ecosan toilets. These include space economy, cleanliness/hygiene, no smell, permanency and cost. The lack of smell, cleanliness/hygiene are outstanding issues and generally common amongst the respondents.
- In general, the respondents would recommend ecosan to others (say their friends/neighbours) on the basis of permanency of the toilets, hygiene, non-smelly nature of the toilets and the possibility to recover nutrients from urine and faeces.
- Some respondents reported that the ecosan toilets are expensive both in terms of initial cost as well as operation and maintenance. It is therefore a possibility that on this basis, such respondents may hasten to recommend ecosan toilets to other people.
- Urine and faeces can both be used in agriculture either as pesticides and/or fertilizer. A few respondents would dispose off urine and faeces. Social or cultural taboos against the use of urine and faeces were not found to be significant although a few respondents mentioned about them.
- There are some challenges that ought to be addressed. These include scarcity of ash and change of design to incorporate big chamber that should take long to fill and provision for washers.
- Sensitization, community mobilization, education and training play a crucial rule in the success of any ecosan project implementation.

I. NUTRIENT ANALYSIS (N, P and K)

There is a reasonable amount of nutrients from faeces that can be used to enrich soil fertility for enhancing agricultural production. The amount of phosphorus is small, however, all of the measured phosphorus would be available for crops. It was found on average that the nutrient concentrations were 5.4 g total-N, 48 g K and 0.3 g of available P per kg of dehydrated faecal mixture. In all the toilets, ash was used as an additive and the toilets were of the dehydrating type. Urine is reported to have far larger quantities of nutrients than in faeces but in this study, nutrient analysis was not performed for urine.

J. MICROBIAL ANALYSIS

Faecal samples were analyzed for *E. Coli*, *Salmonella* spp, *Enterococcus* spp and viable eggs of *Trichuris Trichura* and *Ascaris Lumbricoides*. The analyzed samples had been stored in closed vaults for varying periods ranging from zero month (still in use) to six months and they were gathered from toilets in different parts of the country where the temperature normally is above 25°C for much of the day. Some samples showed no viable microorganisms after storage for four and six months. However, in other samples stored for a period less than 4 months and in which chambers were still in use, *Enterococcus* spp and *E.Coli* were detected in ranges of $2.0x10^1$ to $2.4x10^3$ and $1.0x10^1$ to $8.0x10^3$ colony forming units (cfu) per g of faecal mixture respectively. This demonstrates the importance of storage time to sanitize the faeces and that four - six months of storage might render faeces safe for reuse.

K. CONCLUSIONS

SOCIAL ISSUES

- There is great potential for wider ecosan implementation and adoption in Uganda. However, to achieve this, there is need for increased community sensitization, awareness creation, promotion, marketing, education and training on skills in ecosan
- The option is more easily adopted in areas with difficult soil conditions where people can be easily sensitized to understand the problem they face.
- Generally, people who own ecosan toilets are respected by members of the community
- People need subsidies as they consider the initial cost of ecosan high for them to manage. Ecosan toilets are considered expensive to the great majority of rural poor people.
- In the areas where the study was conducted, there appears to be no significant social or cultural taboos against the use of urine and faeces in agriculture.

POTENTIAL FOR AGRICULTURAL RE-USE

Sanitised faeces contain some nutrients, N, P and K that can enrich the soil and increase soil productivity. Therefore they should be applied to the soil BUT after sanitisation. Sanitised faeces also add humus to the soil which improves the soil structure by increasing the void ratio hence increasing the water holding/retaining capacity of the soil. Since there were no significant social or cultural taboos against re-use of human excreta amongst the communities studied, there is potential for re-use of urine and faeces in agriculture.

PATHOGEN DIE-OFF

- There is a possibility that all the faecal indicators (*Ecoli*, *enterococci*) and salmonella can be completely absent after 6 months or even 4 months of storage, but may not be free from parasites, i.e., ova/cysts and in particular eggs of *ascaris lumbricoides*.
- **For properly managed ecosan toilets, for example, the one at the DWD offices, Kabale, neither of bacteria indicators no parasites (ascaris) were found after six (6) months of storage**.
- **Six (6) months** of storage **should not be used as the rule of thumb** for faeces to be completely sanitised.
- It was noted that after six (6) months of storage, the pathogens are reduced to such low levels that the risk of infection of people using ecosan is significantly probably very small.

L. RECOMMENDATIONS

SOAIAL ISSUES

- There is need to intensify community mobilisation, sensitization and marketing of ecosan for wider uptake in Uganda
- Appropriate ecosan designs suitable for the different classes of poor, middle-income and the rich as well as catering for special needs e.g., children, the disabled and washer communities should be developed.
- It is important to promote ecosan concepts not only amongst the poor and disadvantaged groups but also as options for the whole range of socio-economic rating.

AGRICULTURAL RE-USE

- There is need for more demonstration of applicability of urine and faeces in agriculture. The quality of products where urine or faeces are used should be investigated for possible risk of disease transmission when consumed.

- Not only is there need for demonstration but continual follow-up, implementation and development of research findings.

PATHOGEN DIE-OFF

- There is need for more research, follow-up and implementation/piloting of research findings.
- In particular, investigations are needed to study and document the effect of other factors pH (which depends on the type and quantity of additives used), temperature and moisture content in order to come up with operational guidelines of ecosan toilets for maximum pathogen destruction.
- Studies on die-off of pathogens when using different additives (ash, soil, saw dust, lime) should be intensified.

M. PRELIMINARY DO'S AND DON'T'S IN ECOSAN IMPLEMENTATION

PRELIMINARY DO'S

DO 1: Introducing ecosan in a community

Any introduction of ecosan in a community must be done after a thorough community sensitization and mobilisation has been carried out. The users must first understand the ecosan concept, must know why they should go for it. The community leaders e.g., LCs and politicians should be involved and if possible, implementation should begin from their homes. It is important for one to preach what they practice! and people easily learn from their leaders.

DO 2: Reaching the people

It is important for information to reach the people. Drama shows have an impact, but it may not be possible to reach every one. Selection of place and time of the drama shows is very critical. Arrangements should be made to stage drama shows at public places where possible. Radio programmes should be intensified. Leaflets containing information on ecosan may work, but mainly for the educated. People may not have time to read them and most important, to understand them.

DO 3: Building ecosan toilets

Masons trained in building ecosan toilets and not any one that can build a latrine should be involved in ecosan construction. More masons therefore should be trained in building ecosan toilets. A catalogue of trained masons should be available at the water and sanitation offices in districts.

DO 4: Hygienizing faeces

From different toilets, faeces are not universally safe enough for application in gardens after 6 months or even 12 months of storage in faecal chambers. Therefore, we recommend that they should be treated outside of the faecal chamber (secondary treatment). Although there are many methods to perform this such as additional prolonged storage, composting, chemical disinfection using urea and/or incineration, we recommend the simplest, i.e., burying faeces in a pit, and covering with 0.5 m – 1 m of soil above the faeces.

DO 5: Ecosan options for rich and poor

In the promotion of ecosan concept, various technical options should be developed for the poor, middle income and high income. In this way ecosan options will not be looked as options for the poor only and therefore inferior options. This means good architectural designs, use of variety of materials as well as low flush options incorporating wetlands or evapo-transpiration beds for treating flush water and grey water.

DO 6: Options for children, disabled and washer communities

To ease accessibility and assist the children and disabled use ecosan toilets without difficulty and soiling them, technical options suitable for children and disabled should be developed. Some designs are suggested in Chapter 4 of this report. Toilet designs should also be developed to incorporate use of water for anal cleansing especially for the washer communities.

DO 7: Urine as complete fertiliser

Urine is a complete fertiliser with easily available N, P and K that can enhance soil fertility, improve on yields and therefore reduce poverty and improve nutrition amongst peri-urban, urban and rural farmers. Urine should not be applied in its concentrated form. It should be diluted with water in ratios of parts of urine to parts of water ranging from 1(for urine):2-5 (for water) in order to get good yields. Urine should not be applied to leaves as it is toxic and may scorch them.

DO 8: Interaction with human excreta

People are wary of using human excreta, especially faeces due to fear of pathogens it contains. This may be more limiting if they have to use or interact with fresh faeces. Therefore, large vaults where faeces can be stored until they have turned into a soil-looking like substance before emptying are recommended. A retention period of at least 6 months is recommended.

DO 9: Household Involvement

Ecosan toilets at household level should be managed by households themselves. This includes cleaning and emptying them, addition of ash, operation and maintenance of composts (where they may exist). The more households get involved, the more they can see the relevance resource recovery. However, there should be an option for householders who may not want to handle faeces so that they can pay for the service.

DO 10: Private Sector Involvement in Emptying and Cleaning

All institutional ecosan toilets should have a management system responsible for the operation and maintenance including addition of ash, cleaning, operation of composting units (if any), looking after demonstration gardens as well as emptying. A caretaker or an employee should be hired. Where necessary, the services should be hired out to private sector (if such companies exist).

PRELIMINARY DON'T'S

DNT 1: The need for people's acceptance of ecosan

DO NOT attempt to introduce ecosan in a community until when there has been acceptance by the communities.

DNT 2: The need to sanitise human excreta

Human faeces contain lots of microorganisms, which may be pathogenic. Most pathogens are used to the body temperatures where they flourish and start dying under conditions in most faecal chambers. The die-off is influenced by a number of factors namely, pH (9-12), moisture content, high temperature (>40°C), ammonia and solar radiation. The die-off in faecal chambers is slow, and depending on whether or not the toilet was used well, and on the additive applied, there is still a risk of infection in using faeces stored in faecal chambers for 6 months or even 12 months. Based on this, WE DO NOT recommend direct use of faeces on gardens

without secondary treatment. Secondary treatment could be additional prolonged storage for say 12 months in a separate designated area, burying the faeces and covering with a layer of soil on top, composting and or incineration of faeces.

DNT 3: Composting and dehydrating toilets

Composting toilets SHOULD NOT be promoted as ecosan options but rather dehydrating toilets should be promoted. People are likely to fail to add the carbon materials hence leading to their failure.

DNT 4: Gender roles and responsibilities

In the implementation of ecosan, DO NOT focus on changing gender roles and responsibilities but rather focus on attitude change towards re-use of human excreta. Men still hold the perception that sanitation in the home is the responsibility of a woman and based on this, they may therefore resist ecosan concepts.

DNT 5: The need to exclude visitors and/or teach them how to use ecosan toilets

DO NOT allow visitors to use ecosan toilets unless you are aware that they have used them before. Else teach them how to use it show them alternative toilets e.g., VIP, ordinary pit latrine or other which they are used to (if it is available).

1 INTRODUCTION

People as an "asset" for development often produce in secret human "waste" which is of public concern (Chaggu, 2004). When human "waste" (excreta) is kept in the wrong place, it is likely to lead to environmental health problems, which in many cases cost lives, health of a community and impact on the family income as more money is spent on medication. This may lead to a vicious circle of poverty. In an effort to overcome the problems likely to be caused by inadequate sanitation, we define environmental sanitation as "interventions to:

a) Reduce people's exposure to disease by providing clean environment in which to live with measures to break the cycle of disease,
b) Minimise the negative impacts on the environment and critical ecosystems caused by poor management of human and animal wastes".

Environmental sanitation therefore includes, but is not limited to hygienic management of human and animal excreta, refuse, wastewater, storm water, the control of disease vectors and the promotion of washing for personal and domestic hygiene. In this report, the focus is on the management of human excreta (urine and faeces) using ecological sanitation toilets. In particular, the reporting is on documentation and evaluation of ecosan experiences in Uganda. Reported also are measurements performed on microorganisms, i.e., faecal indicators (*E.Coli*, *enterococcus*) and *salmonella* parasites (eggs of ova/cysts reported in terms of *Ascaris lumbricoides* and *ancylostoma*) at different stages of storage and nutrients (N, P, K) in sanitised faeces.

Traditional means of human excreta management ('*drop-and-store*' and the '*flush-and-discharge*') are no longer adequate in solving sanitation problems in Uganda. The disadvantages/shortcomings of these technologies include: difficult soils (rocky as well areas with high water table), need for digging new pits which is expensive and sometimes there may not be enough land for digging new pits in the case of pit latrines; high initial cost as well as high operation and maintenance costs in the case of water borne systems; and contamination of ground water in some cases by both systems. The examples depicting the extent of the problem of pit latrines that led to the introduction of ecosan in Uganda, especially in the South west area were twofold. The first was the 1997 hydro-geological study which showed that the veins of the Chuho water source were passing beneath the Kisoro town, suggesting a serious health risk of pit latrines in the town. The other was the difficulty of constructing pit latrines in Muhanga trading center where most toilets were collapsing due to high water table and unstable soils.

It is against this background that the Directorate of Water Development (DWD) started constructing ecosan toilets under the South Western Towns Water and Sanitation (SWTWS) Project, a Government of Uganda (GoU) project co-funded by the governments of Uganda and Austria. The first pilot units were constructed in 1997 in Kisoro and Kabale districts. In the beginning, attempts to introduce ecosan toilets were met with resistance as people felt it was unheard of to re-use human excreta (Windberg, 2005). The very first ecosan toilets were of the composting type whose operation required people to add carbon bulking materials. However, as these toilets resembled ordinary pit latrines, people did not follow the correct procedures of adding bulking materials. Consequently, the toilets became messy and this was a serious setback to promotion of ecosan especially in Kisoro. Later, dehydrating toilets were introduced. These appeared to work much better and the existing compost toilets were abandoned in favour of the dehydrating type.

In the year 1999, the first group of Ugandans, from SWTWS undertook an Advanced International Training Course in Ecological Alternatives in Sanitation in Sweden. Since then at least one person each year has

been trained in a similar course in Sweden. In addition, in 2002, the Swedish ecosan Experts came down to Uganda and conducted the same course at Kabale White Horse-in Hotel for a period of two weeks. This course attracted a number of participants from within the East African region, and at least 10 Ugandans participated.

In 2002, the Directorate of Water Development and the Environmental Health Division (EHD) of the Ministry of Health (MoH) in collaboration with the water and Sanitation Programme, Africa (WSP-AF) developed a National Strategy to promote Ecological Sanitation in Uganda. The strategy's main objective was to improve the living conditions of the population in Uganda by ensuring better sanitation practices, personal hygiene and food security through better management of human excreta. The strategy further sought to promote recycling of human waste to be reused in adding soil nutrients, and the protection of the ground and surface water from pollution. The strategy called for concerted efforts from all stakeholders at various levels in order to make the promotion of ecological sanitation a success. This strategy ceased operational in 2004. Ecosan activities since then are included in yearly work plans formulated by the National Sanitation Sector Working Group, which was formed by Government in 2004. In addition, there is the National Ecosan Coalition, which brings practitioners together to share experiences and learn from each other. Further, there is an ecosan sub-committee whose members are members of the ecosan coalition and these advise the National Sanitation Sector Working Group on issues of ecological sanitation.

Implementation of ecosan as an alternative concept of human excreta management in Uganda is now not only done by swTws but a number of NGOs and organisations have followed suit namely, Water Aid, AMREF, BUCADEF, NWSC, Ministry of Health (MoH), Ministry of Education and Sports (MoES) etc. In addition, more donors have been attracted including Austria, Sida and DFID. The Directorate of Water Development has over the last 3 years built an ecosan toilet at each of the 56 District Water Offices throughout Uganda. District Local Governments, town councils and the private sector (e.g., Crest tanks, Uganda Limited) are all interested and have either implemented ecosan initiatives and/or some are following up to undertake activities in the future. Research co-operation with Makerere University and NARO on issues of ecological sanitation, in particular design aspects, nutrient recycling and pathogen die-off studies has been sustained over the last 2 years. A 5-year programme for promotion of ecological sanitation throughout the country has been developed. Currently, it is estimated that there are approximately 5000 Ecosan toilets in Uganda (Pers. Comm. with Tushabe, DWD). With increased donor support, this number is expected to increase in the near future.

Since Ecological sanitation is a new concept of human excreta management, that looks at human excreta as a resource BUT not waste, implementation in the swTws project and in other places by other agencies and organisations has been done with a lot of community sensitization/mobilisation, awareness creation and training. There have been considerable experiences in the implementation, not only in the south western part of the country, but also in other regions where the ecosan concept has been introduced. These experiences have not been documented. To enable the DWD and other partners learn from best and bad practices (preliminary '*dos*' and '*dont's*'), it was felt that a documentation and evaluation of ecosan experiences be carried out hence the commissioning of this study. This was done in 12 districts in Uganda. The districts are Arua, Bushenyi, Kabale, Kisoro, Masaka, Mbarara, Mpigi, Ntungamo, Rakai, Rukungiri, Soroti and Wakiso.

2 OBJECTIVES

The objective of the study was to collect, document and evaluate experiences arising out of ecological sanitation implementation and to come up with fact sheets on the experiences gathered which contain information relevant (the do's and don't's) for future consideration in ecosan implementation in Uganda.

The specific objectives were to:

- To collect, analyse and summarize the experiences with ecological sanitation in Uganda with a view of coming up with preliminary do's and don't's in ecosan promotion in Uganda,
- To come up with preliminary recommendations on storage time of faecal matter in chambers for complete sanitisation,
- To come up with fact sheets on the experiences with ecological sanitation in Uganda.

3 METHODOLOGY

3.1 DESK STUDY

This involved a review of literature on sanitation in general but with relevance and emphasis on ecological sanitation and reuse of human excreta, review of project documents, reports, text books, policy documents and other publications.

