SEI STOCKHOLM ENVIRONMENT INSTITUTE

Ecological Sanitation in Uganda

Inspirational success stories from the field

NETWAS UGANDA

EcoSanRes
UGANDA KNOWLEDGE NODE

Produced by: NETWAS-U (Network for Water and Sanitation Uganda) 2011

Contents

Acronyms and Abbreviations

AMREF	African Medical and Research Foundation
CBO	Community Based Organisation
Ecosan	Ecological Sanitation
EcoSanRes	Ecological Sanitation Research
EHD	Environmental Health Division
GIZ	Deutsche Gesellschaft fur Internationale Zusammenarbeit
HEWASA	Health through Water and Sanitation
IFAD	International Fund for Agricultural Development
IRC	International Water and Sanitation Center
KCC	Kampala City Council
LeaPPS	Learning for Policy and Practice in Household and School Sanitation
MoES	Ministry of Education and sports
MOH	Ministry of Health
MWE	Ministry of Water and Environment
NARO	National Agricultural Research Organisation
NETWAS (U)	Network for Water and Sanitation (Uganda)
NGO	Non Government Organisation
NWSC	National Water and Sewerage Corporation
O&M	Operation and Maintenance
P/S	Primary school
PVC	Poly Vinyl Chloride
SEI	Stockholm Environment Institute
SMC	School Management Committee
SNV	Netherlands Development Organization
SWUWS	South-Western Umbrella for Water and Sanitation
UDDT	Urine Diversion Dry Toilet

Foreword

These documented cases have been compiled in completion of a 15 months Ecological Sanitation Research Project implemented by Network for Water and Sanitation (NETWAS) Uganda as the ecosanres Uganda Knowledge Node with support from the Stockholm Environment Institute (SEI).

The project is part of an international and development program on ecological sanitation, with a mission to develop and promote pro- poor sustainable sanitation through capacity development and knowledge management.

We are very grateful that through this support NETWAS (U) has been working in close collaboration with the Ministry of Health, a number of stakeholders including district local governments, NGO and schools to promote the uptake of ecological sanitation in the country. Ecological sanitation as a system has some challenges around management, but also has many advantages compared to other available options of pit latrine and flush toilets. It is cheap, does not smell, easy to construct, and a source of fertiliser to boost agriculture production and house hold incomes.

I am very happy to be associated with this publication containing an inventory of cases, best practices from the people using the systems, highlighting the advantages and potential for scaling ecological sanitation in the country.

I would like to thank all the people and organizations that are working in the promotion of ecological sanitation in Uganda. It's through publications like this that knowledge can be passed on to other people who are interested in using ecosan toilets.

Special thanks go to all the people who have contributed in documentation of the cases in this booklet. I however, urge those still doubting the advantages or benefits of ecological sanitation to read these cases to have first hand information from their counter parts who are using this option of safe management of human excreta.

I am looking forward to a future where everyone is using ecological sanitation.
I wish you a nice reading.

Charles B. Niwagaba, PhD
Chairman EcosanRes Uganda Knowledge Node
Department of Civil & Environmental Engineering
College of Engineering, Design, Art and Technology
Makerere University.

Introductory remarks from the Programme Manager

NETWAS - Uganda is very grateful for the support rendered by the Ministry of Water & Environment, Ministry of Health, National Sanitation working group members implementing partners and in a special way the Stockholm Environment Institute for supporting the ecological sanitation Research (Ecosan Res 2) knowledge node in Uganda.
Through this project, we have been able to reach out to a number of stakeholders and communities in different parts of the country promoting pro – poor sustainable ecosan options on ground, as well as bridging the ecosan knowledge gap at community and National level.

The knowledge node has provided a strong network for sustainable sanitation information sharing, knowledge management and expertise in ecological sanitation systems.
Through implementing this project, NETWAS Uganda contributed in closing the ecological sanitation knowledge gaps, has been able to influence attitudes, research and demonstrating sustainable sanitation technological options and approaches.
In a nut shell we have been able to increase awareness on sustainability issues of ecosan amongst stakeholders at local, national and regional levels. We have also strengthened communication and marketing of sustainable sanitation knowledge node products and services in Uganda. We have been able to develop working relationships with technology institutes, NGOs, agricultural groups to design and demonstrate alternative sustainable technology options.
We are looking forward to working with other stakeholders to continue documenting and disseminating information on lessons, best practices and research on sustainability and uptake of ecological sanitation.

Cate Z Nimanya
Programme Manager- NETWAS-Uganda

Launching of the Ecosan Knowledge Node in Uganda at St. James –Biina Primary School. In the picture from the Left Sam Mutono (WSP) Jennifer Namiyangu State of Sanitation and the School Priest

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Definition of key Ecological sanitation Concepts

Compiled stockholm Environment Institute

Sanitation
Sanitation refers to a wide range of services and arrangements intended to improve the hygienic conditions of the human environment

Environmental sanitation refers to the management of human excreta, greywater, sullage water, storm water drainage, solid waste and industrial and agricultural products.

Sanitation System
A sanitation system encompasses the institutions regulating the system, the organisation and management, the users and the entire technical infrastructure required to `achieve collection, transportion, treatment and management of end products of human excreta, greywater, solid waste, storm water drainage and industrial and agricultural waste products.

Sustainable Sanitation System
Sustainable sanitation systems protect and promote human health, minimise environmental degradation and depletion of the resource base, are technically and institutionally appropriate, socially acceptable and economically viable also in the long term.

Ecological Sanitation
Ecological sanitation systems safely recycle excreta and other organic waste products to crop production in such a way that the use of non-renewable resources is minimised.

The statement **'safely recycle'** includes hygienic, microbial and chemical aspects. Thus, the recycled human excreta product, in solid and liquid form, shall be of high quality both concerning pathogens and all kind of hazardous chemical components. This means the product should not pose any significant health threat or environmental impact when used.

The definition of ecological sanitation is focusing on the health, environment and resource aspect of sustainable sanitation. Thus ecological sanitation is not, per se, sustainable sanitation, but ecological sanitation systems can be implemented in a sustainable way and have a strong potential for sustainable sanitation, if technical, institutional, social and economical aspects are cared for appropriately.

Productive sanitation
The term **'productive sanitation',** today used by IFAD and others more and more commonly is a synonym to ecological sanitation and will be used in accordance.

Policy and legal framework related to Ecological Sanitation

In Uganda, the sanitation sub-sector cuts across three ministries; Ministry of Health (MoH) responsible for hygiene and sanitation promotion for households through the Environmental Health Division (EHD), the Ministry of Education and Sports that is responsible for hygiene education and provision of sanitation facilities in primary schools and the Ministry of Water and Environment that is responsible for development of public sanitary facilities and promotion of good practices of hygiene and sanitation in small towns and rural growth centers.

The District Local Governments enforce the Public Health Act and are empowered by the Local Government Act (1997) to enact District ordinances and by-laws. The National Sanitation Working Group comprising of representatives from MoH, MoES, MWE, donor community, Private Sector, NGOs and academic Institutional have a major mandate of operationalizing the memoranda of understanding (MOU), integrate hygiene and sanitation promotion in sector operations and improve cross-sectoral coordination.

The community is responsible for seeking and accessing safe sanitation facilities as well as practice safe sanitation and hygienic behaviour. NGOs, CBOs and the private sector provide sanitation services through the construction of facilities, community mobilization, providing operational and maintenance services, training communities and local governments and carry out advocacy and lobbying activities.

Public Health Act, 1964 revised in 2000: Is the main law that governs the sanitation sub sector, and provides the basis for undertaking measures to prevent and address a range of diseases for the preservation of public health. It states that every citizen is obliged to have access to a latrine at one's home (chapter 281), and it requires that all places of work have latrines.

Decentralization policy: Each Local Government is supposed to make own sanitation ordinances and byelaws. They have to be approved by the council and checked by the solicitor general to ensure consistency with other laws. This could include legislation regarding the development and use of ECOSAN approaches.

The Environmental Health Policy (2005): It specifies that all sanitation facilities should be designed in a manner that reduces environmental impact of unmanaged human waste disposal.

Improved Sanitation and Hygiene strategy (2009): This strategy recognizes ecological sanitation as one of the options to be considered especially in areas with difficult geological conditions.

The Environment Management Statute (1995): The statute stipulates guidelines for inception of new Projects e.g. products and by-products and their effects on the environment and the socio-economic benefits.

