CONCEPT

- **A unique concept**
- **The first system for organized and safe utilization of human excreta**

POSSIBILITIES

- **Can be implemented anywhere in the world**
- **Offers solutions to MDG challenges in areas with high human density**
- **SuSan Design is ready for social-, impact- or financial investors**
- **Market ready for roll out - 200 million urban dwellers in Africa lack access to sanitation**

SUSAN TODAY

- **Concept tested and implemented in Uganda in 2011/12**
- **Implementation in Uganda planned to continue in 2012/13**
- **Funded to date by Bill & Melinda Gates Foundation**

Sustainable Sanitation Design
- Sanitation as engine of economic growth

What is Sustainable Sanitation Design?
Sustainable Sanitation Design (SuSan Design) is a business minded foundation focusing on bringing sanitation facilities to users i urban areas, schools and refugee camps in developing countries.

What is the SuSan concept?
We utilize research from agricultural sciences and industrial/service design competencies to improve products and implementation strategies. Susan Design strategy is to create turnover by returning the nutrients from human excreta as a safe agricultural input for farmers. Amplifying the demand amongst farmers will generate incentives for establishment and operation of sanitation services (toilets=production units). In order to offer sanitation services, Susan Design will develop and manage a value chain with the tools/products necessary to run the business, such as low cost household sanitation products, urban public- and school sanitation units, storage- /transport containers, treatment process and application tools/services for the farmers.

How does it work?
SuSan Design upgrades human excreta from pathogenic material to safe agricultural fertilizers and soil improvers in 45 days. SuSan Design will partner with communities, governments, NGOs and impact investors to set up rational, functional and dignifying public toilet facilities in urban areas and peri-urban areas, schools and refugee camps. We set up a viable and comprehensive franchise to operate all the elements in the system.

Where is SuSan implemented?
SuSan Design development and first implementation has taken place in Uganda 2011/2012. The project proved that we are able to produce safe fertilizer and soil improvement products in 45 days. The treatment system is a low tech design easy to scale up.

Where is funding coming from?
SuSan Design has received funding from Bill & Melinda Gates Foundation. We are looking for partners to operate and secure product and service development and implementation.

What are the possibilities?
We are confident that it is possible to leapfrog unsound and non viable water based technology going directly to sustainable sanitation structures in urban areas, in schools, within the private household and in refugee camps - a true sustainable and technological leap.

Contact information:
Karsten Gjefle
Phone: +47 41042275 - e-mail: karsten@susan-design.org - www.susan-design.org

sustainable
sanitation
design

Implementation of Urea Treatment on Faecal Matter in Kampala

Bibliographic information:
Isaksson, E. (2012). Implementation of Urea Treatment on Faecal Matter in Kampala – a bachelor thesis, 15 ECTS, in the Master of Science program in Aquatic and Environmental Engineering. Department of Energy and Technology, SLU. Uppsala, Sweden.

A large part of the world's population lives under bad sanitary conditions which cause diseases. In many of the countries where the sanitary conditions are wanting there is also a big problem with deficiency of nutrients for agricultural production. The increasing prices of conventional fertilizer are causing major problems especially in low income countries where farmers cannot afford the plant essential nutrients. In Uganda, the deficiency of nutrients to agriculture is a serious problem.

There is a huge potential in human excreta as fertilizer. The nutrient content derived from urine, sewage water, compost and faecal matter could potentially replace the fertilizer demand in developing countries such as Uganda. Sanitized human excreta could serve as a fertilizer but as it is today the nutrients and the soil conditioning properties in faeces are not used as they could.

The study examined the feasibility of implementing urea treatment of faecal matter in Kampala, Uganda. The material studied in this trial came from a septic tank and a pit latrine. Using the ammonia sanitation of human excreta as a technology of production of fertilizer, different urea concentrations were added to the material.

The study showed that it is feasible to implement urea treatment of faecal matter in Kampala and that a reduction of pathogens to the extent that faeces can be incorporated into soil as safe fertilizer and soil conditioner were reached after 1.5 months with a urea concentration of 6 %. Hence sanitized faeces can be used in sanitation value chain as resourceful input in agriculture. With this result, Susan-Design's method and approach would be able to contribute to socio-economic development of Uganda in involving and empowering stakeholders/agents in different level of sanitation-agriculture value chain.