3.2 DEVELOPMENT OF FIELD DATA COLLECTION INSTRUMENTS

Questionnaires for use in the field data collection were developed for the different categories of respondents. Three categories of respondents were mainly targeted. These were: 1) Key informants - mainly project staff and other implementers, field engineers (contractors and consultants), 2) Households and 3) Masons. The choice of the different categories of respondents was done because of the following:

3.2.1 KEY INFORMANTS

The key informants that were interviewed were mainly the project staff (sanitation officers) and /or district staff involved in ecosan related activities. In particular, staff involved in the community sensitisation, mobilisation, awareness raising and supervision of construction of ecosan toilets were interviewed. The objective of interviewing this group of respondents was to get information about the successes and/or failures of ecosan, the strategies for wider-uptake of the ecosan concept, costs of ecosan toilets, and their experiences on people's perceptions and attitudes towards ecosan toilets and re-use of urine and faeces.

3.2.2 HOUSEHOLDS (TOILET OWNERS AND USERS)

These were interviewed so as to get first hand information on the use, operation and maintenance as well as general Knowledge, Attitudes and Practices (KAPs) on ecosan and in particular, the re-use of urine and faeces in agriculture.

3.2.3 MASONS

Masons were interviewed as they are the actual doers (builders of ecosan) so that they provide information on how many ecosan toilets they had constructed, how they got into the business and how it is performing, the level of training they underwent and what would generally make people like/dislike ecosan.

The questionnaires for each category of respondents are appended (ANNEX 1).

3.3 INTERVIEWING, FIELD OBSERVATIONS AND SAMPLE COLLECTION

A total of seventy seven (79) respondents were interviewed. The distribution of respondents by district and category is shown in Table 3.1. Interviews were conducted throughout the 12 districts using three different

types of structured questionnaires. In addition, field observations were done to establish the condition and operation of the existing ecosan toilets. The methodology involved interviewing communities, project staff, masons, caretakers of ecosan toilets, school management; to collect information on their knowledge, attitudes and practices in ecosan and re-use of human excreta.

A total of ten (13) samples were taken from 13 of the 79 toilets visited. Representative samples were taken from the toilets and transported to the Microbiology and Soil Science laboratories at Makerere University for analysis. During sample collection, a long stick and a spade were used to mix the toilet contents before a representative sample was taken from the toilet. The sample was collected in black polythene bags, locally known as '*kaveera*'.

Table 3.1: Description of the sample used in this study

District	Respondent Category			SUM
	Key Informants	Households/ Schools	Masons	
Arua	1	2	0	3
Bushenyi	1	6	1	8
Kabale	1	13	1	14
Kisoro	1	9	1	11
Masaka	0	4	0	4
Mbarara	0	3	0	3
Mpigi	1	4	0	4
Ntungamo	1	4	1	6
Rakai	1	4	1	6
Rukungiri	1	4	1	6
Soroti	1	4	1	6
Wakiso	1	5	0	6
TOTALS	**10**	**62**	**7**	**79**

3.4 LABORATORY ANALYSIS OF SAMPLES

Samples were analysed for microorganisms and nutrients in the faecal/ash mixture. Faecal indicators, *E.Coli* and *Enteroccoccus* as well as *Salmonella* and eggs of ova/cysts, in particular of *Ascaris lumbricoides* and *Ancylostoma* were analysed. Additionally, Nitrogen (N), Phosphorus (P) and Potassium (K) were analysed in the dehydrated faecal mixture (faeces, anal cleansing material and ash). The methods of analysis were summarised in Table 3-2.

Table 3-2: Methods used for analysis of nutrients and pathogens

Parameter	Method
Nutrients	
Potassium (K)	Flame photometry
Nitrogen (N)	Kjeldahl method
Phosphorus (P)	Spectrophotometer
Pathogens	
Bacteria (*E.Coli* and *Enterococci*)	Pour plating technique
Parasites	Floating method and McMaster technique

4 EVALUATION AND ANALYSIS OF EXPERIENCES ON ECOLOGICAL SANITATION

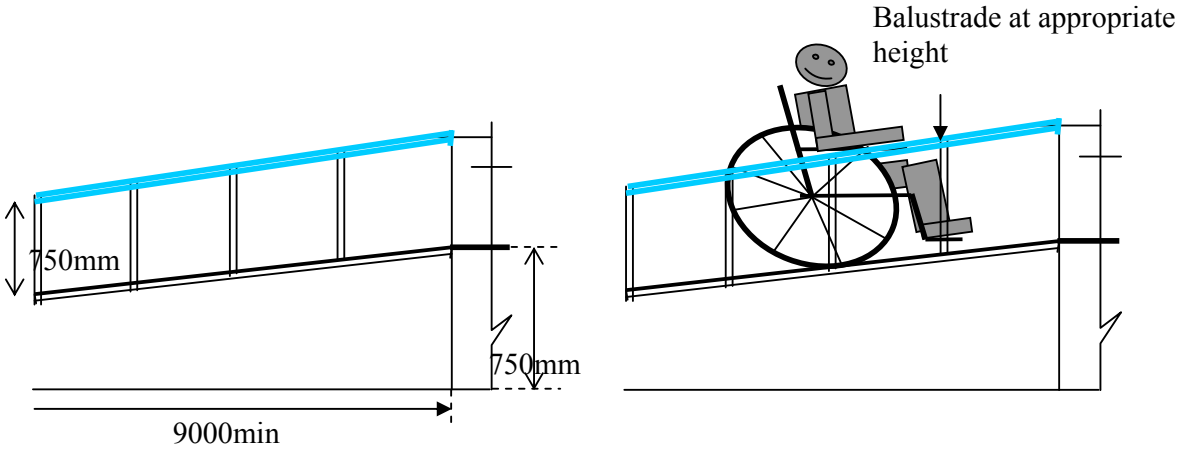
4.1 REVIEW OF LITERATURE

4.1.1 RESEARCH ON DESIGN OF TOILETS FOR THE CHILDREN AND THE DISABLED

This research was carried out by a fourth year student of the Department of Civil Engineering (Akotch Joseph) during the academic year 2003/2004. The objective of this research was to design appropriate Ecosan dry toilets for children and the disabled. To come up with a satisfactory design, various methods were used. These included a visit to Kabale and Kisoro and to various institutions concerned with disabled and children, interviews and an extensive literature search.

The findings revealed that children suffer from inappropriate facilities such as **large squat holes**, **steep steps and generally an unfamiliar technology**. Disabled persons suffered from **inaccessibility of toilet rooms, inappropriate facilities (steep ramps, small rooms etc) and lack of provision of extra support**.

Based on these findings, a suitable toilet for children and the disabled was designed and a prototype constructed. Some of recommended designs are shown below.



(a) Gentle slope (8.5%) (b) Comfort of wheelchair on gentle slope

Figure 4-1: Suggested Ramp design (Not to scale)

SUMMARY OF DESIGNS

Internal space

Minimum 2200 X 1525mm for disabled persons toilet, 1525 X 1525 for children's toilets when toilet is at corner of room. If the toilet is in the middle of room, space should increase beyond 2200x1525mm. The former case is suitable for two-vault Ecosan toilet.

Doors

- 900mm opening outward unless internal space is much lager than given here
- Pull handle at 900 - 1000mm above floor for disabled persons, 465-730mm for children. Younger children's toilets having the lower values.
- Thresholds omitted completely
- Should have appropriate informatory/directional signage

Corridors

- Width of corridors 1.5m minimum for public toilets
- Maybe 0.9m for children's toilets

Ramps

- Gradient: 1:20 - 1:12. If gradient is steeper than 1:12, provide alternative stepped access. For children, gradient is 1:16
- Vertical rise of ramp before landing < 0.5m
- Width of ramp 900 - 1000mm, Length of landing 1.3 - 1.8m
- Provide handrails 32 - 38 mm diameter, 25mm for Nursery children, on each side of ramp steeper than 1:12 at height 900mm and 700-750mm and should continue 300mm beyond beginning and end of ramp.
- For children's toilets, provide handrails at 0.6m height.
- For ramp not steeper than 1:12, provide kerb 75mm high. If handrails are provided, kerb is 50mm high.

Stairs

- Normal adult stairs for ambulatory disabled persons.
- For children, rise of step is 135-175mm, width of tread 300mm.

Support devices

- Support rail in sitting children's toilets at height 455 – 685mm above floor according to ages. Rails for nursery school children are 25mm diameter. In squatting children's toilets support rails are at height 355-585mm above floor.
- In adult toilets, at height 850 – 950mm above floor and 32mm to 38 mm diameter grab bars.
- Include dropdown rail at 480mm – 680mm as shown in adult disabled toilets.

Lowering of support device heights for squatting children

An arbitrary value is chosen here for the lowering of shoulder of child when squatting compared to when seated on the toilet. This assumption is valid because the high reach of the child is longer than the lowering. Inaccuracy will be compensated by the ability of the child to reach higher. What results may be some discomfort when holding the grab rail. This is not expected to be extreme as to be stressful.

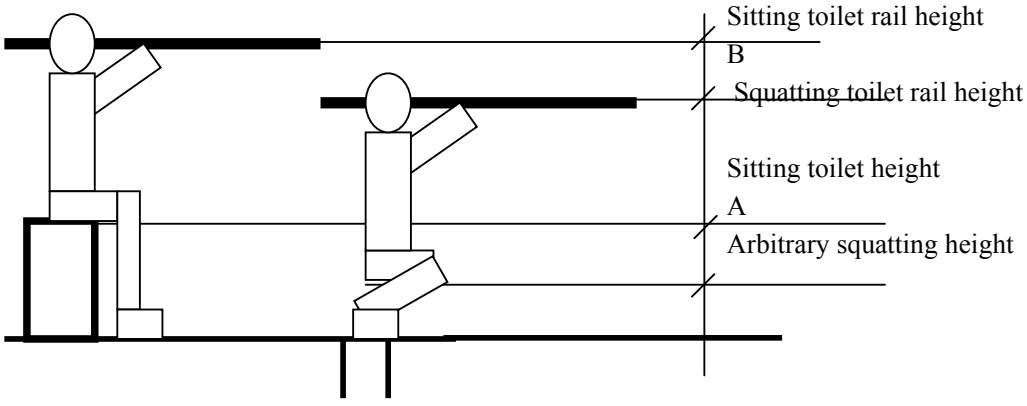


Fig. 4-2: Illustration of lowering of support rail in children's toilet assumption

Table 4-1: Grab bar height in children's squatting toilets

Age group (yr.)	Toilet seat height (mm)	Grab bar height sitting (mm)	Grab bar height squatting (mm)	Dispenser height (mm)
2 – 4 (Nursery)	280-305	455-510	355-410	355
5 – 8 (P1 – P4)	305-380	510-635	410-535	355-430
9 – 12 (P5 – P7)	380-430	635-685	535-585	430-485

Table 4-2: Modification according to age groups

Age group (yrs)	Toilet seat height (mm)	Grab bar height sitting (mm)	Grab bar height squatting (mm)	Dispenser height (mm)
2 – 8	305	510	410	355
5 – 12	380	635	535	430

For squatting toilets, the defecation holes range between 150mm and 210mm diameter. For younger children, the 150mm-diameter hole is the more suitable. With a hole used on the chair of diameter 200-220mm, the distance left between the chair hole and toilet hole (pit hole) at the edges is maximum 35mm using the 150mm-diameter hole, when the chair is well centred (Figure 4-3). This can work as well as the sitting toilet. The urine diversion is offset to pour at least 100mm beyond the end of the defecation hole.

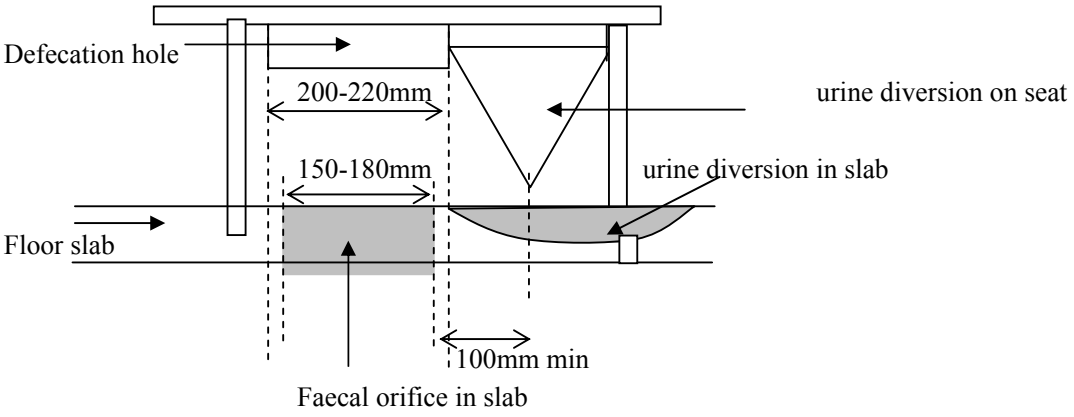


Fig. 4-3: Diagrammatic illustration of placement of Ecosan toilet chair over defecation hole

4.1.2 DESIGN OF AN INNOVATIVE TOILET SYSTEM TO ACCELERATE DRYING

This research was carried out by a fourth year student of the Department of Civil Engineering (Ntabadde Martha) during the academic year 2003/2004. The objective of the study was to develop a modified system that would accelerate drying. Accelerating drying would be useful in shortening the retention period required before faecal matter can be rendered safe for handling, resulting in smaller units and possibility of reducing cost of toilet.

Field visits were made to the South Western Towns Water and Sanitation Project area, specifically Kabale and Kisoro. Other Ecosan and similar kind of toilets were visited in Mbarara and Kampala. A total of 25 sites were visited and 20 people interviewed. Data was collected by use of checklists and questionnaires and from the Meteorological Department. The data was analysed and basing on the results, an appropriate design to accelerate drying was produced, costed and design drawings produced. The cost of a household ecological sanitation toilet incorporating the improved design futures was estimated to be Ug.Shs. 1,439,000/=

The important findings were:

- All the ecosan toilets visited in the field were operating purely on natural ventilation and often with small diameter ventilation pipes (in some cases less than 100 mm). In some other situations, inadequacies were improper and weak materials, inadequate height above the roof, e.t.c. While attempting to measure air flow in some of the pipes, it was found out that many times there was no flow recorded in the vent pipes especially those with a small bore.
- By performing calculations to determine the recommended ventilation rate of 20 m^3/hr either achieved by thermal or stack effect, it was found that this requirement could not be met by pipe sizes less than 150 mm. Therefore, it was concluded that a pipe diameter of at least 150 mm is required for effective ventilation.
- To further increase the rate of extraction of evaporated water from the vaults, it was suggested that the pipes be equipped with a rotary vent turbine would greatly. To maximise the rise in temperatures in the vaults, it was suggested that a one way glass be used to allow in as much direct solar radiation as possible in to the vaults and use of insulating materials within the walls to ensure that the heat is not lost. It was realised that the suggested improvements have cost implications. However the proposed improvements can be carefully selected so as to achieve increased rates of drying to some extent, without necessarily escalating costs.

The model unit designed and constructed by Martha Ntabadde is shown in Plates 4-1 and 4-2.

Plate 4-1: Front view of model constructed

Plate 4-2: Back view of the model

4.1.3 DESIGN OF AN IMPROVED TOILET SYSTEM FOR THE WASHER COMMUNITY

This research was carried out by a fourth year student of the Department of Civil Engineering (Mukiibi Julius) during the academic year 2003/2004. The objective of this project was to design an improved dry toilet system that is appropriate for the washer communities and management of the wastewater generated. The study involved the use of literature, development of questionnaires and carrying out of field visits and interviews.

Important Findings are:

- 35% of the interviewed washer communities suggested that a washing facility be introduced within the dry toilets. In areas where dry toilets exist, 24% used the urine diversion point for washing and 50% preferred moving backwards to wash. However over 75% suggested that dry toilet should not be introduced in public places.

- Over 80% of the dry toilets visited did not cater for the washer communities. Those that did cater for these communities had extremely raised washing points making it uncomfortable for the users. In the case study area (Kazo), the major mode of human excreta disposal is the traditional pit latrine. 30% of the respondents pointed out the problem of flooding, yet the major source of water is the spring.
- A model toilet with provision for washers was designed and constructed (Plates 4-3 and 4-4). The floor slab detail is shown in fig. 4-4 (Not to scale).