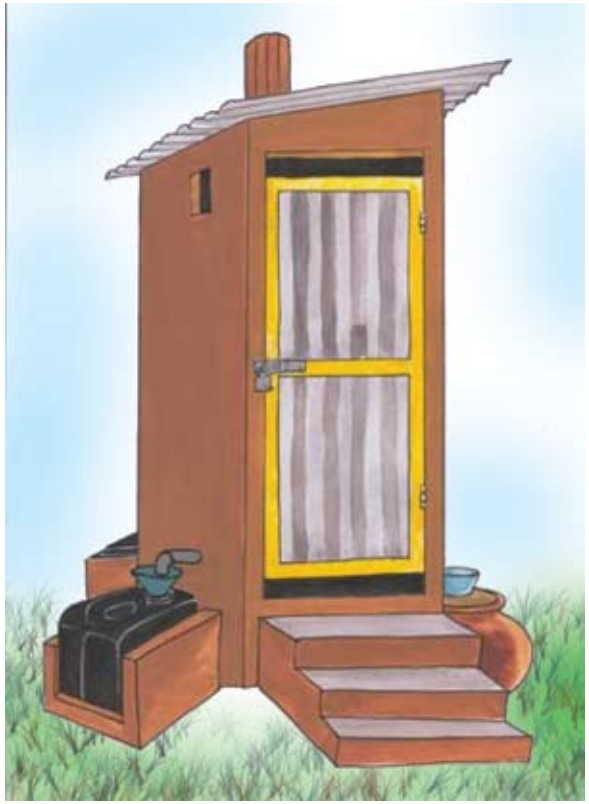
The Water (Waste Discharge) Regulations (1998): This defines Waste to include sewage and any other matter or thing whether wholly or partly in solid, liquid or gaseous state, which if added to any water, may cause pollution. Some of the issues that these regulations stipulate are; standards for effluent.

Ten Year National Strategy on Ecological Sanitation (2008-2018): The overall strategy goal is to improve quality of life in Uganda as water resources and human health are protected by

safe excreta management through sustainable ecological sanitation systems which are implemented at least at 15% of the total sanitation by 2018.

This strategy is composed of four strategy components: coordination and networking, change of attitudes, concept and technology and political plus policy support. These four components or strategy chapters are designed to facilitate the participation of various stakeholders in implementation of the ten year strategy and relate to operational plans. They are embedded in three pillars of: demand (development of improved tools based on social marketing techniques, marketing of sanitation technologies, introduction of social marketing), supply (expanding existing ecosan programs, product improvement) and enabling environment (dialogue with private sector, investigate sources of ecosan failures).

The Ecosan latrine that was introduced in Uganda in 1996 is recognized in the ten year Improved Sanitation and Hygiene Financing strategy as one of the options to be considered especially in areas with difficult geological conditions.



History of Ecological Sanitation in Uganda

Engineer Tushabe Austin, the Assistant Commissioner in charge of planning Rural Water Department, Ministry of Water and Environment is an Ecosan guru and also one of the pioneers of the approach in Uganda.

He defines Ecological Sanitation (Ecosan) as an approach of human excreta management; going beyond disposal and hygiene improvement. It's an approach to human excreta management that emphasizes the need to recover the nutrients- largely urine "which is relatively pathogen free and also to recover nutrients from faeces after sanitization".

He says the Ecosan approach was introduced in Uganda by officials of an Austrian founded project to the Ministry of Water in 1996 as one of the options to provide sanitation facilities to rural growth centres which did not have easy access to safe water and adequate sanitation. The approach was favoured compared to pit latrines because latrines contaminate ground water while flush toilets also use a lot of water at the same time contaminating water bodies especially when septic tanks are emptied into wetlands or near water sources.

Ministry of Water and Environment Interventions:

To scale up the approach, the Ministry of Water and Environment has since played a key role in demonstrating and disseminating information about ecological sanitation concepts and practices through seminars and on job training. The ministry has also been instrumental in influencing other policy makers in the country to promote Ecosan approach as the future for safe human excreta management.

Success stories of Ecosan implementation:

Currently there are over 30,000 units of Ecosan toilets at household level, schools and public institutions in the country. These are mainly found in areas where the water table is high, rocky grounds and unstable soils.

At community level, households with Ecosan toilets have registered reduction in flies and foul smells while on the other hand productivity of bananas, maize and other crops have increased as a result of applying urine and human manure.

Key challenges faced in the Ecosan promotion

The commissioner adds that, the major challenge is with attitudes and conservatism where key policy makers don't want to discuss topics related to human excreta because it is not culturally fitting to publically discuss human excreta- many people shy away. Another challenge is many people still have got all sorts of prejudices and taboos leading to a negative perception and attitude towards the use of human excreta especially faeces as fertilisers.

Recommendations to Ecosan implementers

"Whereas polio and other killer diseases like small pox were eliminated as early as the 20th century and great discoveries like penicillin were made, this 21st century ecological sanitation is the solution to social economic development of the world by reducing diseases burden, pollution of ground water resources and recovering of nutrients especially phosphorous for food and crop production.

ECOSAN: The best Approach to excreta management

COMPILED BY DERRICK SSEWANYANA-**NETWAS-U**

Over the years, two basic approaches to managing human excreta have existed in the world. The approach of ***"drop and store"*** which involves confining faeces and urine a dug hole so that it is kept from the public to decompose. This is commonly seen in form of the traditional pit latrines commonly found in many developing countries.

The second approach is the ***"flush and discharge"*** also known as the conventional method that is common in the developed regions. It involves flushing the excreta away and diluting it in surface water bodies like rivers and lakes.

These two approaches are associated with a number of issues including ground water pollution and land shortage for the construction of new pit latrines when old ones are full. The flush and discharge system involves the loss of large amounts of water, sometimes contaminating fresh water bodies. The approach is also costly in terms of high investments in installation of plumbing and treatment of waste water systems.

As a result, a lot of valuable agricultural fertilizers are lost through the use of these systems which perceive human excreta as ***"waste",*** and are therefore not returned in to the soils to close the loop. According to Stockholm Environmental Institute (2004), 1 person per year looses between 400 and 500 litres of urine, 50 litres of faeces and about 15,000 litres of pure water that is flushed away. This amounts to the loss of 7.5 kg of nitrates, phosphorus and potassium which can produce 250 kg of grain per year.

A sustainable, closed loop approach that treats human excreta as a resource is an alternative for the two approaches. The approach of Ecological sanitation (Ecosan) is based on 3 fundamental principles of; preventing pollution rather than attempting to control it, sanitizing urine and faeces and using the safe products for agricultural activities. It is an approach of ***"sanitize and recycle".*** The Ecosan approach interrupts the cycle of pathogens through sanitization of excreta by either dehydration or decomposition mechanisms. This system can be tailored to the needs of the users in modern, convenient, desirable, gender friendly and economically sustainable means. This is possible through the provision of a wide range of Ecosan toilet options with varying costs and training up the local personnel to construct the facilities for themselves.

The commonest Ecosan toilet designs include; Urine Diversion Dry Toilet (UDDT) that operates by the principle of dehydration, Fossa Alterna and the Arborloo (that operate by the principle of composting). The Ecosan approach is an equitable and sustainable paradigm since it suitably addresses the aspects of diseases prevention by destroying faecal pathogens ensures environmental protection by preventing pollution of water sources and recycles nutrients by returning them to the soil inform of '' humanure.'' Due to the various costs and designs available. It is affordable as well as culturally and aesthetically acceptable and yet simple to maintain in terms of technical capacity, institutional frame work and technical resources.

The Ecosan approach is becoming a big reality in Ugandan community. This has been envisaged in a number of households using Ecosan toilets in different parts of the country. Below are testimonies from community members using Ecosan toilets for which majority have Urine Diversion Dry Toilet (UDDT) some have the Arbo loo type. These cases highlight relating to sustainability, operation and maintenance (O&M), reuse of the products of Ecosan in agriculture and acceptability of the facilities. The cases also elucidate the local perceptions associated with the Ecosan toilet in the Ugandan context.

Sanitation for Increased Agriculture Production:
A case of a subsistence farmer using urine as fertilizer

COMPILED BY BRENDA ACHIRO AND MICHAEL JONGA, **NETWAS UGANDA**

One of the passions fruit gardens where Ecosan by products are used as fertilizers

Background

Kasayi village is found in Kyampisi Sub-county, Mukono district about 10km from Mukono town in central Uganda. Coming from a family of nine children, Miss Kairu Agnes traces her farming experience to her childhood. Her parents had a farm from which they derived a livelihood. They used to grow beans, cassava, and maize which they consumed at home as well as distributed coffee to the local schools for an income.

As a child, Agnes recalls that food was not bought from the market but supplied from the family garden. By then her parents used expensive fertilizers; Nitrogen, Phosphorus and Potassium (NPK) that were applied in the garden, but later on started using animal waste as fertilizer in their cassava and maize plantations.

Now as an adult, Agnes has her own garden from where her family earns a livelihood after selling the agricultural products. To boost her farm output, Agnes has been applying urine from an Ecosan toilet ever since September 2007 to date.

