What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by muench - 14 Jan 2013 14:45

Dear Robert,

I have been meaning to start a discussion on Terra Preta Sanitation (TPS), so maybe now is a good opportunity. Let me start by outing myself as a "TPS sceptic".

I find there is quite a bit of "hype" about TPS but very little hard and fast evidence that a "Terra Preta Toilet" is easy to use and well accepted. I assume that its direct counterpart would be a UDDT, thus a Terra Preta Toilet should be better than a UDDT (Ralf Otterpohl used to say the main advantage would be less odour but only if the lid is tightly closed).

One thing that annoys me a little bit is that the same "facts" about the "vast areas" with fertile terra preta soil in the Amazon area are repeated over and over again. Are people just copying from each other? Strangely, the same one or two photos of this type of soil in the Amazon is used time and time again in various papers... (and journalists just love it by the way: "ancient Indio knowledge is rediscovered to solve problems of today...")

There is an MSc thesis in the SuSanA library which includes information about the areas with terra preta soil, and it is actually only a small area that has that type of very fertile soil according to this research:

www.susana.org/lang-en/library?view=ccbk...mp;type=2&id=796

de Souza Cannavan, F. (2007). Diversidade das comunidades bacterianas em solos de terra preta antropogenica da Amazonia Central e Oriental (in Portuguese) - Diversity of the bacterial communities in Anthropogenic Black Earth from the Central and Oriental Amazon. MSc thesis, Universidade de Sao Paulo, Escola Superior de Agricultura, Brazil.

It is in Portuguese but some additional information in English was provided by Cecilia Carvalho Rodrigues:

Regarding the size, she mentions it in the end of the first paragraph of page 16 (pdf, p.17): “Nevertheless in the same region, one can find one of the most fertile soil in the world, identified as Terra Preta Antrpogênica (TPA) or Terra Preta de Índio, representing a small parcel of Amazon soil, probably covering at least **0.1 to 0.3%** (15,500 – 20,700 km2) of the forested area of Amazonia (SOMBROEK et al. 2003)”. This section of her literature review is quite interesting. Regarding the dimension of occurrence, in the first paragraph of page 17 she says: ‘This kind of soil occurs in isolated round spots with differing dimensions (FALESI et al., 1972). The spots typically occupy small areas, around 0.5 and 3

hectares (SMITH, 1980), with however, indications of sites at the Estacao Científica Ferreira Penna – National Forest of Caxiuma (PA), extending over 100 ha. Despite the vast amount of archaeological sites already known, there is not a mapping of all occurrences of the ADE in Amazon.

Regarding the depth, it is generally around 30 to 60 cm, being possible to reach up to 2m deep (SMITH, 1980).

In her abstract, she uses the term ‘Anthropogenic Black Earth’ (ADE) instead of Terra Preta.

Another question for me is: will the conference bring together those people that work on Terra Preta (without excreta) with those that work with Terra Preta Sanitation? I think that would be useful. The "terra preta compost" (without excreta) seems to be quite popular and maybe already a commercial success? See e.g. this website of a German manufacturer: terra-preta.de/ or palaterra.eu/ . (although of course I can't tell if their product is a commercial success, only that their website looks very nice and professional).

I just can't see Terra Preta Sanitation work on a large scale (on a small scale with some enthousiasts it may work fine) - if we already have such difficulties with scaling up UDDTs, even though they are bound to be much easier to use than TPS-toilets where I have to add lactic acid bacteria/liquid, keep the lid completely closed etc.

I am looking forward to a debate or conversation with you and others on this topic.

Regards,

Elisabeth

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by HakanJonsson - 08 Feb 2013 17:40

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Dear all,

I want to comment some of the statements by Ralf:

1) *"Urine application mimics chemical agriculture and is a dead end road."* I do not at all agree with this. As a matter of fact it is quite the other way around!

Human and animal urine has been around during most of our evolution and the plants have adopted to it and been developed in such a way that they can utilize the easily available nutrients in the urine for rapid growth. Take for example spinach (Swiss Chard) which has been shown to yield about 7 times as much when fertilized with urine as when not fertilized. This is also the reason why ecosystems with plants and animals mixed, like grasslands and savannas can be very productive.

Then chemical fertilizers came along and **chemical fertilizers mimic urine. Not the other way around!** Savannas will be around for a very long time, if not turned into agricultural land or drying up due to climate change. Thus, I can not see that urine is a dead end road.