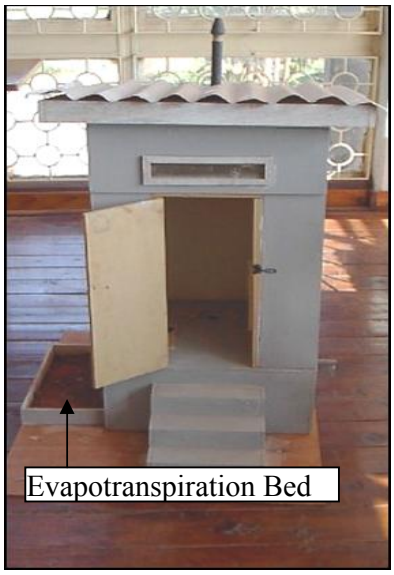


Plate 4-3: Front view of Model

Plate 4-4: Detail of washing point

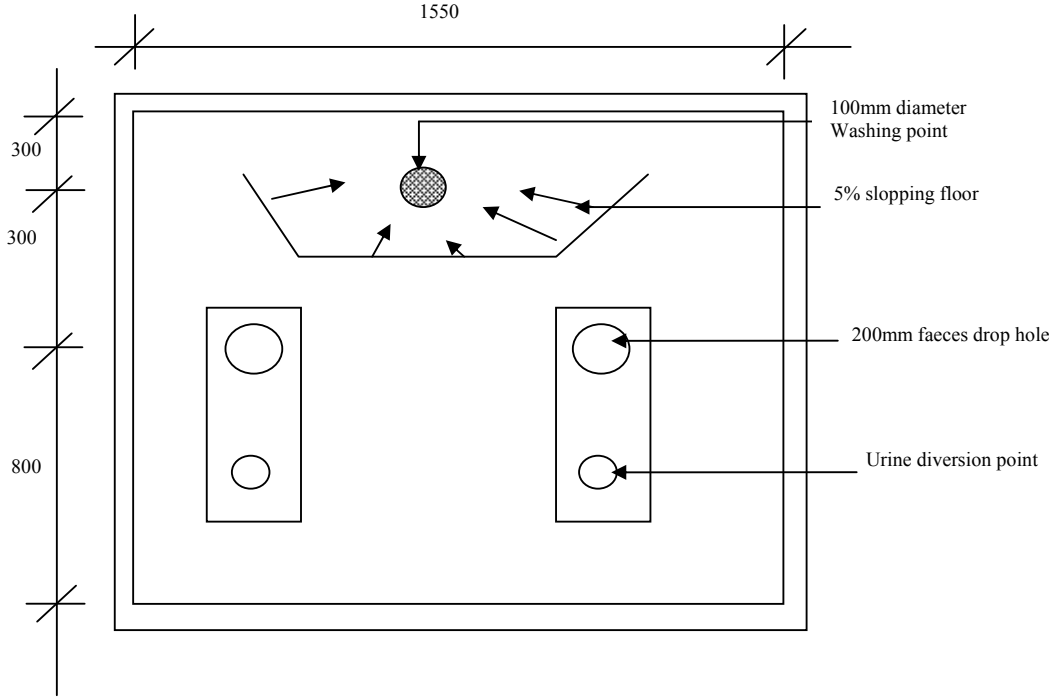


Figure 4.4: Washing Point Created Within the Toilet System

4.1.4 DESIGN OF TOILETS FOR IMPROVED OPERATION AND MAINTENANCE

This research was carried out by a fourth year student of the Department of Civil Engineering (Ahumuza Ezra) during the academic year 2003/2004. The overall objective of this study was to modify existing designs of ecosan toilets to ensure improved operation and maintenance.

DESCRIPTION OF DESIGN

The concept is to have a single vault, but allow for secondary sanitisation of faeces in another compartment of the same toilet structure. It is proposed, in this design, that a single vault is used. The volume of the chamber is designed in such a way that a sufficient sizeable basket fabric can be accommodated and allow for free board. Hence a vault of dimensions 1.5 ×2× 1.15m were recommended.

To facilitate dehydration and emptying, baskets made of loosely woven material will be used to collect faecal matter. The loose fabric will enhance aeration and facilitate drying of the faeces. It will also cut on the weight of the container thus facilitating easy handling. After a basket is full, it should be removed and put into a separate chamber and a new one put in place. The filled container should be left in the chamber for at least six months to allow adequate sanitization of the faeces to occur.

The corridor between the vault and storage chamber doubles as a urinal for both males and females. The ash container is positioned away from the urine diversion to minimize on the blockages due to misuse of ash. The holes for faeces and urine will have separate covers to ensure safe pouring of ash and easy pure urinations. Urine is led to a soak pit if it is not re-used in a garden otherwise it is collected in underground tank from which it is fetched for crop irrigation. An access door is to be provided on the side of the vault to allow users/workers to reach and move the used baskets easily.

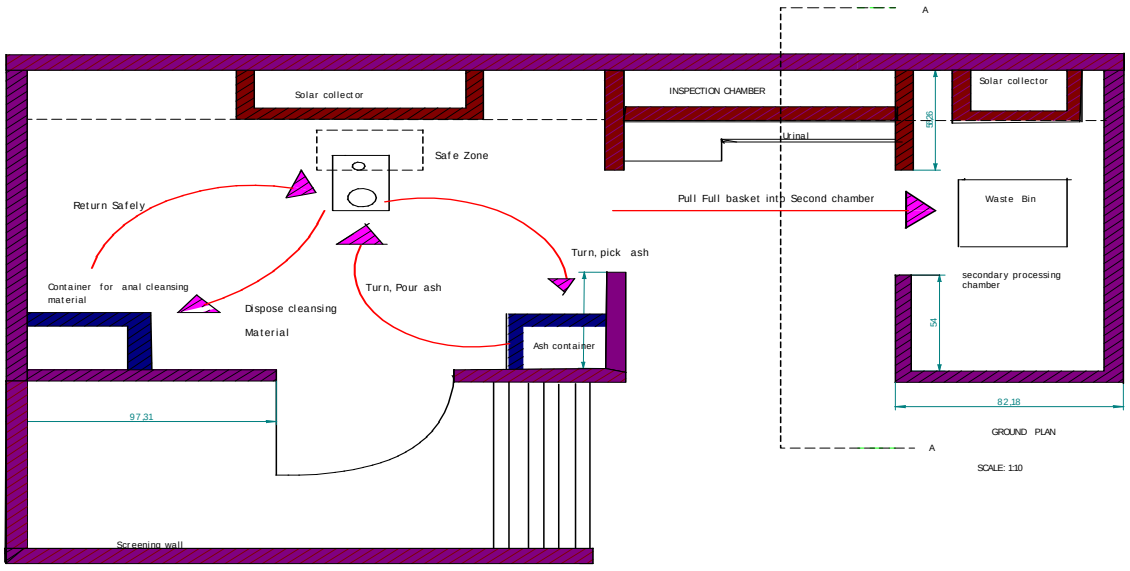


Fig. 4.5: Floor plan of the toilet

Details of the rear, front and side views can be found in the detailed report by Ezra Ahumuza (2004).

Table 4-1: Recommended operation and maintenance guidelines

Problem	Suggested solution
Blocked urine pipe	Use a mechanical snake or caustic soda to unblock if blockage is due to hairs, fibres and precipitation forming on these Use caustic soda if precipitation is on the pipe walls Pour tepid water into the pipe if blockage is due to uric acid build up Ensure adequate pipe slope during plumbing (at least 1% in horizontal sections) Ensure proper addition of absorbent into the vault Appropriate positioning of ash container to minimize chances of pouring it into the urine pipe
Offending smells	Ensure enough absorbent is added Ensure proper ventilation- check vent pipe for cobwebs, leakages; pour water through the pipe during recess if cobwebs are present Ensure the rain stopper is adequate Check urine pipe for leakages, ensure 100% water tightness in the pipe Provide a vent pipe with a belled top Ensure tight closure of solar collector
Presence of flies	Provide adequate lighting in the vent pipe Clean and dry the toilet seat- pour ash on fresh faeces prior to cleaning, scrap off and mop with a piece of damp cloth
Wet/decaying door bottoms	Provide adequate roof overhang Provide a screening wall
Wet seat/ slab	Provide a clear O&M chart Direct kids and elderly on use and/or include design for kids Adequate squat hole sizing
Anal cleansing materials	Use biodegradable materials Dispose non biodegradable ones such as sanitary towels in a separate container with tight cover, dispose by burning

4.1.5 ONGOING RESEARCH (2004-2005)

Research that is ongoing at Makerere University for the academic year (2004-2005) is focussing on pathogen die-off and nutrient recycling. A total of seven (7) undergraduate students are involved in the research and one (1) postgraduate student. This research will be completed in July 2005. The results will be compiled and full-bound reports submitted to the Directorate of Water Development.

PATHOGEN DIE-OFF STUDIES

Effect of different additives on die-off of pathogens

Investigations are focussing on assessing the effect of different additives on the die-off of pathogens in human faeces collected from ecological sanitation toilets. Two additives are being investigated, ash and saw dust. Faeces are collected in buckets when ash is used as an additive. The faecal buckets are then transferred to another storage chamber. Sampling is done once in two weeks and measurements are done for faecal bacterial indicators (*E.Coli*, *Enterococus*), salmonella and eggs of *ascaris lumbricoides*. The same thing is repeated in buckets used in the same toilet when saw dust is provided as additive. In addition, measurements are done for the ambient temperature in the storage chamber, the moisture content and pH of the faecal samples. The collected additive (ash or saw dust) for use in the toilet is initially characterised for pH and mineral content. Preliminary results indicate that the die-off of pathogens in faecal buckets where ash is used is far larger than that where saw dust is used as additive.

Composting as disinfection method for human excreta

The hypothesis here is that pathogenic microorganisms in faeces thrive under given conditions of pH, moisture and temperature. In these experiments we provide harsh conditions for microorganisms to survive. Compost boxes (350 mm x 350 mm x 350 mm) as well as (600 mm x 600mm x 600 mm) are used. Insulation to reduce heat losses is provided using 25 mm and 75 mm thickness Styrofoam. We investigate three units with different substrates: faeces: food waste = 1:0, 1:1 and 1:3 by weight. The first experiments were done without insulating the compost boxes of size 350 mm x 350 mm x 350 mm. The maximum temperature was about 44°C. The experiment was repeated using the same boxes but provided with 25mm Styrofoam as insulation and the temperature rose to over 60°C in the faeces:food ratio of 1:1. In another experiment, using 600 mm x 600 mm x 600 mm compost boxes provided with 75 mm Styrofoam as insulation, an even much higher temperature up to 72°C was achieved and maintained for about 1 week. When samples are investigated for microorganisms, the faecal indicators (*E.Coli* and *Enterococcus*) often test negatively in samples that reach over 60°C degrees after composting for 2 – 3 weeks. Preliminary conclusions are that it is possible to sanitise faeces by composting them with food waste in appropriate ratios. However, for the compost to work well and develop and maintain temperatures in and above the thermophillic range, it must be insulated. Other operational requirements include turning the compost, at least once a week and addition of more moisture (water). Faeces may be difficult to compost without mixing with food waste.

NUTRIENT RECYCLING

Urine has been investigated as a fertiliser in the green house and in laboratory bucket experiments. Results comparably agree in that both experiments have shown the urine in the undiluted form may be unsuitable for use as fertiliser. A concentration of 20% urine (80% water) has shown good results that are even better than commercially available NPK fertilisers (Plate 4-5).

Plate 4-5: Greenhouse experiments with fertilisation using urine. From left to right: Row 1: urine (40%), Row 2: NPK applied at recommended rate, Row 3: NPK applied at half the recommended rate, Row 4: Urine (60%), Row 5: Control (no fertiliser), Row 6: Urine (80%), Row 7: urine (20%).

Full reports of the research mentioned above as well as on other topics such as investigating the effect of improved ventilation on the die-off of pathogens will be available in the middle of July 2005.

4.1.6 FACTORS INFLUENCING HOUSEHOLD'S CHOICE OF SANITATION TECHNOLOGIES AND EXCRETA RE-USE (ECOSAN)

Important findings are:

- People build sanitation facilities to improve sanitation in their homes and avoid diseases related to poor excreta disposal,
- People who have chosen the ecosan toilets do so because of the added advantages of durability and permanency, convenience, economy on space, hygiene and suitability in poorly drained areas,
- Project interventions – community sensitization, mobilization, promotion and marketing have played a very big role in influencing households to adopt ecosan toilets.

4.1.7 MINUTES OF ECOSAN COALITION MEETINGS

Important points noted:

- Single and double vault ecosan toilets are promoted both at household level and in public places,
- Privately owned ecosan toilets are mainly found to perform better than public toilets due to better maintenance of the former,
- Single vault ecosan toilet systems seem to work better than double vault toilet systems, especially in pubic places and institutions,
- A urinal and hand washing facilities are essential parts components that should be incorporated at all ecosan toilets especially those in public places.

4.2 RESULTS FROM INTERVIEWS

As already mentioned, interviews were conducted in 12 districts. Three types of questionnaires targeting different respondents were used. This section presents the results from the interviews.

4.2.1 KEY INFORMANT INTERVIEWS

Ten (10) key informants, mainly the project staff (sanitation officers) and /or district staff involved in ecosan related activities as well as staff involved in the community sensitisation, mobilisation, awareness raising and supervision of construction of ecosan toilets.

4.2.1.1 Success of ecosan implementation

There were diverse views on the success of ecosan implementation. While the majority of respondents indicated that ecosan had been successfully implemented others indicated that the success is low because ecosan is still a new idea. For example eight out of ten project staff (80%) indicated that ecosan was fairly successful. This is a good indication that ecosan implementation has been generally successful.

What made it a success?

Different reasons were stated to have contributed to the success of ecosan. According to the key informants who stated that ecosan was successful, the following reasons were given:

- Geology of the area, landscape makes it hard to excavate the pit.
- Repeated sensitization
- Poverty
- Affordability of initial costs
- Technology involved is less complicated
- Use of wastes

- Does not smell
- People had land shortage
- People owned the ecosan toilet

Generally, the geology of the area (rocky formations making it difficult to excavate pits), and the need to protect the water source from contamination were the major reasons for ecosan implementation in South western Uganda, particularly in Kisoro district. As few people were aware of this linkage (i.e., between excreta from pit latrines and water contamination), repeated sensitization by the project staff on the dangers of pit latrines and hence the superiority of ecosan in this regard as compared to pit latrines had greater impact on the success of ecosan implementation. This was echoed by all of the ten (10) key informants interviewed.

4.2.1.2 Management of ecosan toilets

Communal and household ecosan toilets were managed differently. Accordingly:

- For communal toilets – Committees were elected to manage the toilets
- For households – it was reported that the household head was responsible for the proper use of the toilet. However, it became evident during the interviews that women and children were mainly responsible for the cleanliness of the toilets

In general, the ecosan toilets at household were managed well. Communal toilets were also managed well. However, cases of improper use resulting into higher water (moisture) levels in the toilet chambers were evident in some of the toilets visited.

Although there was effort to manage toilets at household level very well, technical construction problems were noticed in some of the toilets. This was seen where the faecal vaults were likely to be wetted by rainfall (Plate 4-6).

4.2.1.3 Cost, subsidies and Payment of ecosan

In the majority of the cases, the key informants reported that it was the users who paid for the costs while in some cases the project, water board, or the district paid for the costs. During the beginning of implementation of ecosan toilets, there were subsidies provided by the SWTWS project to the households and institutions. The subsidies were at times equivalent to the full cost of toilet. However, these subsidies were later stopped and the project now focuses on creating capacity and demand (community sensitization and awareness raising) and training of masons and communities.

It was reported that a single household ecosan unit cost between Ug.Shs 80,000/= for the lowest cost made up of low cost materials (mud and wattle), up to Ug.Shs. 1,200,000/= for a very good household unit with a tiled floor. It was reported that depending on the size of faecal chambers and the toilet rooms, between Ug.Shs. 600,000/= to Ug.Shs. 750,000/= is sufficient to construct a double vault household ecosan toilet. Institutional toilets and communal toilets of 5 stances (10 vaults), a shower and urinal for men were reported to cost between Ug.Shs. 12,000,000/= to Ug.Shs. 18,000,000/= depending on local site conditions. For operation and maintenance, it as reported that the amount paid ranged from nothing, where households managed their toilets to one hundred and thirty five thousand (Ug.Shs. 135,000/=) per month and between 0 to Ug.Shs. 1,620, 000/= per year where households and/or institutions had to pay for emptying and cleaning services.

Plate 4-6: These faecal vaults are not protected from rainfall

4.2.1.4 Community Contribution

The key informants reported that households and community members contributed towards the construction of household and communal ecosan toilets. The contributions were in form of cash, local materials, land, and labour. The communal ecosan toilets were mainly constructed by local artisans and in some cases registered companies.

4.2.1.5 Choice and Acceptance of ecosan toilets

Varying responses were given as to why ecosan toilets were chosen as the means of excreta management. These included:

- Need to improve sanitation
- Increase latrine coverage in the sub-county
- Difficult site conditions (water logged and rocky formations)
- VIP latrine construction and management was expensive
- Operation and maintenance of ecosan toilet is easy
- To have an exhibition of the new technology
- To protect the water sources down stream from contamination
- There is no need to dig pits when using ecosan
- Ecosan can be constructed anywhere, even in the house or very close to main house
- The faeces and urine can be used for manure

The majority of the key informants, i.e., eight out of ten (80%) reported that re-use of the wastes was the major reason for constructing ecosan toilets.

The main reasons why the people in the area accepted the ecosan toilets included among others;

- They are manageable hygienically, they don't have odor and flies
- Initial cost is low compared to VIP latrines
- Shortage of land
- Hard rock (difficult to dig pits), and soft soils (leading to collapse of pits)
- High water tables
- The by products are used in farming activities

Analysis of the above as well as the reasons stated under 4.2.1.1 which contributed to the success of ecosan and a consideration of frequency of reporting suggests that choice and acceptance was mainly a result of difficult site conditions (/rocky/water logging/collapsing formations) which made it difficult to construct pit latrines.

4.2.1.6 Peoples' attitude towards adopting Ecosan toilets

The majority of the key informants (70%) reported that the people in the area are very willing to construct ecosan toilets and are therefore generally accepting them. However some of the key informants reported that ecosan toilets are relatively expensive and unaffordable by many poor people. Further, it was reported that some ecosan users feel ecosan is a superior method of human excreta management and that it is used in clean homes and by respectable members in their communities. Thus, people become happy owning ecosan toilets. There is therefore a very good attitude towards adopting ecosan toilets.

4.2.1.7 Market for Urine and Composted faecal matter

The majority of the key informants reported that currently there is no market for both urine and composted faecal matter. Sixty percent (60%) of the informants reported that there was no market for urine. A similar percentage (60%) of key informants reported that there was no market for composted faecal matter. However 70% of the key informants reported that people have already used the compost on their own fields.

4.2.1.8 Systems for improving peoples' adoption of ecosan toilets

It was reported that a number of programmes were put in place to increase peoples perception and adoption of the ecosan toilet. These included:

- Setting up demonstration latrines in villages
- Setting up demonstration gardens in village
- Sensitization programmes about construction
- Sensitization about the use
- Capacity building for local artisans through training.

