Scale up urea treatment for safe reuse of excreta (SuSan Design, Norway and Uganda)

Posted by Ekane - 23 Jan 2013 17:53

Dear all,

In my role as one of the moderators of this Forum, i hereby introduce the work performed by Sustainable Sanitation Design (SuSan Design). This work is funded by the Bill & Melinda Gates Foundation (BMGF) within the Grand Challenges Explorations (GCE) programme.

SuSan Design is a business oriented foundation focusing on creating turnover by returning nutrients in human excreta mainly from cities as a safe agricultural input for farmers.

From pilot implementation in Kampala, Uganda, SuSan Design reports that safe and high value fertilizer is produced from the treatment of feacal matter with urea in 45 days.

In the beginning of 2012, the pilot unit had treated human excreta from 2000 users to valuable agricultural input. Even though the agricultural input has been proven to be good for a range of crops, acceptance of this input remains a challenge. Notwithstanding, SuSan Design plans to scale up this system to about 100 000 slum dwellers by the end of 2015.

Please see this link for more information about SuSan Design’s concept, activities, plans and partners:

All documents about this grant are now available in one SuSanA library entry here:

www.susana.org/lang-en/library/library?v...p;type=2&id=1715

SuSan Design’s technology and pilot project in Kampala are not elaborately described in these attachments but we have the opportunity to learn more about this project and technology and discuss the results and challenges through this Forum.

Best regards,

Nelson Ekane

Stockholm Environment Institute (SEI)

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High temperature composting ("Hotbox") in Kampala, Uganda (Kakiri research site)

Posted by muench - 28 Feb 2012 22:16

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Two weeks ago, I had the pleasure to visit the research site used by the NGO SuSan Design together with Makerere University near Kampala. Here they test two interesting processes for excreta treatment:

1) Urea treatment for faecal sludge

2) Heat composting for faecal matter from a UDDT and organic solid waste

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About 1): Urea treatment taking place in closed bins. Goal is to assure a pathogen free material for reuse in agriculture. Expectation from the science behind the urea treatment - log4 reduction - equivalent of 99.99% reduction of pathogens.

About 2): The goal is to present rational and good production routines for urban bio materials - 1 kg of bio waste is generated in Kampala per person per day and most of this enormous volume does not find its way back to agricultural production. Composting can be one way to bring more of this valuable material back and we are testing the composting methodology of Sir Howard. We are also testing how the method handles bio materials from sanitation. How efficient is the method in treating human excreta?

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Anyone interested in composting might find these photos interesting (and 2 short videos showing the turning process):

www.flickr.com/photos/gtzecosan/sets/72157629320894295/

I copy one here as an eye catcher but see more in the link above:

Feel free to ask any questions about this process which you may have.

Regards,

Elisabeth

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Re: High temperature composting ("Hotbox") in Kampala, Uganda (Kakiri research site)

Posted by SuSan Design - 29 Feb 2012 23:04

Sustainable Sanitation Design's Secondary Treatment unit at kakiri site (Uganda). Two hygienization technologies are used: Main: Urea treatment and thermophillic composting. Two variations of the urea treatment: faeces from pit latrine and faecal sludge from septic tanks. In the composting area, using the Sir Howard composting method, biomass is mixed with urine and fecal matter.

In collaboration with Makerere University and the Swedish University of Agricultural Sciences, researchers will test the following pathogens: Enterococcus, Ascaries eggs, E-choli and Salmonella. The field test of the sanitized product to see it effect on yields will be done in partnership with the National Agricultural Research Organization (NARO) during the planting season that is to start in March/April.

Our goal is to have a flexible system for handling of urban bio materials - excreta included - and transform these very large volumes into valuable agricultural inputs. The value creation can support the urban sanitation infrastructure to assure a scaled up system streaching from home to farm with minimal subsidies.

Best regards,

Karsten Gjefle

karsten@SuSan-Design.org

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Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by JKMakowka - 23 Jan 2013 20:34

Hmm... for a donor funded project there is really little information available of the exact treatment process it seems. The documents you linked have little details and the website (susan-design.org/proje

ct/treatment/) neither.

Ok Urea treatment isn't exactly new, but what are the technical details, where did you source the (pure?) urea and how did you determine that the end product is really safe?

As I am also based in Kampala, I would be interested in an visit to your test site if that could be arranged

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by Ekane - 24 Jan 2013 12:41

Thanks for your comment Makowka! I agree with you details on treatment process are lacking in the attached documents. Your questions are very relevant. Now that we have sparked this discussion, we would like to welcome the staff and partners of SuSan Design to join in and shed light on these questions you raised. In addition, answers to the questions i have included below would give us a better understanding of the project.

• What are the goals of the project?

• To what extent has SuSan Design achieved these goals already?

• When did the project start and how much time is left to complete the project?

• What are the biggest frustrations to date?

• What are the biggest successes?

• What have been enabling factors?

• When can this technology be brought to scale and under which conditions?

• Where do you see its biggest niche or application area?

I include a photo of the project site in Kampala (on flickr). Click on the photo to get the entire gallery on flickr.