2)Chemical fertilizers have, by mimicking urine, made it possible feed our present world population of 7 billion, and not just 2 billion, which was its size 1927, just before chemical fertilizers started to be produced. The world population will continue to grow, and chemical fertilizers will continue to be important for feeding this population. Let us work together towards increasing its efficiency and decreasing its use of resources and negative environmental effects, by e.g. recycling as much urine and other fertilizer products from our sanitation systems as possible.

3) In temperate regions, as Sweden, the change in soil temperature is delayed in relation to the amount of sun light over the year. This means that even with a soil rich in humus, there is not at all sufficient concentrations easily available nitrogen in the soil in the spring, when the crops need it, which hampers the development and yield of the crop. In the autumn, when the soil is warm and the crop is ripening there is much nitrogen mineralized, in the form of ammonia (the same form as in stored urine), from the humus, but since the development of the crop was hampered already in the spring, there is not enough crop to take up the mineralize nitrogen and instead it leaches out, and for Sweden often ends up in the Baltic Sea. Furthermore, the low nitrogen supply in the spring means that our winter wheat ends up with a protein (protein is organic nitrogen) concentration that is too low for baking.

Therefore, Swedish ecological farmers in the 1990-ies initiated many urine diversion projects. The farmers wanted the urine so that they would be able to produce ecological wheat good enough for baking and at the same time minimize the leaching to the sea! But then we joined the EU and according to old fashioned EU rules, human sanitation products are not allowed as fertilizers.

The Swedish Association of Ecological Farmers still fight for being allowed to use urine though. For some 10 years, some ecological farmers have used urine through a possibility for exemption for household waste (urine is household waste) from the farm. This possiblity was removed by the EU about 3 years ago. Now the Swedish Association of Ecological Farmers are trying to be allowed to use urine for research purposes. **So the Swedish Ecological Farmers certainly do not see fertilizing with urine as a dead end. Rather, they see it as a sustainable high quality** (=far lower levels of heavy metals than in animal manure or in compost)
fertilizer of biological origin.

4) **We all agree that the hygiene of the food chain is very important and from this point of view, certainly urine and chemical fertilizers have a big advantage,** as both are almost sterile when produced by healthy people. Furthermore, during the storage recommended by WHO (2006) urine sanitizes itself, without any use of external resources except the storage tank. Safe and well documented sanitation methods for faeces are heat treatment through hot composting (see WHO 2006 for requirements) or treatment by ammonia e.g. by addition of urea.

Lactic acid fermentation might also be efficient, but I have not so far read documentation on its efficiency against enteroccus, ascaris or viruses.

5)Waste sugars are used for the lactic acid fermentation. This is an important resource use, as many products with waste sugar, e.g. molasses, are excellent animal feeds and can also be fermented to bioethanol. Thus, I would like to see an environmental systems analysis showing that the use of waste sugar for lactic acid formation for use in sanitation systems is better than using it for feeding cows and gaining milk for undernourished children.

6) A sanitation system should be sustainable in its surrounding. It has to be locally adopted and with about 2.4 billion people without improved sanitation, we certainly need to be open to use all sanitation system, e.g. UDDT, vacuum toilet water separation systems, and Terra Preta, in the situations where they are fit!

Sustainable urine-yellow and faeces-brown regards,

Håkan

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by JKMakowka - 08 Feb 2013 21:08

Not a Terra Preta expert, but I guess I can try and answer some of these questions:

@Florian:

1. The "EM" pit-latrine additives are as far as I know not the same, e.g. those are (if not a total "placebo") probably a by or waste product of microbial enzyme production to boost commercial biogas systems or other agro-chemical fermentation processes that need enzymatic breakdown of organic material.

Lactic acid fermentation is basically the same that is happening during the production of Sauerkraut. The lowering of the pH should kill most pathogenic bacterial, but cysts and worm eggs are probably only

lightly effected I would guess (given that one of the main "features" of worm eggs is being able to withstand the very low pH conditions in our stomages).

2. I think the point of Terra Preta sanitation is to use the the high surface area of charcoal (similar to active carbon) as a sponge for nutrients. For that completely "degassed" charcoal is probably the best.

In the process of charcoal production one usually tries to minimize the buring-out/degassing of the volatile wooden components (mostly wood-alcohole e.g. methanole) as those provide the most heat, the remaining pure carbon skeleton only burns little.