Sensitization was reported to be very crucial if people are to appreciate the importance and convenience of ecosan toilets. Sensitization therefore is carried out monthly, and some times quarterly. As a result of this continued sensitization more people have constructed ecosan toilets and appreciated their use.

4.2.1.9 Problems encountered in implementing interventions

The following problems were reported;

- Increasing number of users hence difficulty in monitoring all constructions
- Few skilled masons
- Negative attitudes held by some people
- Lack of resources

- There are different customary behaviour and practices of the communities
- Limited participation of opinion and civic leaders.

In order to address the above challenges, the ecosan implementers should sensitize the community, civic and opinion leaders and involve them from the beginning. Training of masons and periodical monitoring were reported to have contributed to solution of some of the problems encountered during implementation of ecosan interventions.

4.2.1.10 Accessing information on ecosan toilets

The majority of the key informants (90%) reported that most people in the communities find it easy to access all the necessary information that is required to put up ecosan toilet. This shows that there has been good sensitization and mobilization and proper use of communication media.

The information disseminated to the people includes the following;

- Write-ups (leaflets, fliers) on ecosan system
- Information guide on how to use the ecosan toilet
- Information and addresses of who can help
- Information on masons trained and how/where they can be reached
- Materials for construction
- How ecosan can be constructed and used
- The design of ecosan toilet
- The costs of ecosan construction.

All this information is disseminated to the community free of charge during the sensitization meetings and sometimes at the field offices. The contact persons/officers for sensitization meetings include local artisans, sanitation officers, district community officers, sub-county officers, district health inspectors, district water officers and the sanitation project offices.

4.2.1.11 Constraints in adopting ecosan toilets

The majority of the key informants (80%) reported that ecosans toilets are still expensive for the rural poor people. Other reasons that were reported include negative attitude of people for example some do not want to experiment, lack of information about ecosan toilet, some people feel that the units are small and in urban areas ash is very costly.

4.2.1.12 Solutions to the constraints

The project staff members as key informants reported that the following should be done in order to address the above constraints to increase adoption of ecosan toilets by more members of the community.

- There should be more sensitization and community mobilization
- Ecosan toilets should be marketed vigorously
- Ecosan projects should be integrated with those of agriculture
- Components of Ecosan units e.g., urine diversion squat/sit pans should be availed to the community
- Experiences should be documented
- Government should give subsidies
- Construction of demonstration ecosan toilets in villages
- Give incentives to people who construct ecosan toilets

Of the above stated suggestions, increase in sensitization and community mobilization accounted for the largest percentage (80%), where as 50% of the key informants suggested that government subsidies would be the solution to over come the problems faced in the implementation of ecosan.

4.1.2.13 Lessons learnt

The people and the staff have learnt a number of lessons out of the ecosan project

- The concept of ecosan works very well in communities where people are sensitized and educated on how it works and how it is beneficial.
- The option is more easily adopted in areas with difficult soil conditions where people can be easily sensitized to understand the problem they face
- There is need for more resources to promote ecosan technology. This calls for increased sensitization and training of communities. Ecosan requires intensive sensitization before implementation
- There is need for more promotion of ecosan in schools
- People with water logged and termite infected areas are increasingly interested
- Ecosan should first be implemented at household rather than communal level.

4.2.2 EXPERIENCES OF THE MASONS

In order to assess the success of the ecosan project it was deemed necessary to find out the experiences of the masons whose role is very crucial in the construction of ecosan toilets. In this regard six masons were interviewed on a number of issues. The smaller number of masons interviewed was because of the difficulty in accessing them since it was reported that some of them do other kind of building work and therefore can not easily found in one specific place.

From their personal experiences, it was noted that the masons have been involved in the construction industry for between one and twenty years. This shows that they have enough experience.

4.2.2.1 Information on ecosan

Most of the masons got information on ecosan through training seminars organized by South Western Towns Water and Sanitation (SWTWS) project. Others got the information from the posters, books, while others got it from the consulting engineers. The number of ecosan toilets built by each individual ranged from 2 to 100 toilets.

4.2.2.2 Benefit of ecosan toilet construction

The majority of the masons reported that ecosan toilet construction contributes a little bit of their business, meaning that they don't get much business from construction of ecosan toilets. The masons reported that are other people involved in the business and these include rich people in the area, households themselves, water department, local NGOs, local contractors, and other community masons. This means that competition is high.

The masons are not involved in selling the business of ecosan toilet construction; they just wait for people to come to them for consultation. The masons usually get some help from the sanitation and health promoters in doing their work by creating demand for ecosan toilet construction through sensitization. They also get technical and financial assistance from government through DWD and SWTWS project.

From the observations and experiences of the masons, people want ecosan toilets because of the following reasons:

- Use of human wastes in gardens

- Space economy
- Provision of better sanitation than the pit latrine
- No bad smell
- Permanency of ecosan toilet structures
- Can be constructed on any ground e.g. hilly/rocky or water logged.

However, the masons also mentioned that there are people who dislike ecosan toilets. From the masons' experiences, the following were the reasons why people dislike ecosan:

- Fear to remove human wastes
- The cost of constructing ecosan toilets
- The idea is new and not yet well exposed
- Some people do not know how to use ecosan toilets

4.2.2.3 Attitudes of people on ecosan toilets

Masons reported that people generally have good attitude towards ecosan toilets because it is a modern technology and indeed most people appreciate it though they say that the toilets are expensive. The people are interested in knowing how the ecosan toilets work.

4.2.2.4 Rate of adoption of ecosan toilet in the area

It was reported that:

- The rate of adoption of ecosan toilets is fair,
- The rate of adoption of ecosan toilets is slow as compared to ordinary pit latrines but may be promising in future.
- People who have been trained on how to construct ecosan toilets have positive attitudes, but the promoters are not getting enough assistance,

From the above it shows that there is potential for future higher rate of adoption of ecosan toilets ecosan. However, more promotion of the ecosan concept is necessary.

4.2.2.5 Use of urine and Composted manure

The majority of masons reported that people can use urine and composted feaces. It was mentioned as an example, by a number of masons, that urine is used to kill banana weevils and also as fertilizer. The composted faecal matter is used for improving the soil. Some people are not willing to use urine because of cultural biases while majority are worried of using faeces and urine because of fear of pathogens that they may contain.

4.2.2.6 Market for Urine and Compost manure

It was not clear from the masons' point of view whether there is market for the compost manure and urine. However they all indicated there is potential for such market. Masons mentioned that is potential market in providing collection services for urine but did not commit themselves whether there may such market for collection services for compost. The masons expressed ignorance of the number people who may be willing to pay per ton of compost since there was not yet any known market for it.

4.2.2.7 Attractiveness of construction of ecosan toilets

According to the masons, they have been attracted to construct ecosan toilets because of the following reasons:

- It is modern technology in Uganda,
- Construction is made once,

- A wide variety of local materials can be used for construction,
- It is a business paid for,
- It is easy and takes less time to construct.

To make ecosan construction more attractive the masons were of the view that the following strategies are needed:

- More sensitization so that more people get interested in ecosan,
- Use of flexible diversion for urine so that in case of blockage it is easy to unblock,
- The fee for construction should be increased so that the masons can take on more construction work.

4.2.2.8 Challenges in ecosan toilet construction

According to the masons, the following are the challenges faced in constructing ecosan toilets:

- Some clients take long to provide materials for construction
- People don't want toilets to be attached to their houses/inside the house.
- No enough market and some times they become redundant.

Masons also mentioned that the common types of toilets the people have are the pit latrines. The people are likely not to accept ecosan toilets because of the cost of construction. According to the masons, to make more people adopt ecosan toilet the following should be done;

- Avail ecosan awareness charts to the people
- Conduct more workshops, and involve more people
- Introduce subsidies so that people do not have to pay too much
- More facilitation for promoters
- Sensitization of the people
- Construction of demonstration units.

Although all the above were mentioned what was regarded as most important was **sensitization**.

4.2.2.9Training undertaken by the masons

The masons have undertaken various training that have helped them to effectively handle ecosan toilet construction. These include;

- Advocacy training on sanitation,
- Training workshops,
- Field training on how to design and build ecosan toilets,
- On job training (masonary work).

4.2.3 ANALYSIS OF HOUSEHOLD EXPERIENCES

4.2.3.1 Demographic Analysis

A total of 62 households were visited in 12 districts with Kabale having the biggest households as shown in Table 1. The study was carried out in 35 parishes (Annex 2).

Table 4-2: Districts where the study was carried out, showing number of sampled toilets per district

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	kabale	13	21.0	21.0	21.0
	kisoro	9	14.5	14.5	35.5
	mbarara	3	4.8	4.8	40.3
	mpigi	4	6.5	6.5	46.8
	wakiso	5	8.1	8.1	54.8
	masaka	4	6.5	6.5	61.3
	rakai	4	6.5	6.5	67.7
	arua	2	3.2	3.2	71.0
	soroti	4	6.5	6.5	77.4
	rukungiri	4	6.5	6.5	83.9
	bushenyi	6	9.7	9.7	93.5
	ntungamo	4	6.5	6.5	100.0
	Total	62	100.0	100.0	

A total of 38 of the respondents representing (66.7%) were men while 19 (33.3%) were women and 5 (8.1%) was un-accounted for (i.e., enumerators did not indicate sex of respondent). The age of the respondents ranged from 20-45 years. There were 18 married respondents, 1 widow, 13 single and 30 missing in the system (i.e., these did not indicate their marital status). The households on average had 5 members. The majority of the respondents were the heads of the households themselves (23%), son/daughter (15%). Table 1.13 in Annex 2 gives the detail of respondent category.

4.2.3.2 Weekly expenditure

The household's weekly expenditure ranged from Ug.Shs.500/= to Ug.Shs. 48,750/=. There were more households spending at least Ug.Shs. 48,750/= per week showing that their quality of life was probably better or life was expensive.

4.2.3.3 Level of education

The majority of the respondents had reached tertiary level of education followed by secondary education. This means that the communities using ecosan toilets are relatively literate and can be easily educated on the new technology. The level of education determines the kind of occupation and indeed most of the household respondents were in professional occupations. The major source of income was from professional work. The household heads' earnings ranged from Ug.Shs. 5000/= to Ug.Shs. 700,000/=, the majority being in the range Ug.Shs. 300,000/= to Ug.Shs. 500,000/= bracket. This is an indication that the households can afford to construct an ecosan toilet.

4.2.3.4 Location of Ecosan facility

There was almost equal distribution of the ecosan toilets between urban (44%) and rural areas (45%). Further, majority of them (65%) were located in the medium populated areas. These areas were mainly in low-lying marshy and hence high water table (31%), hilly and not rocky (26%) where as others were in hilly and rocky areas (13%). Table 2.1 in Annex 2 gives the detail of location of ecosan toilet facilities. The majority of these areas had no piped water supply. There were a number of institutions in the areas namely markets and schools. However a big number of the areas did not have these institutions.

4.2.3.5 Availability of enterprises supporting eco-agriculture

Unfortunately most household members reported that there were no such enterprises except a few that included demonstration gardens, fish ponds.

4.2.3.6 Type of ecosan toilet the household possessed

A few households (5%) had composting toilets. Although 69% of respondents reported that they had dehydrating toilets, this number is far larger and a good estimate is close to 100% since majority of people who initially had composting toilets had abandoned them in favor of dehydrating toilets. The majority of these toilets had one stance (65.9%) while 25% had two stances. The majority of the respondents (76.9%) reported that they use one stance at a time.

4.2.3.7 Preferred location of ecosan toilets

It was reported by 89.5% of respondents that the ecosan toilets are located outside the house. Only 3 (4.8%) had ecosan toilets inside the house. Indeed most of the households (78.8%) preferred locating the ecosan toilets outside the house compared to 13.5% who wanted the toilets to be inside the house. The main reason for putting the ecosan toilet outside the house was to allow people to access and use it.

4.2.3.8 Decision on type of toilet and use of ecosan toilets

The responsibility to decide on type of toilet to be constructed lies on the household head. The main users of the ecosan toilet were all members of the household (91.5%). Most of the household members had used the ecosan toilet for 1-4 years and before the ecosan toilet was introduced in the area, the majority of the households (92.5%) were using pit latrines.

4.2.3.9 Experiences on use and maintenance

The majority of the people found ecosan toilets convenient and easy to maintain (79.1%) and what they liked about the ecosan toilet is because it does not smell bad. However, on the contrary what they hated about ecosan toilet most was that it stinks when there is shortage of ash. The issue of availability of ash or suitable alternative is hence very crucial if ecosan toilets are to be used successfully.

4.2.3.10 Problems experienced and suggested solutions

The commonest problem experienced when using an ecosan toilets was shortage of (or the need to constantly look for) ash followed by the need of extensive monitoring. In order to overcome these problems the household members were of the view that there should be continuous sensitization and education; there should be provision of bigger vaults and the use of chemicals instead of ash. Others suggested that money should be secured to buy ash.

4.2.3.11 Production and use of compost and urine

On whether the households have attempted to produce composts from faeces, a good number of them (58%) had done so and at the same time a relatively good number had tried to do so (42%). With time more and more households will be producing compost as their ecosan toilets fill-up. For those who produced the composts, the material was retained for about six months before use. Most of this material was used for soil improvement. On the other hand the urine was used as pesticide and fertilizer while others decided to dispose it off.

The reasons why some of the people did not use the compost was because they lacked gardens where to apply it. The same reasons applied to urine.

It was reported that the importance of urine and faecal composts and their use was well known by the households for example making pesticides and manure respectively. This shows that there was enough education and proper sensitization. So the lack of use of these products can only be explained in terms of attitude or other reasons. Very many respondents (over 80%) answered affirmatively that they would eat

food produced from gardens fertilized using urine. Further, over 90% of the respondents stated that they would eat food produced from a garden fertilized using composted faecal matter.

4.2.3.12 Proposed changes to be made on the ecosan toilet

The respondents suggested a number of changes to be incorporated while constructing an ecosan toilet (Table 3.25, Annex 2). But the majority suggested making the chambers bigger followed by including a small washer for anal cleaning, especially for toilets to be constructed for washer communities. So for future ecosan toilet constructions these suggestions should be put into consideration in the design.

4.2.3.13 Cost and Affordability of the ecosan toilet for a household

The amount each household spent on the ecosan varied greatly ranging from Ug.Shs. 30,000/= to Ug.Shs. 12,000,000/=. There was no majority number that spent the same amount. The household respondents reported that many of them got a subsidy from the project (donor) and government (70%) while 30% did not get any subsidy. If there was no subsidy the majority would have afforded about Ug.Shs. 50,000 to Ug.Shs. 200,000.

4.2.3.14 Why ecosan and whether users can recommend ecosan to others

The majority of the respondents reported that the main reason was because of high water table and rocky formation. As to what is done when the vault is full, the majority empty it later while others empty it for manure and compost. As to whether they would recommend the ecosan toilet to others, the majority were very willing to spread the gospel of ecosan toilet (96.2%) simply because it is hygienic, cheap and easy to construct. However others have not been able to have an ecosan toilet because to them it is expensive. If they were to have an ecosan toilet they would need the sensitization and education about the technology.

4.2.3.15 Payment for excreta disposal

For the individual households there is no cost because it is done by the family members, but as for schools and landlords, it is done by those responsible (school management and/or landlord hiring labor to empty toilet chambers). The amount paid per month and year was difficult to get from the data because majority of the respondents were not incurring the cost.

4.2.3.16 Preferance of the location of ecosan toilet

The majority of the respondents reported that the family prefers the ecosan toilet to be put outside the house because it is appropriate for all the people to use.

4.2.3.17 View of the community on ecosan as a method of excreta management

The majority of the respondents (62.8%) reported that the community looks at ecosan as a very good method of excreta management. In conclusion ecosan projects have been successful in areas where they have been implemented.

4.2.3.18 Lessons Learnt

- Respondents report a wide range of reasons for having ecosan toilets. These include space economy, cleanliness/hygiene, no smell, permanency and cost. The lack of smell, cleanliness/hygiene are outstanding issues and generally common amongst the respondents.
- In general, the respondents would recommend ecosan to others (say their friends/neighbours) on the basis of permanency of the toilets, hygiene, non-smelly nature of the toilets and the possibility to recover nutrients from urine and faeces.

- Some respondents reported that the ecosan toilets are expensive both in terms of initial cost as well as operation and maintenance. It is therefore a possibility that on this basis, such respondents may hasten to recommend ecosan toilets to other people.
- Urine and faeces can both be used in agriculture either as pesticides and/or fertilizer. A few respondents would dispose off urine and faeces. Social or cultural taboos against the use of urine and faeces were not found to be significant although a few respondents mentioned about them.
- There are some challenges that out to be addressed. These include scarcity of ash and change of design to incorporate big chamber that should take long to fill and provision for washers.
- Sensitization, community mobilization, education and training play a crucial rule in the success of any ecosan project implementation.

4.3 FIELD OBSERVATIONS

At every site where the interviews were conducted, the questionnaire enumerator visited toilet to look at its condition, hence confirm some of the responses and take pictures as well. In many instances, it was preferred to interview the respondents at the actual toilet site. In this way some of the responses could be easily verified. While conducting field observations, it was found that the type of toilet mostly used is the double vault urine diverting toilet (>95% of the toilets visited). It was also noted that the composting toilets that were earlier constructed in Kisoro town were abandoned in favour of the dehydrating type, urine diverting toilet. Reasons that were given for this were that the composting toilets smelt and had numerous flies. When one toilet was visited and the user interviewed, it was clear that the toilet was not properly used i.e., no bulking agents were added. The users had earlier been taught how to use the toilet by the swTws project but they considered the continual addition of bulking agents as cumbersome, tedious and quite demanding and were therefore not ready to do it. A variety of toilet systems were found in use at households and institutions/public places. Plates 4.7-5.2 were taken during the field observations and they depict the ecosan situation of the toilets in various parts of Uganda.