First encounter with Ecosan toilet

Agnes first heard of an Ecosan toilet in her childhood days when her auntie from Ibanda district broke the news of a new type of toilet to her mother, from which urine is collected and applied onto a banana plantation, resulting in a healthy banana plantation.

Seeing the wonder toilet at her parents' home, Agnes thought it a good idea to have one constructed for her in Mukono district at her farm house. An Ecosan mason was introduced to the family and he constructed the first Ecosan in the home.

Agnes learnt to collect and mix urine with water at a ratio of either 1:4 or 1:3, and spray it on the crops. In addition, she also learnt how to make compost manure by decomposing animal waste and green matter. She is currently practicing small scale farming but with great hope of going commercial with a pineapple project.

Access and application of urine

To meet the demand for her farm, Agnes collects urine from Biina Primary School in Luzira and from Faculty of Technology, Makerere University.

She uses only urine on her farm now, but has plans of using faecal matter to improve soil composition. She applies urine three times before planting as a way of getting rid of pests. The urine is applied in the gardens using a knap suck pump to spray. Before application, urine is stored in containers for about one week.

She has applied urine to pineapple, cassava, matooke (banana), avocadoes and orange gardens which have all had good yield. Animal dung is composted and used to supplement urine application.

In the season of March 2009, the first time when Agnes applied urine as a fertiliser to her garden, she harvested about 200kg of maize, 85 kg of beans from an acre of land, and she was so excited with the harvest.

Agnes experimented planting potatoes without urine application and her experience was that the yield was so poor and had been infested with worms. She then rested the land and later sprayed with urine, she planted peas - **"gobbe"** on that same piece of land and the results were good because this time her crops were not infested with worms- which she attributes to urine application.

In the past, her garden had anthills all over the place. She says, 'all **the anthills have disappeared, and I spend less funds on purchase of pesticides because urine has done it all.'**

Agnes standing next to her Ecosan latrine

Agnes plucks a weed out of her vegetable garden

Pineapples ripening for the next harvest

Cost implication

The cost of construction of the two stances of Ecosan toilet on Agnes' farm was UGX1, 000,000(2500 USD). She buys 20 litre Jerry can of urine from Biina Primary School, Luzira and Makerere University, Faculty of Technology at UGX 5000 (2 USD), the spraying pump currently costs UGX 300,000 (125 USD). The heavy duty gloves cost UGX 4000 (1.6 USD) while the cost of gumboots is UGX 35000 (15 USD). These are used to avoid contact with faeces and urine. Transportation of urine is at UGX 20,000 (8 USD) from the school to her garden.

Training in Ecosan

Agnes has never had training in handling and use of Ecosan by products, but through experience and observation of what her parents used to do, she uses a dilution ratio of litre of urine to three of water (1:3 or 1:4), or as deemed appropriate. She at times uses a higher ratio for fruits of 1:2 which produces good results.

She is happy that that she can now get relevant information and technical advice about the use of Ecosan by products from Micheal Oketcho eCOSAN COORDINATORof the Ministry of Water and Environment.

Agnes' bumper harvest

August 2009, was a hot and dry month, despite this Agnes had a good harvest of beans and maize. That season she harvested 170kg of maize flour and 70 kg of beans from half an acre.

During the month of July/August 2010, Agnes harvested 2 trucks of pineapples (each carrying 2000 pineapples), a total of 4000 pineapples were harvested and sold to a private juice company, earning UGX 2,600,000 (1,084 USD). She now looks forward to another in the years to come.

Her neighbours have appreciated the Ecosan toilet in her farm, but many are not yet convinced of the safety of using urine.

Challenges

Despite the above, Agnes faces the problem of limited access to water for dilution purposes. The nearest water source is 2km from her farm, thereby spending much of her time collecting water. As her farm becomes bigger and bigger, getting enough urine to use on all the crops is becoming very costly and she has only two sources where she can collect urine but still not enough for large scale farming. This forces her to use high dilution ratios of 1:4 so as not to waste the urine. The transportation costs of urine from the main collection source to the farm has become very expensive due to high fuel costs.

Agnes is looking forward to training other neighbouring households, family members, her workers` and other interested villagers. She has plans to put tiles on the floor of her Ecosan toilets and make it more user friendly and attractive. (There is still need for technical support on issues of right urine ratios for specific crops and safe handling of by products).

Arbor loo:
Easy to use and smell free toilets. A case of Mr. Mawa John a mason trained by NETWAS-U

COMPILED BY DERRICK SSEWANYANA AND DANIEL MWESIGE-**NETWAS-U**

Mr. Mawa John is a trained mason and owner of an Arbo loo latrine at his home in Lobule Sub County in Koboko district. He learnt about the Arbo loo latrine during a the training under the LeaPPS Action Research Project implemented by NETWAS-(U) that was aimed at capacity enhancement of the local artisans. The Arbo loo was constructed at his home in November 2009 using locally available materials.

"Before building my Arbo loo, I used to have an ordinary pit latrine which had logs placed over a pit and with walls made of burnt bricks," Mr Mawa said "This kind of latrine never used to last beyond 2 years because the poles were weak and would easily collapse. The pit was as deep as 5 meters and this took a lot of time and labour to dig. Ever since I acquired new knowledge on the Arbo loo latrine things changed. I am very grateful to the training; I no longer have to face the dangers of using a latrine which can collapse any time."

"Since 2009, my family of six people has been using this type of latrine, but we have never filled up the one and a half meter deep pit of the latrine" he said. "When full I will just cover it up and plant a jack fruit tree and shift the facility to a new site," he added.

He also plans to recycle the bricks, slab and roof from the old latrine when constructing the new one which makes it really cheap. He adds that all his family members have learnt how to use this type of latrine.

"It is really a good latrine because it does not smell if adequate ash and soil are applied after use. Ever since I started using this latrine my life changed for good, I get visitors from the other parishes, sub counties, organizations and from other districts who come here to learn from my experience with the type of latrine. I am now a famous man in Koboko district. But the main challenge I face is that of promoting this technology among my neighbourhood- the Muslim community; these people use a lot of water and at times they do not mind applying adequate ash and soil after visiting the facility which makes it smell badly. My children also waste the ash and soil when am not around to watch over them," he added.

Mr. Mawa advises those who do not have this type of latrine to construct one because of the advantages it has. One needs only 10 kilograms of cement and an iron bar that cost about UGX 17,000 (7 USD) to make the slab. The total cost of construction, doesn't even amount to UGX 50,000 (21 USD). Locally available materials can be used for the other parts of the facility like the super structure. When the pit is full, one can easily recycle the building materials and use them on the new facility.

Community members visiting Mr. Mawa's Arbo loo for replication

Ecosan: the most cost effective alternative

COMPILED BY FRANCIS NAMARA

Tom Wakisi next to his Ecosa

Floor made of timber

Inside the vault chamber

Tom Wakisi lives in the Water Village, Luzira Parish, Nakawa Division in Kampala City. He works with the Directorate of Water Development in the Ministry of Water and Environment as an Architect. He constructed an Ecosan toilet using timber. Below he narrates his experience with Ecosan toilets.

"I learnt about Ecosan through sensitization carried out by Directorate of Water Development where I work. I learnt that one can use this type of toilet for a long time, cheaper to construct with local materials especially when you have no money.

Earlier on I had a pit latrine, then I decided to construct an Ecosan toilet using timber for the superstructure. The cost of my one stance toilet was UGX 800,000/= (333 USD). I met the full cost of the toilet without any subsidy or support.

The toilet is a single vault compost dry Ecosan that separates urine from faecal matter. Ash that is added to the faecal matter is available and locally generated by my family.

"I use urine collected from the toilet as fertilizers in my garden, this urine is normally kept for at least 2 weeks before applying it in the garden. This is to ensure that all pathogens die before applying the urine. I don't sell the urine because it is not even enough for my own garden," he said. "For the compost, when the bucket is full, I remove it and burry the faecal matter in a pit. I don't use it in my garden and there is no ready market for it. The major challenge with this toilet is removing the faecal matter which is still fresh." Since I have only one vault.

He concludes that, Ecosan toilet is not expensive as most people think. The super structure of the UDDT can be constructed with local affordable materials like timber, mud and wattle. The problem is with the people who promote this technology using expensive materials in demonstrations something which scare away the poor from embracing Ecosan approach.

A friendly system for the Muslim society

A case of Hanifa Nakawunde in Kampala

COMPILED BY DERRICK SSEWANYANA -**NETWAS-U**

Hanifa Nakawunde lives in Kulambiro village, Kyanja Parish, Nakawa, one of the administrative Divisions of Kampala city. She is a Muslim lady owning an Ecosan toilet at her home. She does not agree that using Ecosan conflicts with her religious practices.

"I have been using a pit latrine before but learnt about Ecosan toilets through sensitization by Kampala City Council (KCC) health officials. I was convinced to construct one because I wanted manure from the compost and urine to use in my garden. You can't get manure from a pit latrine for a garden.