Composting of Human Excreta with Howard-Higgins Composting Method

- An on-site trial of composting in Kampala, Uganda

Bibliographic information:
Joelsson, Anna-Emilia. (2012). Composting of Human Excreta with Howard-Higgins Composting Method. An on-site trial of composting in Kampala, Uganda. Department of Energy and Technology, SLU. Uppsala, Sweden.

Sanitization problems are caused by pathogens in feces and lack of proper sanitation leads to the loss of thousands of lives every day. Previous researches done in Uganda indicate that in most towns and peri-urban settlements in Uganda people live and raise their families in highly polluted, over-crowded environs where they are subject to outbreaks of epidemics of typhoid and cholera. Fecal sludge is sometimes dumped illegally causing contamination of drinking water and further spreading of pathogens.

Still, human excreta contain much profitable nutrition. If added to the soil it can both improve the status of the soil by making it more airy and better at keeping moisture, as well as fertilize it. Adding organic matter to the soil may also reduce erosion and run off problems caused by heavy rain falls. Today in most part of the world human excreta is looked upon as waste and a problem rather than a resource. In order to improve sanitation and to close the nutrient loop by using human waste as a fertilizer, pathogens in the excreta must be reduced to satisfactory levels.

Sustainable Sanitation Design (Susan Design) aims at establishing value chains that follow the material from the toiler user to the farmer, in a safe and sustainable way. Its goal is to create and implement solutions for improved sanitation in urban slums and schools; hence improve sanitation in the world, particularly in Eastern Africa, where it has established its regional office.

To attain its goal and contribute to the realization of MDGs and the 'sanitation for all', Susan-Design has been trying out methods for having human feces sanitized in a sustainable way. The sanitized product is an important link in the Sanitation – Agriculture value chain. In this trial, the safety and efficiency of composting human feces with a special composting method, called the Howard-Higgins method were investigated. The method claims to sanitize source separated feces in 90 days. The verification of this claim was done in Kampala, Uganda, where a compost trial was set up using six compost containers. The temperature was controlled frequently to ensure that the composting process reached the heat necessary for sanitization. Volatile solids, pH and the weight of the dry substance were also controlled to measure the methods efficiency.

The sanitization was also verified by growing fecal indicators enterococcus feacalis initially and at the very end of the process.

The results from the growing of fecal indicators showed a very varied result. Some of the compost nearly reached the limits for pathogen-free set up by the WHO, and others were far from achieving that goal. Still, Howard-Higgins method had some advantages in being free from leakage of methane. Because of its complicity and uncertainty, the method is not recommended to be used by SuSan Design to sanitize human feces.

Marketing Human Excreta

Bibliographic information:
Schroeder, Enno.(2011). Marketing human excreta - A study of possible ways to dispose of urine and faeces from slum settlements in Kampala, Uganda. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

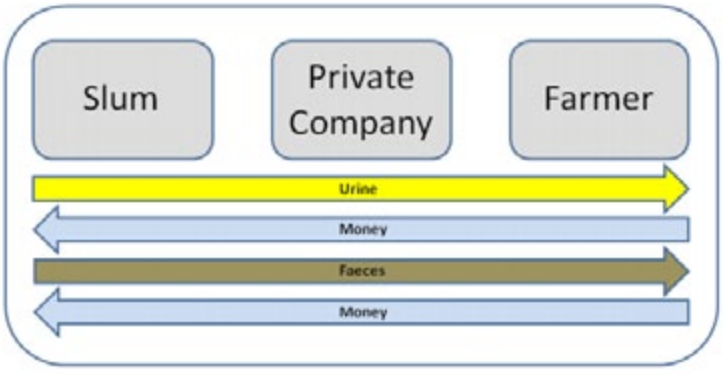
The economic factor is an important equation in the reuse advocated by Sustainable Sanitation Design. The value chain of sustainable sanitation would be possible only if the Sanitation – Agriculture link is economically viable and that all stakeholders can 'make money out of shit'.