Some toilets had single vaults where containers were used as faecal receptacles but in the majority of the systems, double vaults were used. In the case of the double vault toilets, the use of the vault was switched when the first vault was filled while in the case of the single vault; the faecal container was removed and replaced with an empty one. In both cases, the purpose was to allow for six months storage for sanitization of feeces before application on farm land. For public toilets, there was a caretaker responsible for receiving money and for ensuring that the toilets were clean. This was mainly at market places where a '*pay-as-you-use*' system is used. For institutional toilets, i.e., in primary and secondary schools, a caretaker was also in charge of cleaning the toilets, ensuring ash was available and emptying the toilets at the end of every term (3 months when the children are at school). Serious operational difficulties related to emptying were noted for public and institutional toilets of the double vault type whereas the single vault type of toilets were functioning well. It was further noted that a urinal and hand washing facilities are essential components that should be incorporated in all ecosan toilets especially those in public places.

Plate 4.7: Low cost ecosan toilets. Starting it up can be built out of local materials.

Plate 4.8: Low-cost Ecosan toilet, Costs about Ug.Shs. 80,000

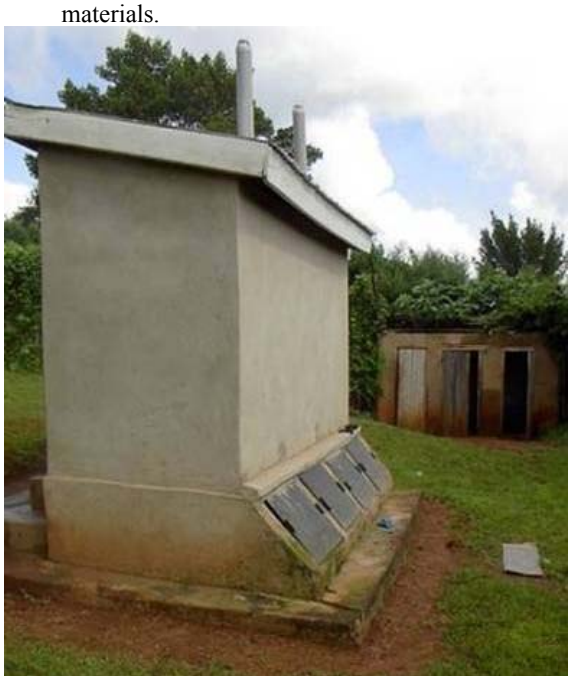


Plate 5.0: Relatively cheap ecosan toilet, Kabale. This unit costs about Ug.Shs. 250,000/=

Plate 4.9: Crestank (U) factory made ecosan toilets installed at Edioffe girls secondary school, Arua

Plate 5.1: The inside of an Ecosan Toilets in Kisoro Uganda

Plate 5.2: The inside of a toilet chamber. Kabale – No smell, no flies, Looks good!

4.4 OTHER INFORMATION FROM LITERATURE AND INTERVIEWING

The sanitation officer in the Governments' South Western Towns water and sanitation Project believes that "*Promotion of ecosan does not focus on changing roles and responsibilities (and it may not happen) but rather on the change of attitude of people (men and women, in their respective capacities) towards recycling and handling (treatment on site and reuse of sanitised material) of urine and faeces*" In EcosanRes Publications Series, Report 2004-5, p21. This implies that in the promotion of ecosan, it may be more beneficial to focus on changing the attitudes of the people in general towards re-use of urine and faeces rather than trying to shift gender roles and responsibilities in sanitation at household level. Men may resist change if they perceive the concept of ecosan being promoted in a different way from the currently held misconception amongst men that sanitation and hygiene in the home are the responsibility of women.

"*When you use flush toilets, they tend to block hence increasing on the plumbing costs. When there is scarcity of ash, soil can be used in ecosan toilets*" Suzan Nankya of Kalungu Girls School. This view seems to mean that ecosan toilets are cheaper that flush toilets, especially when it comes to operation and maintenance. It also shows that when there is no possibility to get ash, ecosan toilets can still be used with soil as the additive. Indeed it was found during the field data collection that some people were using ash in times of shortage of ash.

"*When ecosan toilets are put in place especially in the Urban slum areas where abortions are rampant, these will be reduced because these toilets are accessible at any time in terms of depth unlike the pit latrine*" Katongole of Kalisiso, Rakai district. He further says that "*young kids can access the ecosan toilets without fear of falling into the pit and parents will be secure and confident of their children's lives*" and that "*problems such as wallet falling into pit latrines do not worry users of ecosan toilets since the wallet can be easily retrieved if it fell inside*". Indeed this statement clearly spells out other advantages of using ecosan toilets in addition to the main reasons for which ecosan systems may be implemented namely; disease prevention, environment protection and nutrient recycling.

Tumusiime Alex of Bushenyi said that "*local people in the village identify ecosan toilet owners as knowledgeable clean people hence they also strive to get ecosan toilet*". This is important in ecosan promotion since some people think that ecosan systems are for the poor and may not want to be regarded as poor. When '*knowledgeable and clean people*' use ecosan, there is potential for wider uptake as more and more people will want to be associated with clean technologies.

Twehamye Wilson of Rukugiri said that "*local people see ecosan as a healthy method of human excreta disposal*". This gives confidence to ecosan toilet users and again provides a platform for wider uptake of the concept.

Mwesigye Emmanuel of Kabale reported that "*with the use of ecosan, there is no need of shifting the toilet if the chamber is full like in the pit latrine*". This highlights the superiority of ecosan toilets as compared to pit latrines in that ecosan toilets can be used over and over again (permanency). Indeed during the interviews, many respondents alluded to '*permanency*' as one of the reasons why people opt for ecosan.

Mwesigwa Florence of Mbarara Kyera farm said that "*in ecosan toilets there is low external input and therefore it is sustainable technology*". This highlights that ecosan toilets are sustainable and sustainability is a key component of any given technology.

4.5 RESULTS FROM LABORATORY ANALYSIS OF SAMPLES

4.5.1 NUTRIENTS (N, P and K)

There is a reasonable amount of nutrients from faeces that can be used to enrich soil fertility for enhancing agricultural production. The amount of phosphorus is small, however, all of the measured phosphorus would be available for crops. Not only will the sanitised faeces add nutrients to the soil but they also add humus to the soil. The humus improves the soil structure by increasing the void ratio hence increasing the water holding/retaining capacity of the soil. The results from analysis of nutrients N, P and K are presented in Table 4-3.

Table 4-3: Nutrient values of N, P and K

#	Details	Available P (g/kg)	Nitrogen (g/kg)	Potassium (g/kg)
1	6 months then stored in soil later to be applied to gardens (closed chamber)	0.590	7.4	24.1
2	3 months stored (i.e. closed chamber)	0.224	2.0	60.4
3	15 months still in use (i.e., faeces still drop in sampled chamber)	0.094	4.0	50.9
4	4 months storage (i.e. chamber closed)	0.207	3.4	80.5
5	6 months storage (i.e. chamber closed)	0.783	20.1	34.3
6	Since July 2003 vault still in use (faeces still drop in sampled chamber)	0.084	2.7	74.4
7	2001-2004 still in use (faeces still drop in sampled chamber)	0.264	10.7	61.1
8	6 months storage (i.e. chamber closed)	0.453	3.4	70.3
9	12 months vault still in use (faeces still drop in sampled chamber)	0.142	2.7	42.8
10	9 months still in use (faeces still drop in sampled chamber)	0.081	3.4	47.5
11	1998-2001 put in soil to make compost for 4 days (sample taken from heap of faeces taken from toilet)	0.515	4.7	41.4
12	6 months storage then out for 2 months DWD offices Kabale (closed chamber)	0.445	3.4	48.9
13	In use since Sept. 2002 storage 2 months (closed chamber)	0.235	7.4	39.4
	Totals	**4.117**	**75.3**	**676.0**
	Average	**0.294**	**5.4**	**48.3**

Based on the above analyses, **sanitised** faecal matter should be added to the soil to provide nutrients (N, P and K) to the soil as well as humus for improving the moisture holding capacity of the soil.

4.5.2 PATHOGENS (BACTERIA AND PARASITES)

Composite samples were collected from the toilets and analysed for bacteria and parasites. The results are shown in Table 4-4.

Table 4-4: Measurements of Pathogens from different ecosan toilets

#	Period Description	Bacteria			Parasites
		Enteroccocci	E. Coli	Salmonella	Ova/cysists
1	6 months then stored in soil later to be applied to gardens (closed chamber)	$2.1*10^2$	$1.0*10^1$	Absent	Ancylostoma 150 eggs per gram
2	3 months stored (i.e. closed chamber)	$2.4*10^2$	$8.6*10^3$	Absent	No Parasites
3	15 months still in use (i.e., faeces still drop in sampled chamber)	$2.4*10^3$	$7.0*10^1$	Absent	No Parasites
4	4 months storage (i.e. chamber closed)	Nil	Nil	Absent	No Parasites
5	6 months storage (i.e. chamber closed)	Nil	Nil	Absent	Ascaris lumbricoides 150 eggs per gram of sample
6	Since July 2003 vault still in use (faeces still drop in sampled chamber)	Nil	$5.0*10^1$	Absent	No Parasites

#	Period Description	Bacteria			Parasites
		Enteroccocci	E. Coli	Salmonella	Ova/cysists
7	2001-2004 still in use (faeces still drop in sampled chamber)	Nil	Nil	Absent	Ancylostoma 50 eggs of larvae per gram
8	6 months storage (i.e. chamber closed)	$3.0*10^1$	$2.0*10^1$	Absent	Ascaris lumbricoides 50 eggs per gram of sample
9	12 months vault still in use (faeces still drop in sampled chamber)	$3.1*10^2$	$5.6*10^2$	Absent	No Parasites
10	9 months still in use (faeces still drop in sampled chamber)	$3.0*10^2$	$1.4*10^3$	Absent	No Parasites
11	1998-2001 put in soil to make compost for 4 days (sample taken from heap of faeces taken from toilet)	Nil	Nil	Absent	No Parasites
12	6 months storage then out for 2 months DWD offices Kabale (closed chamber)	Nil	Nil	Absent	No Parasites
13	In use since Sept. 2002 storage 2 months (closed chamber)	$2.0*10^1$	$1.2*10^2$	Absent	No Parasites

The following conclusions can be made from the table of results above:

- First, it was desired to get samples from toilet chambers that were closed and no longer in use. However, such toilet chambers were not always found. Therefore, sampling was also done from toilet chambers that were still in use. It is noted that irrespective of how long the toilets were in use (for example one that was in use for 15 months), indicators of pathogenic microorganisms can still be found as long as the chambers are in use due to continuous contamination from the freshly excreted faeces.
- Six (6) months of storage should not be used as the rule of thumb that the faeces are completely sanitised. Whereas Table 4-4 shows that there is such a possibility that all the faecal indicators (*E.coli*, *enterococci*) and *salmonella* can be completely absent after 6 months of storage, it is a possibility that the faecal matter is not free from parasites, i.e., ova/cysts and in particular eggs of *ascaris lumbricoides*. However, in a properly managed ecosan toilet, for example, the one at the DWD offices, Kabale, there is a possibility that neither of faecal indicators no parasites (*ascaris*) can be found after six (6) months of storage.
- The inactivation of pathogens does not only depend on the prolonged time of storage but also on other factors such as pH (which depends on the type and quantity of additives used), temperature and moisture content. Where such other factors seem to be controlled well, it is a possibility that pathogen inactivation can be achieved after 4 months of storage.
- It is also seen that after six (6) months of storage, the pathogens are reduced to such low levels that risk of infection is significantly smaller.
- As noted from Table 4-4, faeces may not be completely safe of bacteria and other pathogenic microorganisms. Secondary sanitisation is recommended before applying the faeces on the garden. By secondary sanitisation, we mean the processing of faeces outside of the faecal vaults to effect further die-off of microorganisms. This could be prolonged storage in designated areas, composting, chemical disinfection using urea and/or incineration. However, an even much simpler method of simply digging a pit and covering with a layer of soil (0.5 m to 1 m) can be used.
- During the sample collection, the time of storage of faecal matter in the toilet chambers could not be substantiated. Therefore, information told to the study team by the toilet users was relied upon. As no clear records were seen to have been kept by the toilet users, there is a possibility that some of the information may not have been very accurate. In the proposed future studies, study toilets will be identified, the time of closure of the chambers recorded and samples will be taken from the toilets at regular intervals.

6 CONCLUSIONS & RECOMMENDATIONS

6.1 CONCLUSIONS

6.1.1 SOCIAL ISSUES

- There is great potential for wider ecosan implementation and adoption in Uganda. However, to achieve this, there is need for increased community sensitization, awareness creation, promotion, marketing, education and training on skills in ecosan
- The option is more easily adopted in areas with difficult soil conditions where people can be easily sensitized to understand the problem they face.
- There exists a wide range of experiences in ecosan implementation in Uganda. It is generally believed that ecosan is a good method for excreta disposal. Many people need ecosan toilets because they do not smell, they are hygienic and the structures are permanent.
- The concept of ecosan works very well in communities where people are sensitized and educated on how it works and how it is beneficial.
- Generally, people who own ecosan toilets are respected by members of the community
- People need subsidies as they consider the initial cost of ecosan high for them to manage. Ecosan toilets are considered expensive to the great majority of rural poor people.
- In the areas where the study was conducted, there appears to be no significant social or cultural taboos against the use of urine and faeces in agriculture. People are using and/or would like to use urine as pesticide and as fertiliser. Faeces can also be used as fertiliser but some people would rather dispose it off but use urine. Some people are optimistic to handle faeces for fear that they contain pathogenic microorganisms.

6.1.2 POTENTIAL FOR AGRICULTURAL RE - USE

Sanitised faeces contain some nutrients, N, P and K that can enrich the soil and increase soil productivity. Therefore they should be applied to the soil BUT after sanitisation. Sanitised faeces also add humus to the soil which improves the soil structure by increasing the void ratio hence increasing the water holding/retaining capacity of the soil. It is known that urine contains far larger nutrients as compared to the faeces. However, nutrient analysis in urine was not done in this study. Since there were no significant social or cultural taboos against re-use of human excreta amongst the communities studied, there is potential for re-use of urine and faeces in agriculture.

6.1.3 PATHOGEN DIE-OFF

- There is a possibility that all the faecal indicators (*Ecoli*, *enterococci*) and salmonella can be completely absent after 6 months or even 4 months of storage, but may not be free from parasites, i.e., ova/cysts and in particular eggs of *ascaris lumbricoides*.
- **For properly managed ecosan toilets, for example, the one at the DWD offices, Kabale, neither of bacteria indicators no parasites (ascaris) were found after six (6) months of storage**.
- **Six (6) months** of storage **should not be used as the rule of thumb** for faeces to be completely sanitised.
- It was noted that after six (6) months of storage, the pathogens are reduced to such low levels that the risk of infection of people using ecosan is probably very small.
- In toilet chambers that were completely closed and no longer in use at the time of sampling, the relationship between storage time and presence of microorganisms is quite clear, i.e., there is a reduction with time.

6.2 RECOMMENDATIONS

6.2.1 SOCIAL ISSUES

- There is need to intensify community mobilisation, sensitization and marketing of ecosan for wider uptake in Uganda
- Appropriate ecosan designs suitable for the different classes of poor, middle-income and the rich as well as catering for special needs e.g., the requirements for children, the disabled and washer communities should be developed.
- It is important to promote ecosan concepts not only amongst the poor and disadvantaged groups but also as options for the whole range of socio-economic rating.

6.2.2 AGRICULTURAL RE-USE

- There is need for more demonstration of applicability of urine and faeces in agriculture. The quality of products where urine or faeces are used should be investigated for possible risk of disease transmission when consumed.
- Not only is there need for demonstration but continual follow-up, implementation and development of research findings.

6.2.3 PATHOGEN DIE-OFF

- There is need for more research, follow-up and implementation/piloting of research findings.
- The die-off of pathogens in ecosan toilet chambers does not only depend on the prolonged time of storage but also on other factors such as pH (which depends on the type and quantity of additives used), temperature and moisture content. More investigations on this are needed.
- During the sample collection, the time of storage of faecal matter in the toilet chambers could not be substantiated. Therefore, information told to us by the toilet users was relied upon. As no clear records were seen to have been kept by the toilet users, there is a possibility that some of the information may not have been very accurate. In the proposed future studies, study toilets will be identified, the time of closure of the chambers recorded and samples will be taken from the toilets at regular intervals.