The motivation was that after contributing UGX 100,000 (42USD) KCC was to assist me in constructing the toilet.

On completion, the toilet was a single vault dry compost Ecosan that separates urine from faeces. There is a washer trough for Moslems inside the facility and a jerry can for tapping the urine outside the toilet. I specifically requested for a washer trough because as a Muslim, we use water for anal cleansing and it as well helps to avoid the mixing of water with faeces.
I use urine as fertilizer in my garden after keeping it for two weeks. For the compost, I remove it from the toilet, burry it for 6 months before applying in the gardens. I don't sell compost because I use it as manure in my gardens.

I like my Ecosan toilet because it saves me the burden of digging new pit latrines whenever old ones fill up. It saves land and improves crop productivity through providing manure. The only problem I have with Ecosan toilet is that the elderly and physically challenged people sometimes cannot easy climb the high stares on the structure.

Also removing the compost, is difficulty, no one wants to do it except myself. My message to others and particularly Muslims is that using Ecosan toilets is not in appropriate for Muslims. You can still use water provided there is washer trough. Ecosan saves and preserves land ".

Hanifa's beautiful Ecosan constructed with support from KCC

Urine harvesting at Hanifa's Ecosan

Registered success with Ecosan;
A model toilet in South Western Uganda- Ntungamo district

COMPILED BY DERRICK SSEWANYANA -**NETWAS-U**

Ms Monica at her Ecosan

Ms Monica's banana Plantation

Ms Monica Sebune a retired mid wife continues to provide maternity services at home in Kampala "mukadde" village, Mutojo parish, Rubare Sub County in Ntungamo District. She is one of the beneficiaries of the South-Western Towns Water and Sanitation Projects (SWTWSP) with an Ecosan toilet. Below is her experience with Ecosan toilets.

"I learnt about Ecological sanitation toilets from health officials from Ntungamo district who visited my village in 2005. These sensitized us about Ecosan; how they are operated and their advantages; and encouraged me to adopt the UDDT technology. At first I was scared; I asked them why they had chosen me and not anybody else to host an Ecosan demonstration. They responded that it was because I had a model home in terms of hygiene and agriculture activities.

I was also motivated when I heard that the Ecosan toilet would provide manure for my banana plantation. At that time I was using a pit latrine.

The cost of constructing this Ecosan toilet (of one stance and two chambers) was UGX 1.5 million (about USD 800). That was a lot of money which I couldn't afford. It was all paid by South – Western Towns Water and Sanitation Project locally known as ' Maizi Marungi'. My neighbours admire my toilet but are too poor - cannot afford to construct it. I must have been lucky to have got one free of charge.
My toilet separates urine from faeces. We are happy with it. Both males and females use it comfortably without any problem.

When I receive visitors, I teach them how to use the toilet before letting them use it. There are no major challenges in using this toilet except when it is used by persons who don't know how it is supposed to be used. They mix urine with faeces or don't apply ash which causes the toilet to smell.

I collect urine, when the jerry can is full It is kept for 3 – 4 weeks before applying it in the garden. This is to reduce the acidic content within the urine. After 4 weeks, I add water to the urine to further reduce the acid content. The ratio is 1 litre of urine to 2 litres of water (1:2). I then apply the urine to my banana garden. I don't apply directly on the banana plants; I leave a distance of at least 1 foot to avoid the acidity in the urine from burning my banana plant.

For the compost, when the chamber is full, I cover it for 6 months to enable the faeces decompose. After that, we remove the compost from the chamber and put it in another pit and cover it for a period of one month for further decomposition before applying it in my garden. I don't have surplus to sell because all the urine and compost I generate is not adequate for my own requirements.

Since I started applying urine and compost in my banana and fruit plantation, the yield and quality has greatly improved. I no longer harvest small banana bunches from my garden these days and the quality of my fruits is also good.
I have no problem with eating food grown using urine and compost as fertilizers. In any case do we know how other foods we buy from the market are grown?

My last word is to encourage those who can afford to construct this type of toilets because they are user friendly, don't waste land, reduce cost of frequent construction of latrines and they are a source of cheap fertilizers.
I am proud of my Ecosan toilet; it is a demonstration site for South-Western Towns Water and Sanitation Project in this region. I receive visitors from as far as Mbarara district who come to learn about Ecosan."

Fruit farming with Ecosan products:
Lesson from Fustino Twayaga, Kabale district

COMPILED BY FRANCIS NAMARA

Fustino Twayaga is a retired tutor from Kabale National Teachers' College lives in Rutega Zone, Nyabikoni Ward, Southern Division in Kabale Municipality. He is a beneficiary of the South-Western Towns Water and Sanitation Project (SWTWSP) with an Ecosan toilet and is proud to share his experience.

"I conceived the idea of having an Ecosan toilet from my work as a tutor at Kabale National Teachers' College (NTC) and from my daughter who was working with the South-Western Towns Water and Sanitation Project. As a tutor, I used to take students for teaching practice in schools where I saw Ecosan toilets. I was impressed with what I saw. I contacted my daughter who was working with South-Western Towns Water and Sanitation Project in 2004, She educated me about the Ecosan system, how it is used, benefits like manure and the procedure for getting one. At that time, I was using a pit latrine. I would construct pit latrines of 12 feet but every rainy season they would collapse because of sandy soils.

I contacted the project which agreed to construct for me an Ecosan toilet on cost sharing basis. The cost for this toilet (one stance with 2 chambers) was UGX 1.2 million (US$ 500) in 2004. I contributed half UGX 600,000 (250 USD) and the project contributed the rest. Since then, I have made some improvements by adding tiles in the toilet at my own cost.

The toilet separates urine from faeces and has a washer. In the past we used to supplement home generated ash with buying some from the NTC at UGX 5,000 (2USD) per sack. These days I invented another way of generating ash. We collect dry sorghum stems and burn them for ash.

I collect urine in a tank of 100 litres, when the tank has reasonable quantity; I replace with another container and store the collected urine for 21 – 30 days. I get leaves of phobia plant and dip in the urine for 3 days to drain from leaves the nutrients. I add tethonia plant, ash and pepper. This mixture stays for 21-30 days before applying it in the garden. I also mix urine with water in a ratio of 1 litre of urine to 4 litres of water (1:4) during rainy season and 1:6 during dry season. I do this to reduce the acidic content in the urine such that it does not burn the plants. I use knap sack pump sprayer to apply this urine cocktail to the vegetable and fruit gardens. This urine works as fertilizer and pesticide.

With regards to the compost, when a chamber fills up, I cover it and leave it for 6 months to allow the faecal matter to decompose. After this period, we transfer it to another pit for further decomposition for 2 months then apply it to the fruits and vegetable gardens. I grow apples, guavas, oranges, peers, avocados, grapes pineapples spinaches, onions and cabbages. Much as this is a dry season, my vegetables look healthy. The size of apples, cabbages and onions is big. My apples sell at UGX 300 – 500 each and during a good season, I get over UGX 2 million (834 USD).

At the beginning, some household members resisted using the Ecosan toilet because they did not want to touch ash. However, this has changed and they currently apply compost and urine in the gardens.

The major challenge is management of Ecosan toilets. Sometimes my children go and use the toilet but stubbornly refuse to apply ash. You have to inculcate the culture of applying ash after using the toilet.
The urine pipe needs regular unblocking. The tap on the urine tank also needs regular repairs and cleaning. My neighbours do not have Ecosan toilets because they cannot afford the cost of construction. Others are ignorant about Ecosan and have not visited my toilet to learn about Ecosan toilets.

Urine harvesting at Mr. Faustino's Ecosan

Using Ecosan products to grow crops:
A farmer case of John Serwanga Kyanja, Kampala district

COMPILED BY DERRICK SSEWANYANA -**NETWAS-U**

John Serwanga lives in Kyanja village, a peri-urban area of Kampala City Council (KCC). He was introduced to the use of ecosan products (urine and faeces) through a research project, involving KCC and other institutions where he was among 20 farmers selected to take part in the study way back in 2005.

With support from KCC, these farmers were able to access urine and later faecal sludge for application on their crops. In addition, KCC trained these farmers, transported urine and faecal sludge to the village and took them for study tours to see successful farmers using Ecosans.

John uses the urine on vegetables, sweet corn and bananas while the faecal sludge is used on bananas only. He said that he also uses other organic soil conditioners including compost manure, cow dung and cow urine. He sometimes combines these products, for example, when planting; he would use compost and boost it with urine. The urine is kept in a jerry can for 2 weeks, diluted with water and mixed with red pepper and ash before it is applied.

Although the project has ended and he has moved away from Kyanja, John has continued using human urine, collected from members of his household. He gets more urine during the holidays when all his children are at home.