However (as mentioned above) the very efficient wood-gas stoves that utilize the degassing process of fresh wood to burn of all the volatile subsatances in wood have mostly degassed and thus low burn value charcoal as a waste product, which could be very well used for Terra Preta sanitation. And those wood-gas stoves are recommended over regular charcoal stoves for health and efficiency reasons anyways (however charcoal is mostly used and sold to urban areas, where the main point is the ease of storage and transportation, thus wood-gas stoves have seen little take-up in these major charcoal using areas).

About Terra Preta being a hype of not... well I see it as a (little practically proven) additional tool in the sanitaton toolbox. Especially in very humid regions where the UDDT drying process does not properly work, if could be a very good way to make the reuse of fecal material quite a bit safer.

Edit: These very humid regions usually have plenty of wood for burning and waste sugars (fruit and/or sugarcane production waste) available too.

P.S.: I don't see why urine diversion could not be combined with Terra Preta if the users don't have problems with it. As written above Urine is a very good fertilizer, and the addition of so much nitrogen is not required for the lactic acid fermentation at all. And if poured on top of TP soil later on, the nutrient retaining properties should work the same more or less.

However as TP sanitation is ok with mixing urine and feces, it could be a way to avoid those "complicated" urine diversion toilets and simply go for (both gender) urinals to collect urine and not bother with the urine that goes into the TP latrine during "big sessions".

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by mwink - 12 Feb 2013 13:18

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Dear all,

first of all, thanks a lot to Elisabeth for starting this discussion. As TPS is coming up here and there in one point or another, it's great that it is discussed here in the forum and all the pros and cons come together.

Linus, thanks as well for linking the pdf with the hygiene study on TPS in the Philippines. From the discussions on sanitation I followed in the last years, I would say, only if TPS can be proven to by hygienically safe for users and the product produced, there is the chance to get it out of its niche. Great that first results become available on this aspect! If there is already more out there, please let me know.

However, I have a question regarding this study. The study says, no Ascaris eggs were SEEN anymore after 60 days anymore. What does this mean? How were the samples and analyses undertaken?

As far as I know the problem with Ascaris is, that they become inactive but are very resistent. Do you know the reasons or do you have a hypothesis, why the Ascari eggs dissappeared and if the method was sound enough to guarantee this disappearance?

It would be great if other following this discussion can help me out. Maybe even Robert a Co-author or Ralf, who visited the project, can provide some more information.

Best regards,

Martina.

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by joeturner - 12 Feb 2013 15:27

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Hi everyone, interesting discussion. As far as I am concerned, Elisabeth hit on the critical point by asking about the pathogen load reduction from Terra Preta - that is the only factor by which we can assess the efficiency of any sanitation system.

I agree that the information about that is sparce, but then there are very mixed results from studies of UDDT and other similar technolgies. Helminths have been found in working composting systems well beyond the the usual storage times for most composting toilets.

I think we then have to consider a risk assessment proceedure, even though at present with limited information. When emptying any pit latrine, there is a significant risk of infection for those doing the emptying, given that without directly measuring pathogen loads in individual latrines, nobody actually knows for sure the level of the pathogens present. So even if the lactic acid fermentation has done nothing, I can't see that there could be any more significant risk from a terra preta system than a UDDT

system.

However, the difference between the Terra Preta and the UDDT is that there are several other stages, including the mixing and co-composting of the material. Hence there is a multiple-barrer to infection, (at least potentially) several different ways that the sludge could be sanitised.

I do have to say that I'm disturbed by the lack of urine diversion, which appears to me to be unnecessary. The more liquid the sludge is, the more risk there is of microbial pathogen transfer, so one would think that using dry sludge would make more sense than mixed urine and faeces. I can't really see why you would want that.

Of course, the major drawback is the materials that are needed. Most composting toilets work (imperfectly) with additions of ash or sawdust, which can be obtained locally. These would have to have the lactic bacterial inoculations and readily available sources of biochar. Whilst it is possible to imagine people appreciating the value of charring woody materials (given that they should be able to cook on it at the same time), it seems to me to be a bit of a large step to assume that they're then going to see the value of it being used in sanitation, given that the charcoal they have made is clearly now a free source of extra energy.