REFERENCES

1. Ahumuza E (2004). *Design of toilets for improved operation and maintenance*. Unpublished BSc. Dissertation, Department of civil Engineering, Makerere University, Kampala, Uganda.
2. Akotch J (2004). *Design of toilets for the Children and the disabled*. Unpublished BSc. Dissertation, Department of civil Engineering, Makerere University, Kampala, Uganda.
3. Atlas M. Ronald (1989). *Microbiology. Fundamentals and applications*. Second Edition. Maxwell MacMillan International Publications. ISBN 0-02-946242-8
4. Chaggu E. J. 2004. Sustainable Environmental Protection Using Modified Pit-Latrines. PhD Thesis. Wageningen University. ISBN: 90-5808-989-4.
5. Drangert J-O. (2001). *What would make Ecosan a privileged solution?* Paper presented at the First International Conference on Ecological Sanitation, Nanning, China.
6. Drangert J-O. (2004). *Norms and Attitudes Towards Ecosan and Other Sanitation Systems.* An EcoSanRes publications series, Report 2004-5.
7. Earle A. (2001). *Ecological Sanitation*. http://www.thewaterpage.com/ecosan_main.htm
8. Esrey S. A., Gough J., Rapaport D., Sawyer R., Mayling S-H., Vargas J., Winblad U., (ed) (1998). *Ecological Sanitation*. Novum Grafiska AB. ISBN 91 586 76 12 0 pp1.
9. Höglund C. (2001). *Evaluation of Microbial Health Risk s Associated with the Re-use of Source-separated Human urine*. PhD thesis. Stockholm: KTH.
10. Höglund C., Stenström T. A (1999). *Survival of Cryptosporidium parvum oocysts in source separated human urine.* Can. J. Microbial 45.
11. Holmqvist A., Mŭller Jacob. Dalsgaard A. (2003). *Latrine composting – hygienic evaluation*. In proceedings of the 2nd International Symposium on ecological sanitation April 7-11, 2003, Lŭbeck, Germany.
12. Jönsson H. (2003). *The role of EcoSan in Achieving Sustainable Nutrient Cycles*. In proceedings of the 2nd International Symposium on ecological sanitation April 7-11, 2003, Lŭbeck, Germany
13. Jönsson H., Vinneråas B. (2002). *Handling systems for re-use of urine and faecal matter from urban areas*. Unpublished project application, 2002
14. Mukiibi J (2004). *Design of an improved dry toilet system for the washer community – A cse of Kazo in Kawempe Division*. Unpublished BSc. Dissertation, Department of civil Engineering, Makerere University, Kampala, Uganda.
15. Ntabadde M (2004). *Design of an innovative toilet system to accelerate ventilation*. Unpublished BSc. Dissertation, Department of civil Engineering, Makerere University, Kampala, Uganda.
16. Nuwagaba A (2004). *Assessment of factors that influence households' choice of sanitation technologies and excreta reuse (Ecosan)*. Draft consultancy report submitted to WSP-AF.
17. Refai M. K. (1979). *Manuals of food quality control. Volume 4 - Microbiological Analysis*. Food and Agriculture Organisation of the United Nations, Rome.
18. Schönning, C., Stenström T-A (2004). *Guidelines for the safe Use of Urine and Faeces in Ecological Sanitation*. EcoSanRes publication Series. Report 2004-1.
19. Tushabe A. A. (Pers. Comm. 2005). *Personal communication with Tushabe A. A. about the possible coverage of Ecosan in Uganda*.
20. Tushabe A. A., Mullegger E., Knapp A (2003). *National Strategy to promote ecological sanitation in Uganda*. In proceedings of the 2nd International symposium on ecological sanitation, Bonn,Germany.
21. Vinneråas B. (2002). *Possibilities for Sustainable Nutrient Recycling by faecal Separation Combined with Urine Diversion*. Swedish University of Agricultural Sciences AGRARIA 353. PhD Thesis. ISSN 1401-6249, ISBN 91-576-6167-7.
22. Winblad U., Simpson-Herbert M (editors.) *et al* (2004). *Ecological Sanitation*. Revised and Enlarged Edition. Stockholm Environment Institute. ISBN 91 88714 98 5.
23. Windberg C. (2005). *Linking Ecological Sanitation and Urban Agriculture in Sub-Saharan Africa*. In proceedings of 3rd International Conference on Ecological Sanitation 23 -26 may, 2005 in Durban, South Africa.

ANNEX 1: QUESTIONNAIRES USED DURING INTERVIEWING

MINISTRY OF WATER, LANDS AND ENVIRONMENT

THE DIRECTORATE OF WATER DEVELOPMENT (DWD)

Questionnaire for Documentation and Evaluation of Ecological Sanitation (Ecosan) Experiences in Uganda

HOUSEHOLD QUESTIONNAIRE

GENERAL IDENTIFICATION INFORMATION	
Date:	Questionnaire No.
Town, District:	Division/Sub-county:
Parish:	Village/LC1:
Name of Interviewer:	Name of Supervisor (Checker):

1 BACKGROUND CHARACTERISTICS

1.1 Respondent sex 1) M….. 2) F…..

1.2 Respondent age bracket in complete years? 1 <20 2) 20-34 3) 35-44 4) 45+

1.3 What is your name please? ……

1.4 What is your marital status? 1) Married (2) Divorced (3) Widow/ Widower (4) Separated (5) Single

1.5. How many people are you in your family? (1) 1-2 (2) 2-4 (3) 5-10 (4) >10

1.6 How many of those in 1.5 above live at home? (1) 1-2 (2) 2-4 (3) 5-10 (4) >10

1.7 What is your total weekly expenditure on the various items in your household in Ug. Shs?..……

1.8 Highest level of education of respondent? 1) Primary (2) Secondary (3) Tertiary (4) None

1.9 If respondent is not Head of Household, please provide name of Head of the Household…..……

1.10 What is the occupation of Head of Household?……..…….

1.11 What is the major source of income of Head of Household?...…….……..

1.12 Total earnings of Head of Household per month (Ug.Shs.)

a) 0 – 5,000 b) 5,000 – 10,000 c) 10,000 – 50,000 d) 50,000 – 100,000

e) 100,000 – 200,000 f) 200,000 – 300,000 g) 300,000 – 500,000 h) 500,000 – 700,000

i) 700,000 – 1,000,000 j) More than 1,000,000.

1.13 Position of respondent in Household?

a) Head of Household/Woman/Man b) Son/daughter c) Relative d) Other?

Specify……..

2 FIELD OBSERVATIONS AND LOCATION CHARACTERISTICS

2.1 Location of the Ecosan Facility

Urban ( ) Rural Area ( ) Peri-urban ( )

2.2 Density of housing in the area

Low ( ) Medium ( ) High ( )

2.3 General site conditions

1) Low-lying marshy area hence high water table ( )
2) Hilly and rocky area ( )
3) Hilly and not rocky ( )
4) Clay type of soil ( )
5) Sandy type of soil ( )

2.4 Availability of piped Water supply in the area

Yes ( ) No ( )

2.5 Availability of Institutions

Schools ( ) Markets ( ) Health units ( ) None ( )

2.6 Availability of enterprises supporting eco-agriculture in the area

YES ( ) NO ( )

2.7 If YES in 2.6 above, mention them
1) ……. 2)……

3 HOUSEHOLD EXPERIENCES WITH ECOLOGICAL SANITATION (ECOSAN)

Please visit the toilet and take photos showing main features-take note of the number of stances

3.1 What type of Ecosan toilet does the household possess? Composting ( ) Dehydrating ( )

3.2 How many stances does the toilet have? One ( ) Two ( ) Three ( )

3.3 How many stances are used at a time? One ( ) Two ( ) Three ( )

3.4 Where is the Ecosan toilet located?
Inside the house ( ) Outside of the house ( ) Completely separate from bath ( )
Next room to bath ( ) Other,
Specify……

3.5 Where would you prefer your Ecosan toilet to be placed?
Inside the house ( ) Outside of the house ( ) Completely separate from bath ( )
Next room to bath ( ) Other,
Specify…….

3.6 Why did you locate your Ecosan toilet as described in 3.4 above?
……

3.7 In your family, who decides on the type of toilet to use?..……

3.8 Who actually uses the Ecosan toilets? All members of the Household ( ) Adults only ( )
Children ( ) Guests ( )

3.9 For how long have you been using your Ecosan toilet (years)? 1) <1 2) 1-4 3) 5-10 4) 10+

3.10 What type of toilet did you use before you built the Ecosan toilet you use now?
…….

3.11 What motivated you to build an Ecosan toilet?
…….

3.12 How have you found your ecosan toilet?
…….

3.13 What do you like about it most?
…….

3.14 What do you hate about it?
…….

3.15 What problems have you experienced using your ecosan toilet?
…….

3.16 In your view, what could be done to overcome those problems?
…….

3.17 Have you produced any compost from faeces from your ecosan toilet? 1) YES 2) NO

3.18 If YES in above, for how long was the material retained before use?
…….

3.19 What do you do (or will do) with the compost?
Use if as: a) Fertilizer/Soil Conditioner b) Dispose off c) Other?
Specify……..

3.20 What do you do (or will do) with the urine?
Use it as: a) Pesticide b) Fertilizer c) Dispose off d) Other?
Specify……

3.21 What would stop you from using faecal composts/sanitised faecal matter? Ask if there are any cultural taboos associated with such re-use
…….

3.22 What would stop you from using urine as fertiliser? Ask if there are any cultural taboos associated with such re-use
…….

3.22.1 Are there any known use of urine or faecal matter, whether in the past or currently? Urine: YES ( )
NO ( ) Faecal matter YES ( ) NO ( ) If YES for urine and/or faeces, please specify:
Urine……
Faecal matter……

3.23 Would you eat food from a garden fertilised using urine or faecal matter? Urine: YES ( ) NO ( )
Faecal matter YES ( ) NO ( ) If NO for Urine and or faeces, please specify:
Urine……

Faecal matter……

3.25 What would you like to see changed on your toilet and/or in the way you use it?
1)…… 2)……..…….

3.26 How much did the construction of your ecosan toilet cost in Ug.Shs?.....……

3.27 Was there a subsidy in the construction of your toilet? (N: B) h/h might not know, but if they reveal a low figure e.g. Ug. Shs 10,000 know that there was a subsidy) 1) YES 2) NO

3.28 If YES in above, what was the funding agency?
…….

3.29 In the event of no subsidy, how much would you afford to pay to have such a toilet?
…….

3.30 What prompted you to opt for the ecosan toilet?

High water table ( )
Rocky formation ( )
Because it was cheap ( )
I wanted to recycle nutrients ( )
Other (specify)……

3.31 What have you done/will do when the pit/vault is full?
…….

3.32 Would you recommend ecosan toilets to others? 1) YES 2) NO

3.33 Give reasons for your answer in 3.32 above?
…….

4.0 HOUSEHOLDS WITHOUT ECOSAN TOILETS

4.1 What has stopped or is stopping you from having one?
…….

4.2 What would you like to know or done if you were to have an ecosan toilet?
…….

5.0 USER PERCEPTIONS, COSTS AND PREFERENCES

5.1 Who pays and how much for excreta disposal?……..

5.2 How much is paid for excreta disposal? Ug.Shs……..per month, Ug.Shs. .……per year.

5.3 Where would the family prefer the sanitary facilities to be placed?
Outside ( ) Inside ( ) Completely separate from bath ( ) Next room to bath ( )

5.4 Why are the facilities placed where they are (outside, inside or attached to house)?
…….

5.5 How does the community view Ecosan as a method of excreta management? Are the users of Ecosan toilets respected/despised or other?
…….

Thank you for your cooperation!

MINISTRY OF WATER, LANDS AND ENVIRONMENT

THE DIRECTORATE OF WATER DEVELOPMENT (DWD)

Questionnaire for Documentation and Evaluation of Ecological Sanitation (Ecosan) Experiences in Uganda

KEY INFORMANTS – Project Staff and Other Implementers, Field Engineers (Contractors + Consultants etc)

GENERAL IDENTIFICATION INFORMATION	
Date:	Questionnaire No.
Town, District:	Division/Sub-county:
Parish:	Village/LC1:
Name of Interviewer:	Name of Supervisor (Checker):

Key Informants

Name of Official :…… **Designation**:……..…….

1 Ecosan Project Staff

1.1 How successful has the Ecosan project been?
……
……

1.2 In your opinion, what made it successful/ unsuccessful?
……
……

1.3 How are the Ecosan toilets that have been built by the project managed?
……
1.3.1 Who pays?……
1.3.2 How much do they pay? Ug. Shs. ……per month; Ug. Shs.……per year

1.4 How were the toilets constructed? TAKE A PHOTOGRAPH
1.4.1 Did communities contribute? YES ( ) No ( )
1.4.2 What did they contribute?……
1.4.3 Who were contractors? Local artisans ( ) Registered company ( )
Other, Specify?.....

1.5 Why did you choose Ecosan?
……
……

1.6 Was re-use part of the reasons for constructing Ecosan toilets? YES ( ) NO ( )

1.7 Please give reasons for people's acceptance of the Ecosan toilets?
……
……

1.8 What are peoples' attitudes towards adopting Ecosan toilets?
……
……

1.9 Is there a market for urine, composted faecal matter?
Urine……
Composted faeces……

1.10 Have people used (Will people use) the compost on their own fields?
……
……

1.11 What are the financial (capital) costs of the system;
a) To the household ……..……
b) In total (i.e. if there is a government or project subsidy) ……

1.12 What programmes have you put in place to improve on people's adoption of Ecosan toilets?
……

……

1.13 How often do you go to the people for purposes of sensitising them on Ecosan?

……

……

1.14 What has been the response to your interventions?

……

……

1.15 What major constraints do you encounter in implementing your interventions?

……

……

1.16 How have you gone about the constraints?

……

……

1.17 What lessons have you learnt?

……

……

1.18 Do people access all the necessary information required to put up Ecosan toilets? YES ( ) NO ( )

1.8.1 What information can they get?.....

1.8.2 At what cost?.....

1.8.3 From where?.....

1.8.4 Who is the contact person?.....

1.19 In your view, what do you think constrains people from adopting Ecosan toilets?

……

……

1.20 In your view, what can be done to increase adoption of Ecosan toilets by more members of the community?

……

……

Thank You for Your Cooperation!

MINISTRY OF WATER, LANDS AND ENVIRONMENT

THE DIRECTORATE OF WATER DEVELOPMENT (DWD)

Questionnaire for Documentation and Evaluation of Ecological Sanitation (Ecosan) Experiences in Uganda

MASONS

GENERAL IDENTIFICATION INFORMATION	
Date:	Questionnaire No.
Town, District:	Division/Sub-county:
Parish:	Village/LC1:
Name of Interviewer:	Name of Supervisor (Checker):

Name of Mason:…… Name of Company (where applicable):…….……..

1 Providers (Masons)

1.1 For how long have you been in this business?
……
……

1.2 How did you learn about Ecosan and what prompted you to construct these toilets?
……
……

1.3 How many Ecosan toilets have you built since you started this business?
……
……

1.4 How important is construction of Ecosan toilets to your business?
1) Only a little bit of my business 2) Big fraction of my income?
……
……

1.5 Who else builds Ecosan toilets in this area?
……
……

1.6 How many competitors do you have?
……
……

1.7 How else do you sell the idea of Ecosan toilets? Do people come to you, or do you go to them to sell them the idea?
……
……

1.8 Do you get any help from health promoters, or the government? 1) YES 2) NO

1.9 If YES, what kind of help do you get?
……
……

1.10 Why do people want Ecosan toilets?
……
……

1.11 Why do other people dislike Ecosan toilets?
……
……

1.12 What attitudes do people have about Ecosan toilets?
……
……

1.13 What do you think about the rate of adoption of Ecosan toilets in this area?
……
……

1.14 Can people in this area use: Urine YES/NO? Composted faeces YES/NO?
1.4.1 What can they use urine for? ……

1.4.2 What can they use composted faecal matter for?.....
1.4.3 Why would people not use urine and composted faecal matter/……
……

1.15 Is there a market for compost manure?
……
……

1.16 How about a market of urine as a fertilizer?
……
……

1.17 How much are people willing to pay per ton? (If the mason does not know, ask him who would know)
……
……

1.18 Do you see any potential market in providing collection services for (urine of faeces)?
……
……

1.19 Is there a potential for farmers to use the collected organic material?
……
……

1.20 What makes construction of Ecosan toilets attractive to you?
……
……

1.21 What could make it more attractive?
……
……

1.22 What challenges do you face in constructing Ecosan toilets?
……
……

1.23 How have you managed to overcome those challenges?
……
……

1.24 What toilets do most people in this area possess?
……
……

1.25 What would make people not accept Ecosan toilets??
……
……

1.26 What would be done to make more people adopt Ecosan toilets??
……
……

1.27 What kind of training did you undertake?
……
……

Thank You for Your Cooperation

ANNEX 2: SUMMARY OF RESPONSES (FREQUENCIES)

district

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	kabale	13	21.0	21.0	21.0
	kisoro	9	14.5	14.5	35.5
	mbarara	3	4.8	4.8	40.3
	mpigi	4	6.5	6.5	46.8
	wakiso	5	8.1	8.1	54.8
	masaka	4	6.5	6.5	61.3
	rakai	4	6.5	6.5	67.7
	arua	2	3.2	3.2	71.0
	soroti	4	6.5	6.5	77.4
	rukungiri	4	6.5	6.5	83.9
	bushenyi	6	9.7	9.7	93.5
	ntungamo	4	6.5	6.5	100.0
	Total	62	100.0	100.0	

subcounty

		Frequency	Percent
Missing	System	62	100.0

parish

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	karubanda	4	6.5	6.5	6.5
	mayengo	3	4.8	4.8	11.3
	kyasano	2	3.2	3.2	14.5
	kamuganguzi	1	1.6	1.6	16.1
	south ward	2	3.2	3.2	19.4
	northward	3	4.8	4.8	24.2
	kalumena	1	1.6	1.6	25.8
	gasiza	2	3.2	3.2	29.0
	seseme	2	3.2	3.2	32.3
	rukindo	2	3.2	3.2	35.5
	kyera	1	1.6	1.6	37.1
	nkambo	4	6.5	6.5	43.5
	zziba	2	3.2	3.2	46.8
	kasenje	1	1.6	1.6	48.4
	kakiri	1	1.6	1.6	50.0
	luguzi	1	1.6	1.6	51.6
	bulilo	2	3.2	3.2	54.8
	bukibonga	1	1.6	1.6	56.5
	kalungu	1	1.6	1.6	58.1
	kasambya	2	3.2	3.2	61.3
	matale	1	1.6	1.6	62.9
	kaliisizo	1	1.6	1.6	64.5
	mission	1	1.6	1.6	66.1
	kenya ward	1	1.6	1.6	67.7
	camp swahili	3	4.8	4.8	72.6
	akisim ward	1	1.6	1.6	74.2
	kakinga	2	3.2	3.2	77.4
	rushooroza	3	4.8	4.8	82.3
	bukare	2	3.2	3.2	85.5
	kyazire	1	1.6	1.6	87.1
	kibaale	1	1.6	1.6	88.7
	mutojo	3	4.8	4.8	93.5
	rukiiri	1	1.6	1.6	95.2
	kiliginu central cell	1	1.6	1.6	96.8
	southern zone	2	3.2	3.2	100.0
	Total	62	100.0	100.0	