Benefits: According to John, the urine is more beneficial than the faecal sludge, which he has stopped using. He also asserts that it is better than cow urine. He says that the quality of green vegetables improved a lot, as well as the quantity, with the production time being longer. The banana bunches are also bigger and he would sale each bunch between UGX 10,000 and 20,000 (4-8USD). Regarding sweet corn, the use of urine led to production of 2 cobs per plant instead of one cob per plant as usual without the urine. He is now using the urine to grow other fruits like passion fruit.

Attitude: While his family has no problem with eating the products of urine, John says some neighbours refused to buy his products once they learnt that he uses urine. As a result, he no longer tells them that his crops are grown on human urine.

The use of Ecosan is becoming a significant achievement in many institutions in Uganda. Inadequate land, high populations that lead to frequent filling up of pits, odours and other limitations have been associated with the pit latrines and for this reason, the Ecosan is becoming more popular in institutional setting. The following cases discuss issues of operation and maintenance, re-use of the Ecosan by products and local perceptions.

Ecosan- a feasible option for schools:
Lesson from St. James Binna Primary School in Kampala

COMPILED BY IDA COLEMAN AND DERRICK SSEWANYANA -**NETWAS-U**

Binna Primary School is located in Mutungo Parish, Nakawa Division in Kampala City, to date the school has a population of 720 boys and 985 girls. The school learnt about Ecosan from a seminar organised by the Directorate of Water Development (DWD).

The school management liked the idea of Ecosan toilets and accepted the assistance from DWD. At that time, the school was using pit latrines and the space for constructing new latrines was getting finished. Ecosan toilets were seen as more appropriate for the limited space available.

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The Ecosan toilet was constructed with support from DWD at cost of over UGX 8 million (3,300 USD). The school did not contribute any money to have this facility with 12 stances; 6 for Boys and 6 for girls. This toilet is a compost single vault Ecosan Toilet. It separates urine from faeces. The toilet is being used properly.

Being a school's facility, sometimes new pupils who are not sensitized about using the facility often mix urine with faeces causing it to smell. To have enough ash for the school, pupils bring ash from their homes because the school kitchen does not supply enough ash.

Six stances (3 for boys and 3 for girls) are used at a time, when others are closed for decomposition to take place.

The toilet has an attendant/ cleaner who is paid UGX 60,000 (USD 30) per month. The school has a sanitation teacher/ master teaching new pupils on how to use the Ecosan toilet. This is done during morning parades held twice a week (Monday and Friday).

The school Ecosan Latrine block

Pupils of Biina P/S collect ash brought from their homes

Inside the Ecosan latrine

The school uses urine from the Ecosan as fertilizers for the school flower gardens and the surplus is sold to people who take it to their gardens. A 20 litre jerry can of urine is sold UGX 2000 - 5000 (1-2 USD) depending on the demand. The faeces are left for six months to decompose. The compost is used in the headmaster's garden. The compost is not sold because there is no market for it.

The pupils' view

The pupils are happy with using Ecosan toilets because the toilets do not have odour compared to the pit latrines and there are no flies that transmit diseases. However, there are pupils who don't use Ecosan toilets because they don't want to carry ash from home and touch it after defecation.

The challenge

The major challenge is some parents have negative attitude about the Ecosan toilets. They say that the school does not have toilets; pupils defecate in "baskets". The toilets get filled up fast and the compost has to be removed before the six months elapse. The school does not have enough storage for keeping the compost for a long time. Sometimes there is no customer for urine and it has to be poured.

The Ecosan toilets are very good as compared to pit latrines and every institution that can afford, should construct one. For schools with shortage of land or in places where the water table is high, Ecocan toilets are the best solution to such areas. The Ecosan toilets last longer and save money for repeated construction of pit latrines.

Focus on the urine Product:
Experience of a sanitation teacher of St. James Biina Primary school

COMPILED BY IDA COLEMAN AND DERRICK SSEWANYANA -**NETWAS-U**

Singiza Emannuel is a proud sanitation teacher of St. James Biina Primary school reknown for using Urine Diversion Dry Ecosan latrine that was constructed by the Ministry of Water and Environment. Ever since construction, the teacher can't stop narrating the benefits of harvesting urine from the school toilet.

On a daily basis he harvests about 60 to 80 litres of non diluted urine. The urine is collected using 20 litre plastic jerry cans that are positioned at the harvesting point which is made of PVC piped system that runs from the urine pans of the toilet to the collection point.

Singiza said that he prefers the 20 litre jerry can collection containers to wider vessels like plastic tanks of 100 litres because it involves less time and effort since it does not involve scooping out the urine to another container after harvesting and as well limits the nuisance of foul smells associated with opening wide vessels.
When the jerry cans are filled with the urine, they are placed in a store (drying yard) and tightly covered with lids not to emit bad smells.

The collected urine is used by the school but the surplus sold to farmers. Mr. Singiza refers to Urine as a magic "fertilizer". It has done wonders for the school compound – it is now green with nice looking flower gardens yet it used to have bare earth for a compound. The urine is preferably applied in the wet season in the ratio of 1 undiluted 20 litre jerry can of urine to 5 twenty litre jerry cans of water.
''We have four customers from the school who constantly take the urine apply to their farms, among who include the head master. This urine is taken free of charge as long as the customer leaves an empty jerry can for collection purposes.'' However, at one moment each jerry of urine was selling at UGX 5,000 (2 USD).

The reason for not charging a fee at the moment is due to the school's desire for more people to learn about the benefits of the urine fertilizer. The demand for the urine fertilizer is now high. This has been evidenced by the frequent phone calls inquiring on the availability of urine product at the school.

The school has also gained a lot of fame from the use of Ecosan toilet. Many other schools, government officials, organizations and even individuals visit the facility. "Just recently a visitor from German came to see the school Ecosan and the pupils are picking interest in the Ecosan tiolet," the teacher said.

Challenges:

At times, the urine system gets clogged due to ash and other foreign materials that are wrongly dumped in to the system by some pupils especially the new ones. This however has reduced due to the constant sensitization of the pupils.

Some community members have also expressed the issues of cultural beliefs- they find it strange to use urine on food crops. Some farmers choose to reveal the urine fertilizer as a "certain fertilizer" to their farm workers.

Another challenge is that there are not many farmers in Kampala as compared to the rural areas and so this limits the urine market to a certain extent.

He advises that those wishing to invest in Ecosan must put more emphasis on sensitization of children/pupils and ensuring their direct involvement in operation and management of the facility.

The experience of Kiniogo Primary School, Kabale district

We are tired of constructing pit latrines

COMPILED BY FRANCIS NAMARA ,**RESOURCE PERSON**

Poster reminding pupils how to use Ecosan latrines pinned on doors of school latrines

One of the gardens where urine fertilisers are used. Constructed Ecosan by AMREF at the schools.

Kiniogo Primary School located in Kitumba parish, Kitumba Sub County in Kabale district. The school benefitted from a Programme supported by AMREF which was constructing Ecosan toilets for institutions like schools. Below is the experience of the school with Ecosan toilets.

"In the AMREF supported project the School Management Committee, the teachers, the Parents Teachers Association (PTA) members and the Prefects were sensitised about ecological sanitation, how they work, management and their advantages.

Before we got Ecosan toilets, we had pit latrines of six feet deep due to a high water table. These latrines would fill very fast and we had to construct new ones. When AMREF came, we readily embraced the idea of Ecosan toilets because we were tired of constructing pit latrines.

Ecosan toilets are durable and the compost provides manure for the school garden. Using Ecosan toilets we are saving UGX 110,000 (46 USD) every term the money we used to empty the pit latrines and yet the school had also run short of land to construct new pit latrines.

The cost of a 3-stance Ecosan toilet was UGX 4 million (1,667 USD). We were lucky that all the three school blocks each with three stances were constructed by AMREF. The toilets separate urine from faeces with 2 chambers per stance. The urine is collected in jerry cans and pupils bring ash from their homes.

Each day we harvest 20 litres of urine. We keep the urine for four weeks to reduce the acidity before applying it to the gardens. We then mix urine with water in a ratio of 1 litre of urine to 3 litres of water (1:3) before applying it between the ridges of cabbage, sweet potatoes and carrots. Sometimes we sell the urine to farmers at a cost of UGX 20,000 (8 USD) per 20 litre jerry can.

When the chambers are full, they are covered and the faeces are left for 3 months to decompose. The pupils then empty the chambers and we apply the compost immediately to the garden before planting. Using urine and compost has improved the yield. We now harvest cabbages of up to 3 kg each which had never happened before.

Teachers and pupils, comfortably use the toilet. The girls have 2 blocks and boys have 1 block which they share with teachers. Ecosan toilets are better in everything including hygiene. New pupils are taught how to use the toilet by the sanitation teacher, prefect or fellow pupils.