Mixing the compost heap manually by Sustainable sanitation , on Flickr

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by christoph - 26 Jan 2013 13:02

Dear Karsten,

Thanks for the information you send to Ekane. They give a little insight. I combined this information with information that was posted before the project (a year ago) (ecosanres 7/2/2012). I cut out just the central points (underlining by me)

The goal of SuSan Design is to test methodologies of converting nutrients from sanitation systems and bio materials from urban households to safe agricultural inputs. The methods we use are based on research from the Swedish University of Agricultural Sciences
, our initiative to further develop a biochar oven and we are
testing the composting methodology from India described by Sir Howard
that has been described vividly by Richard Higgins. Our role in terms of composting is to test and verify the pathogen kill off …

The main goal is to develop scalable treatment units to assure that fecal matter becomes a safe soil improvement product. If SuSan Design can translate the research into a methodology that is practical, economic and scalable this will give additional incentives to "get the shit out of town" through value creation in agriculture. (value chain development from home to farm is our vision).

We are now testing the materials for pathogens and collecting information on how the planned treatment unit functions. We will report to our partners in 3rd Q 2012. If we can provide additional information please contact me.

By that I took, basically 2 methods are tested to come to a safe product – Urea treatment and the composting method described by Sir Howard.

As the information put up by Ekane just mentions the Urea treatment (third attachment) and the second paper as well only speaks of the research about the Urea…. Do I have to conclude that the composting by Sir Howard did not show as efficient? If I´m correct, it would be very interesting to know why. From people who visited the testing site, I understood that all testing has been done very much on a (almost) lab scale. The pictures posted as well suggest that. Is it possible that the scientific conditions haven´t been the best (as often in field- lab experiments)? That leads me to my next question. You wrote in the Karsten1…. Attachment posted by Ekane (underlining by me)

What have we done? The centerpiece and technological platform of the system is the treatment unit. ith Grand Challenges Explorations funding from Bill & Melinda Gates Foundation SuSan Design has reated and implemented the first full scale ammonia/urea based treatment plant for human excreta. The pilot treatment unit has been operated in one cycle in January/February 2012 and treated human excreta from 2.000 users to valuable agricultural inputs. The results are demonstrating that urea treatment of human excreta produces safe, pathogen free soil improvement products and fertilizers that increase agricultural productivity.

My reading would be: Only one cycle in Feb 2012 has been under total scientific conditions, before and after were used to set up, take down etc. Is that right? What is one cycle? Just collection of the feces from 2.000 persons and processing? From how many days? And the real results, numbers graphs, could you put that on?

I really appreciate the view of many households that can be served with a dry solution but I think there is so much polemic and so much hesitation that I think we need to be very cautious about what we promote. Therefore I would like to ask you who you solved all the problems between lab scale treatment experiment and full scale. As you point out

What are our plans for GCE Phase II - 2013-2015? SuSan Design aims at establishing a

business oriented sanitation value chain providing 100,000 slum dwellers with a safe and dignifying sanitation service by the end of 2015.

Well, I´m really keen to know more and hope for some clarification.

All the best.

Christoph

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by SuSan Design - 27 Jan 2013 15:38

• What are the goals of the project?

Transform what is today is regarded as pollution or waste into a safe agricultural input that enhances soil quality and farmer income in communities. Set up production of this type of treatment units so SuSan Design and partners can operate them across the country. (starting in Uganda/Kenya)

Today the nutrients from sanitation (pits, septic tank and UDDT volumes) represents 13 x the nutrient value of imported artificial fertilizers. The goal is to create income to sanitation providers so they get motivated by delivering quality services.

• To what extent has SuSan Design achieved these goals already?

SuSan Design has achieved proving that this methodology has enormous potential and no bottle necks

in terms of scale up. We have been able to produce a pathogen free volume from the excreta of 2000 people and we know that it can be done with excreta from 200.000 or even 20 million if the day comes that full return of nutrients today wasted are to be brought back to the land and not pollute the ground water, rivers and lakes of Uganda/Africa/Asia.

In cooperation with the National Agricultural Research Organization (Uganda) we have field tested the fertilizer value and it gave very good results of root structure, leaf size and bio mas production. This indicated that the product has value as fertilizer in addition to its soil improvement properties.

• When did the project start and how much time is left to complete the project?

The project started in 2007/08 with an analysis of the sanitation sector in Uganda. This lead to our firm belief that sanitation scale up (for all) would only take place if we could find value drivers that gave back to the communities more than just a toilet service. We needed to create income as well to limit the need for payment or subsidies. The urine market study we did with GIZ published in 2011 indicated the importance of urine in the income side. This is one reason we are so committed to our unisex urinal that was developed with women in Kampala and tested in Nairobi.

The testing of urea/ammonia treatment started in 2011 and was finalized in 2012 just outside Kampala.

• What are the biggest frustrations to date?

That we do not have funding to scale – later the product value will take care of cost for our treatment unit owners but this initial phase does need some investment. The move towards low cost quality service provision is too slow and the donors are not following up their intentions of pro poor policies.