1.1 sex of the respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	38	61.3	66.7	66.7
	female	19	30.6	33.3	100.0
	Total	57	91.9	100.0	
Missing	System	5	8.1		
Total		62	100.0		

1.2 age of the respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	below 20	6	9.7	11.5	11.5
	20-34	15	24.2	28.8	40.4
	35-44	12	19.4	23.1	63.5
	45+	19	30.6	36.5	100.0
	Total	52	83.9	100.0	
Missing	System	10	16.1		
Total		62	100.0		

1.4 marital status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	married	18	29.0	56.3	56.3
	widow/widower	1	1.6	3.1	59.4
	single	13	21.0	40.6	100.0
	Total	32	51.6	100.0	
Missing	System	30	48.4		
Total		62	100.0		

1.5 number of family member

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2-4	5	8.1	14.7	14.7
	5-10	15	24.2	44.1	58.8
	>10	14	22.6	41.2	100.0
	Total	34	54.8	100.0	
Missing	System	28	45.2		
Total		62	100.0		

1.6 family members living at home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2-4	8	12.9	26.7	26.7
	5-10	14	22.6	46.7	73.3
	>10	8	12.9	26.7	100.0
	Total	30	48.4	100.0	
Missing	System	32	51.6		
Total		62	100.0		

1.7 what is your weekly expenditure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	500	1	1.6	6.3	6.3
	700	2	3.2	12.5	18.8
	2000	1	1.6	6.3	25.0
	3000	2	3.2	12.5	37.5
	5000	2	3.2	12.5	50.0
	10000	3	4.8	18.8	68.8
	60000	1	1.6	6.3	75.0
	48750	4	6.5	25.0	100.0
	Total	16	25.8	100.0	
Missing	System	46	74.2		
Total		62	100.0		

1.8 level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	primary	2	3.2	5.9	5.9
	secondary	13	21.0	38.2	44.1
	tertiary	16	25.8	47.1	91.2
	none	3	4.8	8.8	100.0
	Total	34	54.8	100.0	
Missing	System	28	45.2		
Total		62	100.0		

1.10 occupation of household head

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	house wife	2	3.2	4.5	4.5
	self employed	8	12.9	18.2	22.7
	casual labourer	2	3.2	4.5	27.3
	peasant farmer	5	8.1	11.4	38.6
	professional	24	38.7	54.5	93.2
	student	1	1.6	2.3	95.5
	opinion leader (L C)	2	3.2	4.5	100.0
	Total	44	71.0	100.0	
Missing	System	18	29.0		
Total		62	100.0		

1.11 what is the major source of income?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	profession(salary)	16	25.8	55.2	55.2
	L.C chairman(salary)	2	3.2	6.9	62.1
	trader/trading	2	3.2	6.9	69.0
	selling beer	1	1.6	3.4	72.4
	farming	6	9.7	20.7	93.1
	pension	1	1.6	3.4	96.6
	dobby	1	1.6	3.4	100.0
	Total	29	46.8	100.0	
Missing	System	33	53.2		
Total		62	100.0		

1.12 household head's earnings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-5000	1	1.6	4.3	4.3
	10000-50000	1	1.6	4.3	8.7
	50000-100000	3	4.8	13.0	21.7
	100000-200000	5	8.1	21.7	43.5
	200000-300000	4	6.5	17.4	60.9
	300000-500000	6	9.7	26.1	87.0
	500000-700000	3	4.8	13.0	100.0
	Total	23	37.1	100.0	
Missing	System	39	62.9		
Total		62	100.0		

1.13 respondent's position in household

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	household head/man/woman	14	22.6	46.7	46.7
	son/daughter	9	14.5	30.0	76.7
	health prefect	1	1.6	3.3	80.0
	brother to house hold head	1	1.6	3.3	83.3
	employee	5	8.1	16.7	100.0
	Total	30	48.4	100.0	
Missing	System	32	51.6		
Total		62	100.0		

2.1 location of ecosan facility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	urban	27	43.5	49.1	49.1
	rural area	28	45.2	50.9	100.0
	Total	55	88.7	100.0	
Missing	System	7	11.3		
Total		62	100.0		

2.2 density of housing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low	7	11.3	13.7	13.7
	medium	40	64.5	78.4	92.2
	high	4	6.5	7.8	100.0
	Total	51	82.3	100.0	
Missing	System	11	17.7		
Total		62	100.0		

2.3 general site conditions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low-lying marshy area hence high water table	19	30.6	38.0	38.0
	hilly and rocky area	8	12.9	16.0	54.0
	hilly and not rocky	16	25.8	32.0	86.0
	clay type of soil	5	8.1	10.0	96.0
	sandy type of soil	2	3.2	4.0	100.0
	Total	50	80.6	100.0	
Missing	System	12	19.4		
Total		62	100.0		

2.4 availability of piped water supply

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	25	40.3	45.5	45.5
	no	30	48.4	54.5	100.0
	Total	55	88.7	100.0	
Missing	System	7	11.3		
Total		62	100.0		

2.5 availability of institutions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	schools	10	16.1	20.0	20.0
	markets	13	21.0	26.0	46.0
	health units	2	3.2	4.0	50.0
	none	25	40.3	50.0	100.0
	Total	50	80.6	100.0	
Missing	System	12	19.4		
Total		62	100.0		

2.6 availability of enterprises supporting eco-agri

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	5	8.1	11.6	11.6
	no	38	61.3	88.4	100.0
	Total	43	69.4	100.0	
Missing	System	19	30.6		
Total		62	100.0		

2.7 if yes, mention them

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	demonstration garden	1	1.6	25.0	25.0
	swtws	2	3.2	50.0	75.0
	fish guard	1	1.6	25.0	100.0
	Total	4	6.5	100.0	
Missing	System	58	93.5		
Total		62	100.0		

3.1 what type of ecosan toilet the household possess

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	composting	3	4.8	6.5	6.5
	dehydrating	43	69.4	93.5	100.0
	Total	46	74.2	100.0	
Missing	System	16	25.8		
Total		62	100.0		

3.2 how many stances does the toilet have

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	one	29	46.8	65.9	65.9
	two	11	17.7	25.0	90.9
	three	4	6.5	9.1	100.0
	Total	44	71.0	100.0	
Missing	System	18	29.0		
Total		62	100.0		

3.3. how many stances are used at a time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	one	30	48.4	76.9	76.9
	two	8	12.9	20.5	97.4
	three	1	1.6	2.6	100.0
	Total	39	62.9	100.0	
Missing	System	23	37.1		
Total		62	100.0		

3.4 where is the ecosan toilet located

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	inside the house	3	4.8	5.3	5.3
	outside the house	51	82.3	89.5	94.7
	completely separate from bath	1	1.6	1.8	96.5
	next room to bath	1	1.6	1.8	98.2
	public toilet	1	1.6	1.8	100.0
	Total	57	91.9	100.0	
Missing	System	5	8.1		
Total		62	100.0		

3.5 where you prefer ecosan toilet to be placed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	inside the housee	7	11.3	13.5	13.5
	outside the house	41	66.1	78.8	92.3
	completely separate from bath	1	1.6	1.9	94.2
	next room to bath	3	4.8	5.8	100.0
	Total	52	83.9	100.0	
Missing	System	10	16.1		
Total		62	100.0		

3.6 why did you locate your ecosan toilet as describe above

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	to stop children from using it anyhow	4	6.5	10.3	10.3
	so as people to access and use it	31	50.0	79.5	89.7
	so as to get enough sunlight	4	6.5	10.3	100.0
	Total	39	62.9	100.0	
Missing	System	23	37.1		
Total		62	100.0		

3.7 who decides on type of toilet in family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	father	2	3.2	6.5	6.5
	head of the family	19	30.6	61.3	67.7
	couple	1	1.6	3.2	71.0
	husband	4	6.5	12.9	83.9
	head teacher	3	4.8	9.7	93.5
	managing director	1	1.6	3.2	96.8
	officer in charge	1	1.6	3.2	100.0
	Total	31	50.0	100.0	
Missing	System	31	50.0		
Total		62	100.0		

3.8 who actually uses the ecosan toilets?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	all members of the household	43	69.4	91.5	91.5
	adults only	3	4.8	6.4	97.9
	guests	1	1.6	2.1	100.0
	Total	47	75.8	100.0	
Missing	System	15	24.2		
Total		62	100.0		

3.9 how long have you been using the ecosan toilets(years)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1	15	24.2	31.9	31.9
	1-4	29	46.8	61.7	93.6
	5-10	2	3.2	4.3	97.9
	10+	1	1.6	2.1	100.0
	Total	47	75.8	100.0	
Missing	System	15	24.2		
Total		62	100.0		

3.10 type of toilet you used before ecosan toilet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	pit latrine	37	59.7	92.5	92.5
	ecosan toilet	3	4.8	7.5	100.0
	Total	40	64.5	100.0	
Missing	System	22	35.5		
Total		62	100.0		

3.11 what motivated you to build an ecosan toilet?

		Frequency	Percent
Missing	System	62	100.0

3.12 how have you found your ecosan toilet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	convinient and easy to maintain	34	54.8	79.1	79.1
	requires intensive care	3	4.8	7.0	86.0
	gets filled up easily	2	3.2	4.7	90.7
	misuse by students	2	3.2	4.7	95.3
	not so good	2	3.2	4.7	100.0
	Total	43	69.4	100.0	
Missing	System	19	30.6		
Total		62	100.0		

3.13 what do you like about it most?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	manure	9	14.5	18.8	18.8
	doesnt smell bad	26	41.9	54.2	72.9
	not expensive	2	3.2	4.2	77.1
	young ones cant fall in	1	1.6	2.1	79.2
	confortable and convinient	10	16.1	20.8	100.0
	Total	48	77.4	100.0	
Missing	System	14	22.6		
Total		62	100.0		

3.14 what do you hate about it?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	it stinks on shortage of ash	11	17.7	40.7	40.7
	constant search for ash	8	12.9	29.6	70.4
	gets full quickly	7	11.3	25.9	96.3
	inconvinient to moslems	1	1.6	3.7	100.0
	Total	27	43.5	100.0	
Missing	System	35	56.5		
Total		62	100.0		

3.15 what problems expirienced when using ecosan toilet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	shortage of ash	11	17.7	32.4	32.4
	raises dust when ash is used	2	3.2	5.9	38.2
	not friendly to moslems	1	1.6	2.9	41.2
	sometimes mixes up with urine and faecal matter	4	6.5	11.8	52.9
	gets full fast	4	6.5	11.8	64.7
	requires extensive monitoring	8	12.9	23.5	88.2
	improper use by visitors	4	6.5	11.8	100.0
	Total	34	54.8	100.0	
Missing	System	28	45.2		
Total		62	100.0		

3.16 what could be doner to overcome those problems?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	secure money to buy ash	5	8.1	17.9	17.9
	instructions to visitors before use	1	1.6	3.6	21.4
	provision of bigger vaults	8	12.9	28.6	50.0
	use chemicals instead of cash	4	6.5	14.3	64.3
	education/sensitise users	10	16.1	35.7	100.0
	Total	28	45.2	100.0	
Missing	System	34	54.8		
Total		62	100.0		

3.17 have you produced composts from faeces from ecosan toilet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	21	33.9	42.0	42.0
	no	29	46.8	58.0	100.0
	Total	50	80.6	100.0	
Missing	System	12	19.4		
Total		62	100.0		

3.18 if yes, for how long was the material retained before use?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 month	2	3.2	11.8	11.8
	2 months	1	1.6	5.9	17.6
	3 months	2	3.2	11.8	29.4
	6+ months	11	17.7	64.7	94.1
	2 years	1	1.6	5.9	100.0
	Total	17	27.4	100.0	
Missing	System	45	72.6		
Total		62	100.0		

3.19 what do you do/will do with the compost?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	fertiliser /soil conditioner	40	64.5	85.1	85.1
	dispose off	7	11.3	14.9	100.0
	Total	47	75.8	100.0	
Missing	System	15	24.2		
Total		62	100.0		

3.20 what do you do/will do with the urine?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	pesticide	15	24.2	33.3	33.3
	fertiliser	18	29.0	40.0	73.3
	dispose off	12	19.4	26.7	100.0
	Total	45	72.6	100.0	
Missing	System	17	27.4		
Total		62	100.0		

3.21 what would stop you from using faeceal composts/sanitised faecal matter?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	lack of gardens where to apply it	2	3.2	66.7	66.7
	lack of market for the faecal products	1	1.6	33.3	100.0
	Total	3	4.8	100.0	
Missing	System	59	95.2		
Total		62	100.0		

3.22 what would stop you from using urine as a fertiliser?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	lack of gardens where to apply it	3	4.8	75.0	75.0
	lack of market for the faecal products	1	1.6	25.0	100.0
	Total	4	6.5	100.0	
Missing	System	58	93.5		
Total		62	100.0		

3.23a are there known uses of urine?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	24	38.7	77.4	77.4
	no	7	11.3	22.6	100.0
	Total	31	50.0	100.0	
Missing	System	31	50.0		
Total		62	100.0		

3.23b if yes,please specify

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	used to make measals	10	16.1	47.6	47.6
	pesticides	11	17.7	52.4	100.0
	Total	21	33.9	100.0	
Missing	System	41	66.1		
Total		62	100.0		

3.23c are there any known uses of faecal matter?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	21	33.9	50.0	50.0
	no	21	33.9	50.0	100.0
	Total	42	67.7	100.0	
Missing	System	20	32.3		
Total		62	100.0		

3.23d if yes, please specify

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	fertilisers/manure	14	22.6	100.0	100.0
Missing	System	48	77.4		
Total		62	100.0		

3.24a would you eat from a garden fertilised using urine?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	14	22.6	82.4	82.4
	no	3	4.8	17.6	100.0
	Total	17	27.4	100.0	
Missing	System	45	72.6		
Total		62	100.0		

3.24b if no, please specify

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	the produce is for commercial purposes	1	1.6	50.0	50.0
	appetite goes away	1	1.6	50.0	100.0
	Total	2	3.2	100.0	
Missing	System	60	96.8		
Total		62	100.0		

3.24c would you eat from a garden fertilised using faecal matter?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	41	66.1	91.1	91.1
	no	4	6.5	8.9	100.0
	Total	45	72.6	100.0	
Missing	System	17	27.4		
Total		62	100.0		

3.24d if no, specify

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	appetite goes away on matooke/tomatoes	2	3.2	66.7	66.7
	the produce is for commercial purposes	1	1.6	33.3	100.0
	Total	3	4.8	100.0	
Missing	System	59	95.2		
Total		62	100.0		

3.25 what would you like changed on your toilet /in the way of use?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	include a small washer for anal cleaning	8	12.9	28.6	28.6
	sitting rather than squating	2	3.2	7.1	35.7
	bigger chamber	12	19.4	42.9	78.6
	vent pipe	4	6.5	14.3	92.9
	aeration to be better(vent)	2	3.2	7.1	100.0
	Total	28	45.2	100.0	
Missing	System	34	54.8		
Total		62	100.0		

3.26 how much did ecosan toilet construction cost(ug shillings)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30000.00	1	1.6	3.0	3.0
	35000.00	1	1.6	3.0	6.1
	40000.00	1	1.6	3.0	9.1
	50000.00	1	1.6	3.0	12.1
	100000.00	2	3.2	6.1	18.2
	120000.00	1	1.6	3.0	21.2
	150000.00	1	1.6	3.0	24.2
	250000.00	1	1.6	3.0	27.3
	500000.00	1	1.6	3.0	30.3
	600000.00	1	1.6	3.0	33.3
	700000.00	1	1.6	3.0	36.4
	740000.00	1	1.6	3.0	39.4
	749000.00	1	1.6	3.0	42.4
	800000.00	3	4.8	9.1	51.5
	1000000.00	2	3.2	6.1	57.6
	1500000.00	2	3.2	6.1	63.6
	2000000.00	1	1.6	3.0	66.7
	2400000.00	1	1.6	3.0	69.7
	3500000.00	1	1.6	3.0	72.7
	4000000.00	1	1.6	3.0	75.8
	4700000.00	1	1.6	3.0	78.8
	5000000.00	1	1.6	3.0	81.8
	7000000.00	1	1.6	3.0	84.8
	8000000.00	3	4.8	9.1	93.9
	10000000.00	1	1.6	3.0	97.0
	12000000.00	1	1.6	3.0	100.0
	Total	33	53.2	100.0	
Missing	System	29	46.8		
Total		62	100.0		

3.27 was there a subsidy in the construction of your toilet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	28	45.2	70.0	70.0
	no	12	19.4	30.0	100.0
	Total	40	64.5	100.0	
Missing	System	22	35.5		
Total		62	100.0		

3.28 if yes,what was the funding agency?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	gov't	7	11.3	23.3	23.3
	self/private	1	1.6	3.3	26.7
	donor	22	35.5	73.3	100.0
	Total	30	48.4	100.0	
Missing	System	32	51.6		
Total		62	100.0		