The pupils interviewed said they like the Ecosan toilets because they do not smell and they are easy to clean. "I wish we had an Ecosan toilet in our home" said one of the girls interviewed. The main challenge is keeping the toilet clean. Some pupils forget or stubbornly refuse to apply ash which makes the toilet smell.

Improved sanitation and hygiene:
A case study of the Fossa Alterna in Mutesa 1 Primary school, Wakiso district

COMPILED BY IDA COLEMAN AND DERRICK SSEWANYANA -**NETWAS-U**

Mutesa 1 Primary School is located in Wakiso town council, wakiso district. The school has a population of 220 pupils. There are two Fossa Alterna toilet blocks that have been in use since September 2010, constructed with support from Jo Smet (IRC). This was a remedial action to the poor conditions that were experienced from sharing a pit latrine between the school and the community.

The boys' block has 2 stances where one is for the teachers and the other for the pupils, the block also has a urinal. The girls' block on the other hand has one toilet stance, 2 bathrooms and urinals for the girl pupils. Allon Lugoloobi, the teacher in charge of sanitation and eco latrine in the school says that all pupils with the exception of primary one and two use the fossa Alterna toilet.

The primary one and two pupils use the newly constructed spiral composting latrine with the aim of acquiring experience for proper use of the fossa Alterna that requires strict observation of the ash and soil application after use.

When primary two pupils graduated to primary three, pupils then begin using the fossa Alterna toilets; the older pupils play a tremendous role in teaching of the new comers and the younger ones on the proper use of the fossa Alterna. At the moment, none of the pits of the fossa Alterna are full but when due this will require shifting to another pit.

Mr. Lugoloobi commended the pupils for the excellent use of the toilet and attributed this kind of practice to a number of reasons. There is a good voluntary culture of collecting ash and soil by the pupils. The pupils are further motivated by rewarding those that are active in collecting the ash and cleaning the toilets with gifts every Friday of the week.

It was also observed that the pupils have out grown the negative attitude of refusing to level the faecal matter in the collection chamber. This activity that is referred to as "summary of the day of Ecosan" is now done by any pupil willingly once chosen by the eco latrine teacher. The "summary of the day of Ecosan" involves using a stick to spread and level the faecal matter in the chamber so as flatten the cone shaped heap. In addition, the pupils are vigilant about the maintenance of their toilet. They actually report any forms of misconduct by fellow pupils in using the toilet.

Spiral composting toilet used by P.1 and P.2 pupils of Mutesa 1 Primary School

The eco latrine teacher in front of the boys' toilet block.

Inside the clean girls' fossa alterna toilet

Hand washing facility at the school Fossa Alterna toilet

The cleaning of the toilets is done every evening. A moistened piece of sponge is carefully used and clean inside the toilets to avoid pouring water in to the pits. The urinals and bathroom shelters on the toilet blocks are scrubbed with wire brush using soap and detergent.

Mr. Lugoloobi as well put in place an initiative of weekly reports on challenges, operation and maintenance, situation analysis of the fossa Alterna toilets by the teachers. This greatly supplements the active role of their straight talk club and student leadership in ensuring the proper usage of the toilets.

This active involvement of the pupils has greatly spread the good news of this wonderful toilet to even their parents and households. The constant sensitizations on advantages, operation and maintenance of the fossa have convinced some parents to adopt the technology in their homes. The culture of hand washing is constantly improving since there is a hand washing facility constructed at the school fossa Alterna toilet.

The story has not been different for the state of hygiene in the school- girl child hygiene has greatly improved since their fossa Alterna block has 2 bathroom shelters and urinals to adequately address their privacy challenges especially during the menstruation periods. The risks of diseases, inconvenience, lack of privacy, crime and others that were associated with the formerly shared pit latrine were put to an end.

Key Challenges

The experienced challenges were in line with the inadequate supply of ash as a result of many of the pupils coming from homes that generate less volumes of ash owing to the use of electricity and charcoal stove and the eco latrine teacher is not informed of a viable alternative for the ash.

In addition new comers and younger pupils are still problematic in the operation and maintenance of the fossa Alterna toilets in the school. A similar problem happens at the opening of each term since most of the pupils have pit latrines in their homes.

The urine drainage system for the urinals poses challenges of blockage resulting from mud and other foreign materials but this has been partly rectified by repairs from a hired plumber.

Despite the above, Mr. Lugoloobi says fossa Alterna toilets save land since the facility is used over and over again which is not the case with the pit latrines. He noted that it is a financially friendly system and beneficial to agriculturalists through the use of by-products as fertilizer. The latrine does not smell, is fly free and very hygienic.

"Fossa altena – the miracle latrine that never smells"
says a primary four pupil of Iborooga Primary school, Kyenjonjo district

COMPILED BY PAMELA KABASIGUZI: **HEWASA PROGRAMME**

Iborooga Primary school is found in Katooke Sub County, Kyenjojo District. It has 861 pupils of which 417 are girls and 444 boys enrolled. The school was selected by the district authorities to take part in an Action Research linked to a learning initiative called LeaPPS.

With support from SIMAVI, NETWAS Uganda through HEWASA a local NGOs in implementing action research project focusing on low cost sustainable Ecosan latrines.HEWASA's main objective in this project is to promote fossa altena Ecosan and assess its adoptability and appreciation in primary schools.

Before the action research project, Iborooga Primary School had been facing the problem of collapsing soils, as a result the school latrines used not last for long and the environment at the school was smelly due to use of these latrines.
As a remedy to the above challenges, the fossa altena type of latrines was introduced to the school. It is low cost compared to other ecosan latrines and more permanent because one only keeps emptying and reusing at the same time able to harvest humanure.

At Iborooga Primary school, 120 girls out of the 417 and 180 boys out of 444 are using the latrine. HEWASA Project constructed three stances for the boys and two for the girls whereby each stance is used by 60 pupils.

Pupils accessing the fossa alterna were trained on how to use it and its maintenance, this enabled the general school cleanliness improve. Space which was gazetted for new latrines is now being prepared for a school garden.
Pupils using the latrine feel more comfortable to go in because there is no smell and flies. When girls are in their monthly periods, they have no problem using the toilets because they are cleaner, with no smell and urine around as compared to the traditional pit latrines. However they have to move to the pit latrines to dispose off their sanitary pads.

Roles of different stakeholders

For the sustainability of the toilet as school roles have been accorded to different stake holders as below:

- The school management Committee (SMC) is involved in planning and information dissemination.
- Parents Teachers Association (PTA) to give counsel, awareness and mobilize parents for support to understand the benefits of a fosa altena children
- School health club to train other pupils on how to use fosa alterna toilets. The club members often use music, dance and drama or sensitize fellow children and parents about good hygiene and sanitation.

Success factors

The success in the use of this type of toilet in the school has generally depended on the involvement, support and the interest of all stakeholders- these include school pupils, parents, teachers, the entire school management committee and district authorities.

Challenges

Despite the above the school faces the challenge of some pupils and toilet users not following the practice of adding ash, soil / dust and dry leaves each time they use the facility. This at times causes the toilet to smell. Some pupils say that it takes them long in the toilet to pour ash, soil and leaves while they have to rush back to class.

Suggested areas of improvement for better access:

In one of the schools management meeting it was suggested that the school should construct an incinerator, urinals for boys and wash rooms for girls

A club member of P.5 talks about the school Fossa Alterna toilet

Upgrading from a flush to a public Ecosan toilet:
A case of SWUWS in Kabale district

COMPILED BY FRANCIS NAMARA ,**RESOURCE PERSON**

South-Western Umbrella for Water and Sanitation (SWUWS) office in Kigongi ward, Central division, Kabale municipality has upgraded to using an Ecosan toilet in their double storey office block which originally had flush toilets. This office block was originally owned by another person who had designed it to have flush toilets. When SWUWS who are the promoters of Ecosan toilets in the region rented the building in 2003, the design of the toilets was changed to Ecosan. This was done as a sign of walking the talk in promotion of Ecosan toilets. Since then, all people occupying the building offices amounting to over 100 persons are now using Ecosan.

Sustainability

The cost of the toilet is difficult to compute because it was part of the building and was funded by the SWuWS. There are two stances on each of the floor; one for male and another for females. It is a dehydrated type of Ecosan toilet with 4 chambers. It has ash and bath tabs and separates urine and faeces. The ash is supplied by a watch man who does also regular maintenance. He buys a sack of ash at UGX 6,000 (3 USD) from residents around the neighbourhood.

There is a fee charged for using the toilets by either the office occupants or visitors. The fee paid covers maintenance costs of the toilets. From the rent the caretaker is paid UGX 80,000 (34 USD) per month. The caretaker trains new users and encourages the occupants to train their visitors as well. The watchman is also responsible for emptying the chambers.