• What are the biggest successes?

We can “off grid” produce a safe fertilizer from human excreta. Our ability to decentralize production of natural fertilizer and inspire to bring back nutrients that today are considered a “waste” product is our main potential and strategy to success. The unisex urinal tested in Nairobi has also been a great innovative process and I hope we can bring in investors/donors that want to help scale distribution and logistics supporting the product soon. We are on the right track and luckily there are partners that are willing to take risk to solve the sanitation crisis with partners like SuSan Design.

To be frank – we have always been looking at how many million users enjoy our sanitation services so in that respect we have not succeeded yet. 1 billion urban users and of them over 200 million in Africa are waiting so I hope we can bring our business model forward and start bringing the local entrepreneurs on board to scale up service provision.

• What have been enabling factors?

Uganda and most countries in Africa needs “sanitation for all” to achieve health goals and provide dignity to urban communities. At the same time the agricultural production or e.g. flower industry needs quality natural fertilizers to secure current and future production.

Business matter and income matters so we have to make it a good job to provide a quality service in urban areas.

Willingness to learn and review, innovate and not fall into the over-engineering trap is our main asset. Staying user centered is our goal both in terms of toilet services but also to see how the farmers need the product to be easy and valuable for them to use.

• When can this technology be brought to scale and under which conditions?

We have an industrial partner that could produce modular treatment units in Uganda for the East African market. We are part of a consortium that is looking into a first unit in Bangladesh in 2013 and an Indian partner has evaluated our methodology for scale up as part of a health program. It’s great to see that a large health program view “getting the shit out of town” as a pathway to delivering health results. By producing valuable soil conditioner with fertilizer value we can give incentives to transform pollution to value.

• Where do you see its biggest niche or application area?

In Africa where 98% of human excreta are not water based flush systems. We proved that we can handle from pits, septic tanks and UDDTs. The cost increases with water use so the incentive with our treatment system is low water use value chains. So we are not the niche – its water based flush that is and should remain the niche. The challenge is to make to so available and convenient that people see that there needs are better served through sustainable solutions compared to the illusion of WC. The best cities for this are areas where the distance between human population and agriculture is limited. Transport is still very expensive in Africa and the large cities are congested to we have to be smart about the logistics.

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by SuSan Design - 27 Jan 2013 15:39

Thanks Christoph, I will respond to your questions asap... leaving for Mozambique now and will respond from there.

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by SuSan Design - 26 Feb 2013 10:12

[attachment:1]C:fakepathShort presentation treatment unit - SuSanA Forum.pdf[/attachment]

Dear all,

Sorry I have not written before - the composting was tested to see how composting could substitute or complement the urea treatment and assure that all bio materials that are in normal urban waste streams can be brought back to productive use in agriculture as safe inputs.

The test unit in Kampala showed that under the curcumstances urea treatment gave pathogen free material and we did not get the same robustness of treatment from composting. Our suggestion for an urban structure is to assure treatmenet and reuse of human excreta (from pits, septic tanks and even better UDDTs) with ammonia traetment and the non pathogenic wastestreams go into the composting cycle. This would save work and give safe inputs to agricuture, flower industry or other land based production.

Unfortunatly there is little funding available to scale this and with the knowledge of human excreta representing 13 times the industrial fertilzer imports to Uganda it is a shame that we do not have the funding to create urban production sites of safe natural fertlizer. An incentive to create a pull factor so shit can get out of town must be found and I belive that this type of low tech production is key to the solution. The incentives in the treatment unit based on the research from SLU also motivates to implement low water use solutions at the toilet level.

This does not respond to all your questions but please review the file with additional information.

Our goal is to create treatment units with entrepreneurs across Uganda (and anywhere else in Africa) run with technical support from SuSan Design and sufficient follow up research during the start up and more business orientation going forward. The methodology is low cost and decentalizable.

Best regards,

Karsten Gjefle - SuSan Design

skype: karsten.gjefle

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by SuSan Design - 26 Feb 2013 10:16

Unfortunatly the test site is not up and running. We only had funding to run 1 cycle of approx 20m3 of shit from pits, Septic tanks and dry toilets.

We will restart operation in Kampala asap.

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by joeturner - 26 Feb 2013 10:22

When you say that you are using a method from the Swedish University of Agricultural Science, do you mean that you are using a method developed by Nordin et al?

What pathogens are you measuring? I have not seen any laboratory work suggesting that urea treatment can completely kill all pathogens within any less than 2.5 months, and possibly a lot longer. And if that cannot be done in a laboratory, it seems highly unlikely it can be done in the field.

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Re: Scale up urea treatment for safe reuse of excreta - SuSan Design

Posted by joeturner - 26 Feb 2013 11:01

I have found this interesting study by Jorgen Fidjeland on the proposed system in Uganda. It is a Quantative Microbial Risk Assessment on the urea treatment.

It seems that rather than suggesting all pathogens are sanitised by the system, it appears that the team consider the risks associated with using the products from the system to be acceptable after 45 days.

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