The idea that some entrepreneur is going to set up a system for mass production of an isolated bacterial culture - and that the users are going to appreciate and afford to pay for production and distribution - seems quite far fetched to me. As Florian says, it smacks of EM, which is a highly disputed process with very little scientific evidence of efficacy. TP at least has the advantage of a major university research department behind it and properly peer reviewed science, though.

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by SusannahSoilet - 15 Feb 2013 17:14

This weeks New Scientist magazine (issue 2904 16th Feb 2013) has a lengthy article on re-use of excreta, called 'Flushed with Success' by Fred Pearce. Focusing mainly on the benefits to farmers, it has some effective illustrations and might make NS readers think beyond 'flush and forget'.

Sanitation issues have been tackled by livestock farmers for as long as animals have been domesticated - the nutrients contained in the waste products are the only way of maintaining soil fertility for organic livestock farmers. And the stock population have to be kept healthy while the dung is re-used, so

systems which minimise exposure to helminth challenge have been devised. Without hand washing!
Varied and numerous soil organisms (incl fungi) can accomplish much of benefit, given half a chance.
Any system which stimulates the soil biology should be taken seriously.

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by joeturner - 18 Feb 2013 10:16

SusannahSoilet wrote:

Sanitation issues have been tackled by livestock farmers for as long as animals have been domesticated

Well that's true, but livestock farmers are also notorious incubators of disease. It seems to me that what is needed is solid microbiological science rather than romantic nescience.

the nutrients contained in the waste products are the only way of maintaining soil fertility for organic livestock farmers. Well that isn't really true. A farmer who is only relying on manure is not going to be maintaining the soil fertility as it cannot give all the nutrients that are needed. This is why organic farming systems do not rely solely on animal manure inputs.

And the stock population have to be kept healthy while the dung is re-used, so systems which minimise exposure to helminth challenge have been devised. Without hand washing! Well again, that is kind-of true. But the idea that animals in livestock systems are not rife with infection is bunk, in my opinion. Also it is a mistake to imply that animals are affected by all human pathogens of concern or vice versa - helminths are a pathogen but are also supposed to be an indicator of the survival of other pathogens in the sludge that are more difficult to isolate and identify.

Varied and numerous soil organisms (incl fungi) can accomplish much of benefit, given half a chance.
Any system which stimulates the soil biology should be taken seriously. That depends on the science rather than just marketing! But yes, in general it is perfectly possible to sanitise sludge given the **right conditions**
using soil microbiology.

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by Otterpohl - 25 Feb 2013 18:42

Dear Linus,

Dear All,

your point on demand for resources like woody waste and charcoal are correct. We do also need a source of simple sugars, ideally from waste.

Why does it make sense?

Because good fertile soil is the most important resource on earth, water is following good soils. Improving soil must be the highest priority, else we kill hundreds og millions and we make climate change worse.

Therefore, woody waste should go into the soil! It is an important component of compost and it makes volume. It makes urine organic humus, too.

Charcoal: woodgas stoves are highly efficient, combat indoor pollution, produce charcoal with using LESS wood that most commonly used stoves.

Sugars: This is still a challenge, we should go for adding fruit waste, kitchen waste, spoilt fruit, spoiled bread (also absorbing moisture)

Sanitation problem solved, but only if we widen our view to teh more severe problems with the same projects. There are many variations, but lactic acid fermentation is the breakthrough.

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by Otterpohl - 25 Feb 2013 19:04

Dear Hakan,

Dear All

some answers to your comments below. Be assured that I like you very much as a person even though i

have quite different views. I am a strong promoter of organic farming!

Dear all,

I want to comment some of the statements by Ralf:

1) *"Urine application mimics chemical agriculture and is a dead end road."* I do not at all agree with this. As a matter of fact it is quite the other way around!

Human and animal urine has been around during most of our evolution and the plants have adopted to it and been developed in such a way that they can utilize the easily available nutrients in the urine for rapid growth. Take for example spinach (Swiss Chard) which has been shown to yield about 7 times as much when fertilized with urine as when not fertilized. This is also the reason why ecosystems with plants and animals mixed, like grasslands and savannas can be very productive.

Answer Ralf:

Comparing urine addition to no fertiliser is a nice show for naives. If you want to compare youo need to build living humus and compare urine with that. Mineral and sub-optimum organic production have around the same product yield.