Urine is collected in a tank. When the tank fills, people come and take it free of charge. As for the compost, it is stored it for 6 months to decompose. Those who want it collect free of charge. They have planted cabbages using the urine and compost from our toilets.

The users appreciate the technology and we all have no problem in using this toilet. Visitors who always use the toilets want to know more about them.

Challenges

The main challenge they face is that many visitors don't know how to use the toilet. Some pretend to know when actually they don't know how Ecosan toilets work. There is also negligence among the staff members. Some don't apply the ash.

Not many people from the neighbourhood have constructed ecosan toilet because they prefer flush toilets while others are just poor to afford construction of ecosan.

Modern interior view of the Ecosan at SWuWS

Biogas toilets:
an innovation by Makerere University College of Engineering, Design, Art and Technology

COMPILED BY ALICE MANGO, **RESOURCE PERSON**

Besides, proper disposal of faeces, biogas toilets provide direct benefits to users through the production of biogas, an incentive for investment into such a facility, especially in an urban setting. This has some advantages over Ecosan toilets where products have to be transported off site as there is limited land for using it in urban areas. Researchers at the College of Engineering, Design, Art and Technology at Makerere University have designed and tested a biogas toilet as one of the renewable energy technologies demonstrated in Kakiri, Wakiso district.

Description of the technology:

A pour flush latrine is constructed with a pipe behind it, leading to a bio-digester, where bacteria digest the waste matter, releasing biogas. The gas is kept in a dome at the top of the digester and released through a pipe feeding gas to a stove in the kitchen. The system requires water for flushing the toilet which is also necessary for the digestion to take place. An inlet is provided for addition of cow dung to the system as the faeces produced are not adequate. Water from the bathroom next to the toilet is also directed to the bio-digester. Water used is collected by rainwater harvesting from the roof. An important by-product of bio-digestion is the bio-slurry, a high nutrient organic fertilizer that can replace many types of mineral fertilizer for agricultural production.

Operation and maintenance of the facility:

The feeder has to be periodically fed with the substrate, which in this case are faeces. Cow dung is first mixed with water before it is added to the system. The slurry is periodically removed and applied to a garden just next to the biogas system, as well as on tower gardens that have been set up at the centre.

Number of toilet users: 3 (2 caretakers and a spouse to one of them).

Benefits of the technology:

The system produces cooking gas, offsetting the cost of cooking fuels like charcoal. The slurry is used for crop production, contributing to increased production, even in peri-urban areas where garden towers can be set up. In an urban setting, a landlord with many tenants can have access to tenants' faeces to produce gas adequate for his household needs, while also eliminating the cost of emptying latrines or septic tanks.

In this respect, similar facilities at the household and community level have been introduced in the slums of Bwaise by an NGO, Sustainable Sanitation and Water Renewal Systems. Biogas is also cleaner to use, reduces indoor pollution and cooking takes a very short time, compared to firewood or charcoal.

Challenges of the system:

The faeces generated at household are usually not sufficient to produce sufficient quantities of biogas to meet the cooking requirements of the household. However, this can be overcome by either supplementing with other substrates or collecting faeces from the neighbourhood. In a school setting like Namilyango High School, production of faeces was limited by two factors: (i) girls were not using the facility due to fear of throwing in sanitary towels; (ii) most of the students were not residents at the school. The amount of gas produced was therefore very little, just enough to boil drinking water and the school still has to buy firewood for its kitchen. The school can overcome this by introducing cow dung or collecting faeces from nearby schools.

There is still an issue of attitudes towards using products of human faeces for cooking, as expressed by students of Namilyango High school. However, this can be changed by setting up demonstrations, as it happened in Bwaise area after bio- toilets were introduced by a local NGO called Sustainable Sanitation and Water Renewal Systems.

Latrine, biodigester (below ground), gas holder & pipe

Inside the pouflush toilet

One of the care taker using bio gas for cooking

The UDDT toilets in South Western Uganda:
A case of the South Western Towns and Sanitation Project

COMPILED BY FRANCIS NAMARA ,**RESOURCE PERSON**

SWTWSP Office Toilet

In 1996, South Western Towns and Sanitation Project began working this region of Uganda focusing on safe water and sanitation to the public. In an attempt to promote sanitation, Ecosan toilets (compost type) at households levels were constructed. The first type of Ecosan toilets put in place mixed urine and faeces and the chambers were below the ground. The maintenance of the toilets was a problem and decomposition was difficult leading to further contamination of ground water. These toilets were mainly constructed in Kisoro district.

In 1997/98, this technology of compost was dropped and opted for dehydrated Ecosan toilet which separate urine and faeces and constructed above the ground. One such public toilet was constructed in Kisoro Taxi Park with 6 stances and 12 chambers. It worked well and people borrowed the idea. Over 400 household Ecosan toilets have been constructed in Kisoro district.
Because of high adoption exhibited in Kisoro, the project decided to rollout to other districts focusing on rural growth centres which were facing shortage of land and high water table. The first Phase covered seven districts of Kabale, Kisoro, Rukungiri, Ntungamo, Kanungu, Mbarara and Bushenyi. In the second Phase which started in 2006, three districts of Ibanda, Isingiro and Kiruhura were added.

In the third Phase (2010), seven more districts of Kasese, Kabarole, Kamwenge, Kyenjojo, Sembabule, Lyantonde and Rakai were added. The project currently operates in 17 districts covering 50 piped water schemes in Rural Growth Centres and small towns. They covered Landing Site on Lake Edward in Rukungiri district because of high prevalence of water and sanitation related diseases like cholera.

Households were asked to contribute UGX 100,000 (42 USD) and the balance was contributed by the project. A total of 300 household dehydrated Ecosan toilets were constructed. Due to mismanagement the project no longer promotes the construction of public and institutional Ecosan toilets. However the only public toilets being funded are those at water offices in the 50 schemes in RGCs. The cost of construction per stance ranges between UGX 1 million (417 USD) to UGX 1.5 million (625 USD) depending on availability of materials.

Ecosan Toilets work in areas where there is demonstrated need. Otherwise, people seem reluctant to adopt the technology. Very few have adopted the technology from the demos constructed in the 50 schemes.

Key lesson

The key lesson from the project is that having Ecosan demonstrations in place without public sensitization and mobilization no success can be attained. Another lesson is that Ecosan toilets are easily adopted in areas with need particularly those with shortage of land, high water table or rocky ground.

Construction of low cost wastewater treatment facilities in small towns: a case of Adjumani Town Council

COMPILED BY ALICE MANGO, **RESOURCE PERSON**

Town councils without National Water Sewerage Corporation wastewater treatment facilities can construct low cost facilities for treatment of wastewater and faecal waste like the case of Mityana and Adjumani town councils (TC), in order to reduce the hazards of improper disposal.

The technology:

In the case of Adjumani TC, such a facility was constructed at a cost of UGX 9m/= (3,750 USD) only, with support from GIZ. It uses vertical flow artificial wetlands followed by irrigation of the effluent on agricultural land. The sludge derived from pit latrines and septic tanks is dried and decomposed in three wetlands with a capacity of 20 m3 each. The sludge rests for one year and is then disposed off on adjacent agricultural land.

Advantages: Benefits of this technology are two-fold, namely:

- Proper disposal of latrine and septic tank sludge
- Use of nutrients and waste products for food production on agricultural land

Operation: The facility is operated by a private operator who charges UGX 10,000/= (4.2 USD) per load, and who is required to maintain the facility. The operator is also allowed to grow crops on the adjacent agricultural land that is part of the facility.

Issues in operation and maintenance of the facility: Operation and maintenance is a crucial aspect of the facility. Great care must be taken to select a reliable and trustworthy operator. In the case of Adjumani, the new operator is the only pit emptier who is stationed in Adjumani and who thus has a personal interest in the success of the project and in the maintenance of the facility.

Environmental safety: The facility is constructed in in-situ clay, with minimal threat to ground and surface water. The isolated location of the facility minimizes the smell at the time of off-loading the waste.

Implications for use of sludge and effluent for agriculture

- The use of processed sludge and effluent on land adjacent to the facility reduces the cost of transportation from the facility to the area where sludge is needed.
- The resting period of one year is adequate to kill off the micro organisms to make the sludge safe enough for use in agriculture.
- The issue of too much manure on the same piece of land is eliminated as it takes several years before the next removal of the humus-like residue, by which time the nutrients would have been exhausted.
- The danger of toxicity of crops by heavy metals is very minimal in the small towns as there are limited industrial activities.

Challenges: The road to the facility is in a poor state, making disposal at the site difficult, especially during the wet season.

Construction of the wetland series

Facility after use

Household composting in Kitgum Municipality

COMPILED BY ALICE MANGO: **RESOURCE PERSON**

Resource-Oriented Sanitation concepts for peri-urban areas in Africa (ROSA) implemented a composting project in Kitgum, NorthernUganda, with the following objectives:

- Using composting in order to develop practical operation and management strategies for peri-urban areas
- Demonstrating safe resource reuse by sanitizing food waste mixed with source-separated faeces using different composting techniques.