A total of 794 million people in the urban areas of the world did not have access to improved sanitation in the year 2008. Keeping the rate of population growth in urban areas in mind, solutions for improving this situation with sustainable sanitation options are more required than ever. However, when talking about sustainable sanitation the discussion often focuses on ways of financing its implementation, neglecting the costs of the existing, unimproved sanitation. Hutton et al. (2007) state that water supply and sanitation interventions for developing countries are cost-beneficial without exception, meaning that even if sanitation improvements do require major investments, economic benefits through time savings by improved access to facilities, higher productivity of labor or savings on health expenses can be realized. Trying to approach the above mentioned issue, the study aimed at developing economically sustainable logistics systems for separated human excreta which are generated in Urine Diversion Dehydration-Toilets (UDDTs) or similar devices, in slum areas of the capital of Uganda, Kampala. In order to finance the logistics, the generated human excreta should be marketed as fertiliser and used in agricultural areas around the city.

Various interviews have been conducted with stakeholders, data was collected and literature was reviewed in order to design the logistics systems. After drafting them, cost calculations were carried out in order to test their economic feasibility.

As a result, the cost calculations of the designed logistics systems presented positive results in terms of the return on sales, if certain prerequisites are complied with. However, during the interviews several constraints could be observed. Among them not only sociocultural barriers were revealed, but also technical and economic issues contributed to a relatively narrow choice of potential participants for the system.

Key results and recommendations of the study can be accessed in:
http://www.susana.org/docs_ccbk/susana_download/2-752 schroedergtzmarketinghumanexcretareportfinal.pdf



Hutton, G., Haller, L., Bartram, J., 2007: Global cost-benefit analysis of water supply and sanitation interventions. Journal of Water and Health. IWA Publishing, London/WHO, Geneva

Unisex Urinal Usability Testing

Bibliographic information:
Sindani, E. G. Y. (2011). Unisex urinal usability testing - consultancy report for Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Eschborn, Germany. Sustainable Sanitation Design (SuSan Design). Nairobi, Kenya. (**http://www.susana.org/lang-en/library?view=ccbktypeitem&type=2&id=1048**)

The desire of Industrial designer Sarah Keller, who was working and living in Kampala (Uganda) from 2008 to 2009, to design a product that would enhance the slum residents' human dignity in Africa led to the development of unisex urinal, in cooperation with Crestank, Uganda. The urinal, that facilitates the collection of urine directly from the user, is instrumental in protecting urine from cross contamination and making urine sanitization process shorter and its quick use in the sanitation value chain as a natural source N fertilizer, linking sanitation to agriculture.

Especially designed to serve the needs of women, the urinal had also to serve other family members. It had to be producible with local material and local industrial partners. As a sustainable product, it had to have a far reaching impact in areas such as hygiene, health, environment, education and economy. Hence, a usability testing was conducted as first step of its development.

Mukuru kwa Njenga, a Nairobi slum as a seriously affected urban area lacking basic sanitation system, was selected for testing. The sanitation situation in the slums of cities like Kampala and Nairobi is characterized by dirty latrines, filled up pits, long queues of waiting users, idlers, drunkards and bang smoking men around the facilities; all of which makes it hard, especially for women, to use the few public facilities in the slums.

The needed baseline survey, selection of families, community mobilization and testing phase lasting 3 months included placement of the unisex urinal in 20 families for 2 weeks and for 1 week at a large primary school in the slum. The testing with families and school children was to assure that the product served the goals of the unisex urinal in the local context. One of the main intentions was to gain user feedback to ensure that the final product would be successful and can then be mass produced as part of a scalable value chain for sanitation. The collection and sale of sanitized urine to farmers would serve the community as a source of income – socio economic empowerment - to maintain the value chain.

The process was greatly supported by the community at all levels before and during the testing phase. The primary users (women) were very happy about the sense of relief, security and function the product gave them. The test confirmed that women and their families want to have access to this product. There is a certain willingness to pay for such a product, therefore additional studies should be undertaken regarding the market, production, distribution and information campaigns. The use of the urinal by a bedridden girl and her subsequent feedback called upon the designer to find out how the unisex urinal can be customized for people with disability.