3.29 with no subsidy,how much would you afford to pay to have such a toilet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20000.00	1	1.6	5.0	5.0
	30000.00	1	1.6	5.0	10.0
	50000.00	3	4.8	15.0	25.0
	70000.00	1	1.6	5.0	30.0
	100000.00	1	1.6	5.0	35.0
	200000.00	3	4.8	15.0	50.0
	250000.00	1	1.6	5.0	55.0
	300000.00	2	3.2	10.0	65.0
	400000.00	1	1.6	5.0	70.0
	500000.00	2	3.2	10.0	80.0
	1500000.00	2	3.2	10.0	90.0
	2500000.00	1	1.6	5.0	95.0
	3500000.00	1	1.6	5.0	100.0
	Total	20	32.3	100.0	
Missing	System	42	67.7		
Total		62	100.0		

3.30 what prompted you to opt for the ecosan toilet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high water table	18	29.0	34.0	34.0
	rocky formation	13	21.0	24.5	58.5
	because it was cheap	9	14.5	17.0	75.5
	i wanted to recycle nutrients	7	11.3	13.2	88.7
	experiment new ideas to school	3	4.8	5.7	94.3
	to reduce water bills	3	4.8	5.7	100.0
	Total	53	85.5	100.0	
Missing	System	9	14.5		
Total		62	100.0		

3.31 what have you done/will do when the pit/vault is full?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	use another pit	3	4.8	7.5	7.5
	empty it (later)	12	19.4	30.0	37.5
	empty it for manure and composite	19	30.6	47.5	85.0
	burry the faeces	3	4.8	7.5	92.5
	store then sell to people	3	4.8	7.5	100.0
	Total	40	64.5	100.0	
Missing	System	22	35.5		
Total		62	100.0		

3.32 would you recommend ecosan toilets to others?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	50	80.6	96.2	96.2
	no	2	3.2	3.8	100.0
	Total	52	83.9	100.0	
Missing	System	10	16.1		
Total		62	100.0		

3.33 give reasons for your answer above

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	hygienic	21	33.9	42.9	42.9
	manure/composite	7	11.3	14.3	57.1
	cheap and easy to construct	19	30.6	38.8	95.9
	water sources not polluted	2	3.2	4.1	100.0
	Total	49	79.0	100.0	
Missing	System	13	21.0		
Total		62	100.0		

4.1 what has stopped/is stopping you from having one?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	expensive	4	6.5	66.7	66.7
	lack of knowledge about ecosan	2	3.2	33.3	100.0
	Total	6	9.7	100.0	
Missing	System	56	90.3		
Total		62	100.0		

4.2 what would you like to know /done if you were to have an ecosan toilet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	need for water bills of quantities for ecosan	1	1.6	50.0	50.0
	sensitisation and education about ecosan toilet	1	1.6	50.0	100.0
	Total	2	3.2	100.0	
Missing	System	60	96.8		
Total		62	100.0		

5.1 who pays and how much for excreta disposal?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not yet cost	6	9.7	35.3	35.3
	school	2	3.2	11.8	47.1
	self	4	6.5	23.5	70.6
	management	4	6.5	23.5	94.1
	landlord	1	1.6	5.9	100.0
	Total	17	27.4	100.0	
Missing	System	45	72.6		
Total		62	100.0		

5.2a how much is paid for excreta disposal ug shs per month?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2000	1	1.6	100.0	100.0
Missing	System	61	98.4		
Total		62	100.0		

5.2b how much is paid for excreta disposal ug shs per year?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10000.00	1	1.6	50.0	50.0
	17000.00	1	1.6	50.0	100.0
	Total	2	3.2	100.0	
Missing	System	60	96.8		
Total		62	100.0		

5.3 where would the family prefer the sanitary facilities to be placed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	outside	24	38.7	68.6	68.6
	inside	8	12.9	22.9	91.4
	completely separate from bath	1	1.6	2.9	94.3
	next room to bath	2	3.2	5.7	100.0
	Total	35	56.5	100.0	
Missing	System	27	43.5		
Total		62	100.0		

5.4 why are the facilities placed where they are

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	prevent children to use it any how	2	3.2	10.5	10.5
	appropriate for all people to use	5	8.1	26.3	36.8
	good place	4	6.5	21.1	57.9
	a patient can use it at night	1	1.6	5.3	63.2
	cleanliness	1	1.6	5.3	68.4
	no place for it inside	3	4.8	15.8	84.2
	convinient space at the time	2	3.2	10.5	94.7
	for covinience at night	1	1.6	5.3	100.0
	Total	19	30.6	100.0	
Missing	System	43	69.4		
Total		62	100.0		

5.5 how does the community view ecosan as a method of excreta management?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	indifferent	10	16.1	23.3	23.3
	good excreta mgt system	1	1.6	2.3	25.6
	good	27	43.5	62.8	88.4
	expensive	5	8.1	11.6	100.0
	Total	43	69.4	100.0	
Missing	System	19	30.6		
Total		62	100.0		

ANNEX 3: A FACT SHEET OF EXPERIENCES ON ECOLOGICAL SANITATION IN UGANDA ~ *"Preliminary do's and don't's"*

General

Before presenting the facts arising out of the documentation study, it suffices to describe the kind of ecosan toilets we are mainly referring to. The below gives a description, in general terms, of what is meant by urine diverting ecosan toilets and a general guide of how they should be used. This is then followed by what we refer to as preliminary do's and don't's in ecosan implementation in Uganda.

A UD ECOSAN TOILET, A SUSTAINABLE TOILET, NOW AND FOR THE FUTURE!

1. What is a UD Ecosan toilet?

A UD Ecosan toilet is one, in which the contents of urine and faeces are never mixed. The toilet can consist of a single chamber otherwise known as Single Vault Urine Diverting (SVUD) toilet or it can consist of two chambers, referred to as Double Vault Urine Diverting (DVUD) toilet. No water is used in this type of toilet. The toilet system operates by diversion of urine from faecal matter.

2. Why a UD Ecosan toilet?

A UD Ecosan toilet is a sanitation facility that considers and treats human excreta as a resource NOT waste. This toilet;

- prevents water pollution
- contains and destroys pathogens,
- recycles human excreta as fertilizer

In addition, the UD Ecosan toilet can be constructed indoors, allowing the user to be more comfortable and secure to use it at night. Further, the toilet is constructed once in a life time thereby saving you time, land and money to build another toilet when the previous one is full.

3. How much does a UD Ecosan toilet cost and can be built using local materials?

There exists a range of designs suiting different categories of consumers. Depending on how much money one has, and on how they want the toilet to look like, one unit with double vaults can cost between Ug. Shs. 80,000/= for the cheapest one where mainly local materials are used (**Fig. A-1**); up to Ug.Shs. 1,500,000/= for a high quality double vault single household unit (**Fig.A- 2**).

Fig. A-1: Cheap Ecosan toilet built using local materials

Fig. A-2: Inside an ecosan toilet that can be expensive

4. Having built a UD Ecosan toilet, how do I use it?

For the SVUD toilet, you insert in the chamber a container where the faeces drop and are contained. The container can be a bucket, a polythene bag or basket woven out of papyrus reeds or other suitable local material. For the DVUD toilet UD toilet the faeces drop on the floor of the chamber. For each toilet, there are two holes, the large one (drop hole), and the small one in front of you when you squat or sit. You must defecate in the large (drop) hole while you urinate in the front, small hole. Each you use the toilet, you should add absorbent material, suitably lime or ash, but if you do not have any of these, you can add dried soil or saw dust.

WHAT DO I DO WHEN A UD TOILET VAULT IS FULL?

1. What do I do when the first vault or the container fills-up?

For the SVUD toilet, you will need to remove the faecal container and replace it with a new one, else empty the previous container (by digging a hole in the ground and burying). For the DVUD toilet, you will need to cover the filled-up hole and open or move the toilet pedestal/squat pan and place it over the second vault.

2. Why must I cover/shift the toilet squatting pan or pedestal?

The faecal material in the full vault or container needs to dry out, to get sanitised. You can still use the toilet if the pedestal or squat pan is moved to the top of another vault, or when the container is replaced.

It is important to clean-up after this operation. Therefore, you should wash:

- **the toilet pedestal/squat pan,**
- **Around the toilet; and MOST IMPORTANTLY,**
- **Your hands.**

3. How do I move the toilet pedestal/squat pan?

Stand in front of the pedestal/squat pan, and hold the toilet on each side. Gently move it and pull it out of the floor. Remove the vault cover and put it in a safe place. Now you need to check the pipes.

4. How do I check the pipework?

The pipes for the first and second vault may be joined. Pour a cup of water into the urine pipe to check that it is not blocked. If the water does not go down, the pipe needs to be unblocked.

Please note that if frequent blockages occur, check to ensure that the pipes are of correct sizes. The following are recommended for urine pipes:

- **Vertical pipes should have a minimum diameter of 50 mm,**
- **Horizontally laid pipes should have minimum diameters of 75 mm - 100 mm or more and should be laid at a minimum slope of 1 in 100.**

5. If the pipe is blocked, how do I unblock it?

Pour water into the pipe. At the same time GENTLY push a piece of wire at the point of entry into the pipe. Move the wire back and forth. If the pipe cannot be unblocked, approach the nearest water and sanitation office and ask for help.

6. How do I Put back the toilet pedestal?

Put the toilet pedestal/squat pan over the empty (unused) vault so that the toilet lid opens towards the wall.

Check that the pipe work of the toilet pedestal fits into the pipe work (that you have checked) in the floor.

Gently push downwards so that the toilet fits well over the empty vault.

Replace the vault floor cover over the full vault.

IMPORTANT:
Check that the pipe work is properly connected – pour a cup of water into the urine pipe (the front part of the toilet pedestal/squat pan), look at the back and inside of the vault. You should not see any water coming out. If there is water outside or inside of the vault, the pipe work is not properly done. You need to check it out and ensure that there are no leakages.

Your toilet is now ready for use again until the second vault is full.

WHAT DO I DO WHEN BOTH VAULTS ARE FULL?

A. Do I need any tools??

YES. You will need the following tools:

- A cloth (clean and damp)
- Gloves
- A spade
- A hoe
- A large polythene or Hessian bag or sack

B. How do I prepare?

- Put on gloves to protect your hands.
- Dig a hole, 3 ft long by 3 ft wide by 3 ft deep.
- Do not spread the soil but rather heap it aside the hole because you are going to use it to for covering.

C. How Do I Clean up the vault?

- Put the polythene/Hessian bag or sack under the opening at the back of the first vault.
- Open the back cover of the vault, which you want to empty.
- Use a hoe or spade to rake the manure out of the vault and into the bag. Drag the bag to the hole and then use your spade to shovel the manure into the hole.
- Continue until you have emptied the vault.

D. Do I need to do anything afterwards?

- Use the soil you dug out earlier to make a mound on top of the filled hole
- Walk over the soil until it is flat and hard
- Plant grass over the vegetation on top of the hole
- Tidy up around the toilet structure
- Check to see you did not interfere with urine pipes otherwise check pipe work (detail on first page)
- Put back in place the cover of the vault

E. Now that the vault is empty, what do I do?

- You need to move the pedestal or squat pan and place it over the vault which you have emptied
- Take the plastic floor cover off the first vault
- Put the plastic cover in a safe place
- Move the pedestal back over the first vault
- Put the cover over the full vault
- Clean up, wash the tools and the toilet pedestal and then wash your hands.

Your toilet is again ready for use until the vault is full, then repeat A – E for the closed vault. You will use this toilet for your entire life time! No need to build another!!

PRELIMINARY DO'S AND DON'T'S IN ECOSAN IMPLEMENTATION

The following have been compiled based on interviews conducted, results of microbiological analysis of the samples and a literature review of local, national and international information on ecological sanitation implementation. It must be borne in mind that more information will be generated as more experiences are gained. This takes time for all the information to be exhausted! However, we are convinced that the information below, if used correctly can guide ecosan implementers. We call them "*preliminary do's and don't's*". They should be revised from time to time as more information is obtained and as more research findings are generated. A nomenclature is suggested: DO – Do (a best practice recommended), DNT – Do not do (May lead to serious repercussions).

PRELIMINARY DO'S

DO 1: Introducing ecosan in a community

Any introduction of ecosan in a community must be done after a thorough community sensitization and mobilisation has been carried out. The users must first understand the ecosan concept, must know why they should go for it. The community leaders should be involved in the project, and if possible, implementation should begin from their homes. It is important for one to preach what they practice! and people easily learn from their leaders.

DO 2: Reaching the people

It is important for information to reach the people. Drama shows have an impact, but it may not be possible to reach every one. Selection of place and time of the drama shows is very critical. Arrangements should be made to stage drama shows at public places if possible. One avenue would be to stage drama shows on Sundays at most frequented churches. Radio programmes should also be intensified. Leaflets containing information on ecosan may work, but mainly for the educated. People may not have time to read them and most important, to understand them. Community health workers should move and reach people in their homes, but one easier way is to organise community meetings and meet people as a group because this is les costly and more practical.

DO 3: Building ecosan toilets

Masons trained in building ecosan toilets and not any one that can build a latrine should be involved in ecosan construction. More masons therefore should be trained in building ecosan toilets. A catalogue of trained masons should be available at the water and sanitation offices in districts. Health workers or other staff responsible for supervising construction of ecosan toilets should ensure the works are undertaken by trained masons. People should be sensitised about the need to use trained masons in constructing ecosan toilets. Where construction works for ecosan toilets are to be tendered out, prequalification should include as a pre-requisite that the bidders should have prior training in construction of ecosan toilets.

DO 4: Hygienizing faeces

From different toilets, faeces are not universally safe enough for application in gardens after 6 months or even 12 months of storage in faecal chambers. Therefore, we recommend that they should be treated outside of the faecal chamber (secondary treatment). Although there are many methods to perform this such as additional prolonged storage, composting, chemical disinfection using urea and/or incineration, we recommend the simplest, i.e., burying faeces in a pit, and covering with 0.5 m – 1 m of soil above the faeces.

DO 5: Ecosan options for rich and poor

In the promotion of ecosan concept, various technical options should be developed for the poor, middle income and high income. In this way ecosan options will not be looked as options for the poor only and therefore inferior options. However, it is important that there are very cheap options that the poor can afford, and there should be a range of options from which the rich can choose. This means good architectural designs, use of variety of materials as well as low flush options incorporating wetlands or evapo-transpiration beds for treating flush water and grey water.

DO 6: Options for children, disabled and washer communities

To ease accessibility and assist the children and disabled use ecosan toilets without difficulty and soiling them, technical options suitable for children and disabled should be developed. Some designs are suggested in Chapter 4 of this report. Toilet designs should also be developed to incorporate use of water for anal cleansing especially for the washer communities.

DO 7: Urine as complete fertiliser

Urine is a complete fertiliser with easily available N, P and K that can enhance soil fertility, improve on yields and therefore reduce poverty and improve nutrition amongst peri-urban, urban and rural farmers. Urine should not be applied in its concentrated form. It should be diluted with water in ratios of parts of urine to parts of water ranging from 1(for urine):2-5 (for water) in order to get good yields. Urine should be applied on the soil and worked out in the soil as soon as possible. Urine should not be applied to leaves as it is toxic and may scorch them.

DO 8: Interaction with human excreta

People are wary of using human excreta, especially faeces due to fear of pathogens it contains. This may be more limiting if they have to use or interact with fresh faeces. Therefore, large vaults where faeces can be stored until they have turned into a soil-looking substance before emptying are recommended. A retention period of at least 6 months is recommended.

DO 9: Household Involvement

Ecosan toilets at household level should be managed by households themselves. This includes cleaning and emptying them, addition of ash, operation and maintenance of composts (where they may exist). The more households get involved, the more they can see the relevance resource recovery. There may also be better control of for example, compost products. However, there should be an option for householders who may not want to handle faeces so that they can pay for the service.

DO 10: Private Sector Involvement in Emptying and Cleaning

All institutional ecosan toilets should have a management system responsible for the operation and maintenance including addition of ash, cleaning, operation of composting units (if any), looking after demonstration gardens as well as emptying. A caretaker or an employee should be hired. Where necessary, the services should be hired out to private sector (if such companies exist).

PRELIMINARY DON'T'S

DNT 1: The need for people's acceptance of ecosan

DO NOT attempt to introduce ecosan in a community until when there has been acceptance by the communities.

DNT 2: The need to sanitise human excreta

Human faeces contain lots of microorganisms which may be pathogenic. Most pathogens are used to the body temperatures where they flourish and start dying under conditions in most faecal chambers. The die-off is influenced by a number of factors namely, pH (9-12), moisture content, high temperature (>40°C), ammonia and solar radiation. The die-off in faecal chambers is slow, and depending on whether or not the toilet was used well, and on the additive applied, there is still a risk of infection in using faeces stored in faecal chambers for 6 months or even 12 months.

Based on this, WE DO NOT recommend direct use of faeces on gardens without secondary treatment. Secondary treatment could be additional prolonged storage for say 12 months in a separate designated area, burying the faeces and covering with a layer of soil on top, composting and or incineration of faeces.

DNT 3: Composting and dehydrating toilets

Composting toilets SHOULD NOT be promoted as ecosan options but rather dehydrating toilets should be promoted. People are likely to fail to add the carbon materials hence leading to their failure.

DNT 4: Gender roles and responsibilities

In the implementation of ecosan, DO NOT focus on changing gender roles and responsibilities but rather focus on attitude change towards re-use of human excreta. Men still hold the perception that sanitation in the home is the responsibility of a woman and based on this, they may therefore resist ecosan concepts.

DNT 5: The need to exclude visitors and/or teach them how to use ecosan toilets

DO NOT allow visitors to use ecosan toilets unless you are aware that they have used them before. Else teach them how to use it show them alternative toilets e.g., VIP, ordinary pit latrine or other which they are used to (if it is available).