Technology: Two technologies were used namely; piling and windrow composting. The piling technology involves putting organic matter like food residues, leaves and weeds then leaving them to decompose. The composting takes between 6 months to 2 years and compost is ready when the materials have turned blackish.

In the windrow method, a mixture of feed stock materials is placed in a long, narrow pile. The pile is turned or mixed on a regular basis to provide oxygen throughout the pile. Frequency of turning is determined by several factors including temperature, moisture level and porosity of the pile. The advantages of the windrow composting process include thorough mixing of materials. The compost is ready in about 4 months.

Operation and maintenance (O&M): this involves acquisition of household domestic wastes that are placed in piles or windrows and left for decomposition. The decomposed organic matter is applied in gardens. Cow dung is sometimes added to supplement the nutrient level of the other wastes. Households that have UDDTs often apply source-separated faeces to the compost pit. O&M is mainly done by women with the assistance of children. Some people prefer windrows while others prefer the use of pits, especially where the spatial extent has to be minimized. Thus, the costs of O&M may be kept minimal or reduced to zero when done by the household members. Otherwise, it is estimated to cost less than 8 USD per composting period. The costs include the turning of the compost, as well as spreading the compost on the garden.

Impacts: Overall, more than 50 households were trained in hands-on courses on how to make compost for their gardens. By January 2010, the total number of households performing on-site composting had grown to 100. All households who were trained on composting are doing it at their homes, producing compost for their gardens.

Acceptability:

- Many homes, whose members have been trained, started composting their organic waste. Most of them have prepared small gardens within their compounds where they are now applying manure and growing their crops.
- By involving people from various villages in the sensitization workshops, the knowledge about composting could be disseminated extensively.

Lessons learnt:

- Only few members of the community were willing and/or had the capacity to pay for their solid waste collection by private operators. The majority of them opted for composting to manage their organic wastes and apply the compost in their urban farmland while the few non-biodegradable wastes were taken to collection points were a Town Council truck collects them.
- The quantity of wastes generated at household level in the peri-urban areas of the Town Council is small, compared to those produced by households in urban areas.
- Many private operators are skeptical about the people's willingness to buy the final compost manure considering the product is expensive.

Sustainability

With regards to long-term impacts of the project, the main expected impact of the project is improved cleanliness of the area as well as increased productivity through the use of compost.

Challenges:

- Many households in peri-urban areas only produce small amounts of organic waste. This makes the quantity of compost produced very small.
- Composting requires a certain amount of area for the process itself, the storage of raw materials and the storage of finished compost. Since land area is limited in Kitgum Town, this might pose constraints.
- The gases produced during the process of decomposition can be offensive and may generate complaints from nearby residents and by-passers.

CORNER OF EVIDENCE BASED STUDIES

Benefits and pontential health risks due to use of human Urine in farming

BY ONESMUS SEMALULU, PATRICK Makhosi (NARO), MARGARET AZUBA (KCC), FRED SEMYALO (UWESO) LUBOWA MUSISI (MUK-FACULTY OF VETERINARY MEDICINE)

A joint pilot project/ research conducted by NARO, KCC, Makerere University and UWESO on benefits and potential risks of human urine in farming revealed interesting findings as documented below. These experiences were based on pilot projects with farmers in 'Kyanja' *(peri-urban setting)* in Kampala and 'Migyera' (Rural setting) in Nakasongola district. Cabbages, Spinach, Nakati, Kale and maize plants were subjects of this research experiment.

Human urine application in farming

Field observations;

Crop appearance and yields

- More vigorous plants on beds treated with urine than controls.
- Weekly applications favoured faster growth of plants.
- Increased cabbage yields and head size observed where urine was applied weekly than once in 2 wks.
- Application of 10% urine weekly increased cabbage yield from 3.98 kg to 12.89 kg per plot of 8 m^2, with associated financial gains.
- Urine application up to 20% had no significant effect on average leaf/fruit weight for all vegetables (Spinach, Cabbage, Kale, Tomato, Eggplants). Increasing urine concentration to 30% decreased average cabbage head weight significantly, by 36% below the control.
- At the optimum, spinach leaf weight (23g) leaf N content was higher for weekly applied urine than urine applied once in 2 weeks, thus weekly applied urine gives a higher protein food material than once in 2 weeks application.

Study recommendations:

- To apply 30% urine weekly for 8 weeks for maize crops, 10% urine weekly for 8 weeks for Nakati (vegetable), 20% urine weekly for Kale and 20% urine weekly for spinach.
- To apply 10% urine weekly for 8 weeks starting at 2 weeks from transplanting for cabbage and spinach.
- It is also proposed that the urine-water mixture should be applied about 15 cm around each plant to minimise possible scorching of leaves.

In line with the potential risks of human urine in farming, the following conclusions were drawn from this study:

- E. coli, Enterococcus/streptococcus, Salmonella and/or Shigella were not detected in urine or water.
- E. coli was found in 7% of the vegetable samples but was un-related to urine application (concentration, frequency). Rather, this was attributed to other unidentified sources, possibly transferred by houseflies.
- Enterococcus/streptococcus was found in 9.5% of the soil samples. This was also un-related to urine application.
- The findings suggest that use of human urine in vegetable production does not pose a risk of exposure to E. coli, salmonella/shigella nor enterococcus/ streptococcus.
- However, owing to the many likely sources of E. coli contamination, hygienic food preparation is always advisable to minimise possible health risks from random exposure.

Flourishing maize plants fertilized with urine

Treatment technologies for Human Faeces and Urine

BY DR. CHARLES B. NIWAGABA , PhD: **MAKERERE UNIVERSITY, DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING**

Mixing of compost from the Ecosan toilet

Incineration of faeces

Faecal treatment:

Faeces are more pathogenic and harder to treat than urine. Faeces can contain large concentrations of pathogenic viruses, bacteria, cysts of protozoa and eggs of helminths.

Faecal treatment methods include:

Storage: when excreted faeces are stored in the environment at temperatures below or above human body temperature (37ºC) pathogenic micro organisms die off naturally. Storage of faeces at low moisture content increases the rate of pathogen destruction. However, helminths especially the eggs of Ascaris lumbricoides are resistant to unfavourable conditions. Therefore recommendation for a period between one and a half and two years at temperatures ranging between 2-20ºc and one year at temperatures between 20-35ºc.

Composting: this is the microbiological degradation of organic material to humus like stable product under aerobic, moist and self heating conditions. During this process, a lot of heat is generated and this is vital in sanitizing the products. For effective decomposition, there is need to add some organic matter such as kitchen food waste, constant mixing of the decomposing material.

High moisture (>65%), and low pH (<6.5) should be avoided during the process. In open windrow composting, temperatures greater than 55ºC should be maintained for at least 15 days with a minimum of 5 turnings during the high temperature period while in aerated static pile or in-vessel reactors, a minimum of 55ºC should be maintained for 3 consecutive days during composting.

Incineration: involves the use of heat as a medium of sanitizing the faecal matter. High moisture content should be avoided in the process to avoid bad smell and heavy smoke. Proper design of the incinerator is needed to ensure that all out going material is exposed to high temperature. At temperatures between 800 to 1000ºC no organism should be in position to survive. The source-separated faeces cannot catch fire when they are wet. When source-separated faeces are wetter i.e Moisture content (MC)>10%, only gasification takes place, producing charcoal like substances and a lot of smoke that smells badly.

Chemical treatment: Chemicals for disinfecting faeces products that take into account an additional advantage of the agronomic value of the substances in the disinfectants, such as calcium hydroxide ($Ca(OH)_2$), Ammonia (NH_3), potassium hydroxide (KOH) and phosphates (PO_4), are preferable - the nutrient content of the disinfectant increases the fertilizing value of the product. Wood ash and lime are rich in calcium and potassium and that is why it is recommendable to pour them on faeces after using the ecosan toilet. Ammonia is also increasingly being used to treat faeces.

Solar treatment: this method of faecal treatment is commonly used in combination with other methods like incineration and in preliminary processes of reducing moisture content from faeces collected in Urine diversion dry toilets.

Urine treatment:

Only a few organisms are excreted in urine and this is usually in case of infections. Urine is almost sterile in the human bladder. Urine is usually contaminated by organisms from faeces during the collection processes for example in the urine diversion toilets. Urine can easily be treated by storage. After performing laboratory experiments at various temperatures, it is recommended to store urine at near room temperature (around 20ºC) for not more than 6 months. It was actually discovered that varying temperatures sanitize urine faster than constant temperature.

Case owners:

Name	Contacts
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Inspirational success stories from the field

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