The complete results of the testing phase are presented in this report full report:
http://www.susana.org/docs_ccbk/susana_download/2-1048-uni-sex-urinal-post-testing-final-report-feb-2011.pdf

Biochar

Sustainable Sanitation Design (Susan-Design)'s reuse approach and methodology is willing to integrate all natural elements which improve agricultural production for the sake of food security. To protect the environment and make use of other sources of soil improvement materials, a treatment unit producing Urea treated faecal sludge could also transform household/urban bio waste to biochar. Our partner the Royal Norwegian Society for Development has a bio material reuse program that produces energy from agricultural waste streams and the bi-product is biochar. These very large volumes could be included in the urea treatmet faecal sludge adding great soil improvement qualities to the volumes sold to farmers.

Since its origin as terra preta in the Amazon where farmers would make charcoal and bury it in the ground to improve crop yield, biochar will bring value to farmers on terms of long term of fertility increase and slow release of nutrients to roots.

Biochar benefits have been listed as follow: enhancing of nutrient holding capacity soil fertility; improving water retention; beneficial soil microbial activity; increasing soil organic matter and yields under optimal conditions; and repulsing termites. Its effects last longer due to greater stability of charred organic matter.

As soil improvement product and water retainer making soils more resilient to climate change, biochar would increase the quality of Susan-Design product. Bio mass from food preparation and sanitation, which have no constructive role in an urban slum, will be brought out of the – Kampala - slum for treatment and safe reuse. The large volumes of urine will be used as fertilizer and the bio mass from food etc. will be transformed into charcoal briquettes, or integrated as biochar into solids to improve the pathogen kill off during the treatment process before integration as soil improvement product for farmers to assure their productivity and the lands ability to hold water. This is CO2 sequestration in its pure and cheap form. A bio waste that rots in the open releases CO2 while the bio waste transformed into biochar will be integrated into the soil improvement product for improved farming. Hence biochar approach is suited for urban renewal and agricultural development as value creation from urban bio materials. Biochar production will be an added value to the Susan-Design endeavor of linking sanitation to agriculture for the sake of food security and sanitation for all with its economic and health benefits; ultimately raising the living standard of communities.

Alhaji S. Jeng's presentation (2010): Biochar: Production and Importance in Agriculture. Norway
Photo: Wikipedia.org

Swedish University of Agricultural Sciences

Dr Björn Vinnerås
Swedish University of Agricultural Sciences
Department of Energy and Technology
Box 7033
SE-750 07 Uppsala, Sweden

To whom it may concern:

The Swedish University of Agricultural Sciences (SLU) do express with this letter strong interest and commitment to work with Sustainable Sanitation Design (SuSan Design) in Phase II with the goal of faecal sludge treatment unit scale-up based on our research.

The key objective SLU would like to see during the next 2 years of scale up is wide use of the knowledge generated by our team and practical protocol SuSan Design Phase I have developed assuring hygienization that makes nutrients from toilets available to agriculture in a safe and economically viable way. This will improve food security while reducing risk of exposure from poor sanitation. The cycle of water related diseases can be stopped at the same time as safe cycles of plant nutrients are promoted, and ultimately alleviate the disease spreading as well as decreasing the mal and miss nutrition in the society. The overall goal we support is efficient sustainable utilization and recycling of resources.

SLU has collaborated with SuSan Design since their analysis phase in 2007/08. Together, we participated in Phase I by having master students working with the evaluation of the system followed up by our strong research team.

Consequently, we strongly support the phase II application as well as express our strong desire and commitment to work with SuSan Design in an effort to scale-up the treatment unit. It is important that SLU also during the scale up are involved assuring that the very promising results achieved in Phase I are brought forward when larger units are established and that the human and environmental health is not at risk by the system implementation.

Ammonia treatment has enormous potential as a safe and robust faecal sludge treatment and the development of economic incentives based on value creation in agriculture or e.g. the flower industry that can secure collection, transport and treatment before reuse.

We look forward to a continuation of our excellent collaboration in Phase II activities.

Björn Vinnerås, Uppsala 2012-10-29

Associate Professor (Docent), responsible of the SLU SuSan design cooperation.

Dr Björn Vinnerås
Associate Professor
Environmental Engineering

Phone: +46 18 67 18 34
email: bjorn.vinneras@slu.se

NATIONAL AGRICULTURAL RESEARCH ORGANISATION

NATIONAL AGRICULTURAL RESEARCH LABORATORIES - KAWANDA

P.O.Box 7065,
Kampala, Uganda
Tel: 0414-567649, 574073,
Fax: 0414-567649, 567226
E-mail: karidir@imul.com

Our Ref: NARL/ADM/17

Your Ref: .....

17th October 2012

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

Re: LETTER OF SUPPORT OF PHASE II APPLICATION BY SUSAN DESIGN

I hereby write to express interest and commitment to collaborate with Susan Design in Phase II application to scale-up the treatment unit for human excreta in Uganda.

The National Agricultural Research Organisation (NARO) is a government institution legally mandated to carry out agricultural research in crops, forestry, fisheries, and livestock sectors of Uganda. NARO conducts client-led, demand-driven and market responsive research that is aimed at improving the livelihoods of people within and beyond Uganda. NARO also collaborates with other local and international organisations to conduct research and development activities, and has indeed collaborated with Susan Design during Phase I of the project on sanitation of human excreta using urea.

NARO's role in the first phase has been to test on-station, the suitability of the fertiliser materials generated out of the treatment unit for human excreta, and interesting results have been generated. Results and lessons from the first testing phase of this project will therefore form an important basis for scaling up this approach thus contributing to improved sanitation in poor neighbourhoods/slums while generating promising fertiliser that can be put to good use.

We therefore strongly support the phase II application and express our strong desire and commitment to work with Susan Design to scale-up the treatment unit, carry out more field testing and information analysis and present the emerging results to farmers.

I look forward to a further collaboration in Phase II activities.

Yours faithfully,

Dr. Wilberforce Tushemereirwe
DIRECTOR NARL

SSWARS
ENVIRONMENTAL SYSTEMS FOR LIFE

SUSTAINABLE SANITATION &

WATER RENEWAL SYSTEMS

(SSWARS)

Community Sanitation Center, P.O.
BOX 21302, Kampala Uganda,
Tels : +256 77 2 335 477,
+256 70 1 00 8000,
Email: sswars@sswarsuganda.org
www.sswarsuganda.org

Our Ref **SSWARS/SusanDesign1/2012**

Your Ref

14th October 2012

To Whom It May Concern.

Dear Sir / Madam,

Re: LETTER OF SUPPORT OF THE PHASE II APPLICATION BY SUSAN DESIGN

I hereby, write expressing strong interest and commitment to collaborate with Susan Design in Phase II application to scale-up the treatment unit for human excreta in Uganda.

Sustainable Sanitation and Water Renewal Systems (SSWARS) is a non profit making, Non-Governmental organization registered to operate in Uganda. SSWARS plans and implements people-centered approaches to sustainable sanitation and water supply. The key objective is to develop, improve and sustain the status of the communities through use of sustainable and renewable systems with a prime objective of reducing risk of exposure to poor sanitation and water related diseases, and ultimately alleviate poverty amongst the communities. The overall goal is efficient sustainable utilization and recycling of resources.

SSWARS has known and worked with Susan design for more than 5 years. Together, we worked in Phase I of the project which involved the setting up and testing of the secondary treatment unit with a simulated capacity of treating human excreta from approximately 2000 people. This unit worked very well and good results in terms of pathogen die-off have been obtained. Additionally, the results from the field testing have achieved very good yield increases when using the natural fertilizer (urea treated faecal sludge from pits or septic tanks or UDDTs).

Consequently, we strongly support the phase II application as well as express our strong desire and commitment to work with Susan Design in an effort to scale-up the treatment unit and multiply it in 3-5 units that can handle human excreta from 100.000 people.

I look forward to an excellent collaboration in Phase II activities.

Yours faithfully,

SUSTAINABLE SANITATION &

WATER RENEWAL SYSTEMS

(SSWARS)

Community Sanitation Center, P.O.
BOX 21302, Kampala Uganda,
Tels : +256 77 2 335 477,
+256 70 1 00 8000,
Email: sswars@sswarsuganda.org
www.sswarsuganda.org

Our Ref **SSWARS/SusanDesign1/2012**

Your Ref

Dr. Charles B. Niwagaba (PhD)
Executive Director