Then chemical fertilizers came along and **chemical fertilizers mimic urine. Not the other way around!** Savannas will be around for a very long time, if not turned into agricultural land or drying up due to climate change. Thus, I can not see that urine is a dead end road.

Answer:

it is a questin of dosage, urine as a super fast mineral fertilizer should be added to woody compost to build humus. Plants prefer to feed on microbes and macromolecules, force-feeding with NPK makes plants ill and bad food.

2)Chemical fertilizers have, by mimicking urine, made it possible feed our present world population of 7 billion, and not just 2 billion, which was its size 1927, just before chemical fertilizers started to be produced. The world population will continue to grow, and chemical fertilizers will continue to be important for feeding this population. Let us work together towards increasing its efficiency and decreasing its use of resources and negative environmental effects, by e.g. recycling as much urine and other fertilizer products from our sanitation systems as possible.

Answer by Ralf:

Chemical fertilizers continue to ruin ouf future. Soils are dead after 25 years unless very fertile land stands misuse longer. We see this in many areas and organic farms are the only way towards a future for many. Building soil requires comittment and knowledge, but the product yield dcan be the same up to a lot more (see

) Instead of being sucked by partly criminal agro-monster companies organic farmers can earn money and hand over good land to their children one day, with balaced food production. Global reports are very very clear.

3) In temperate regions, as Sweden, the change in soil temperature is delayed in relation to the amount of sun light over the year. This means that even with a soil rich in humus, there is not at all sufficient concentrations easily available nitrogen in the soil in the spring, when the crops need it, which hampers the development and yield of the crop. In the autumn, when the soil is warm and the crop is ripening there is much nitrogen mineralized, in the form of ammonia (the same form as in stored urine), from the humus, but since the development of the crop was hampered already in the spring, there is not enough crop to take up the mineralize nitrogen and instead it leaches out, and for Sweden often ends up in the Baltic Sea. Furthermore, the low nitrogen supply in the spring means that our winter wheat ends up with a protein (protein is organic nitrogen) concentration that is too low for baking.

Answer by Ralf:

Also Scandinavia has great and productive organic farms. Plants PREFER organic feeding.

Therefore, Swedish ecological farmers in the 1990-ies initiated many urine diversion projects. The farmers wanted the urine so that they would be able to produce ecological wheat good enough for baking and at the same time minimize the leaching to the sea! But then we joined the EU and according to old fashioned EU rules, human sanitation products are not allowed as fertilizers.

The Swedish Association of Ecological Farmers still fight for being allowed to use urine though. For some 10 years, some ecological farmers have used urine through a possibility for exemption for household waste (urine is household waste) from the farm. This possiblity was removed by the EU about 3 years ago. Now the Swedish Association of Ecological Farmers are trying to be allowed to use urine for research purposes. **So the Swedish Ecological Farmers certainly do not see fertilizing with urine as a dead end. Rather, they see it as a sustainable high quality** (=far lower levels of heavy metals than in animal manure or in compost)
fertilizer of biological origin.

4) **We all agree that the hygiene of the food chain is very important and from this point of view, certainly urine and chemical fertilizers have a big advantage,** as both are almost sterile when produced by healthy people. Furthermore, during the storage recommended by WHO (2006) urine

sanitizes itself, without any use of external resources except the storage tank. Safe and well documented sanitation methods for faeces are heat treatment through hot composting (see WHO 2006 for requirements) or treatment by ammonia e.g. by addition of urea.

Lactic acid fermentation might also be efficient, but I have not so far read documentation on its efficiency against enteroccus, ascaris or viruses.

5)Waste sugars are used for the lactic acid fermentation. This is an important resource use, as many products with waste sugar, e.g. molasses, are excellent animal feeds and can also be fermented to bioethanol. Thus, I would like to see an environmental systems analysis showing that the use of waste sugar for lactic acid formation for use in sanitation systems is better than using it for feeding cows and gaining milk for undernourished children.

Answ:

This is an important point that also concerns me! We can probably use the stuzff that is spoilt and not useable any more as fodder. At the same time we make excellent organic fertiliser out of the waste sugar, maybe the whole chain is not too bad...

6) A sanitation system should be sustainable in its surrounding. It has to be locally adopted and with about 2.4 billion people without improved sanitation, we certainly need to be open to use all sanitation system, e.g. UDDT, vacuum toilet water separation systems, and Terra Preta, in the situations where they are fit!

Answer:

UDDT can be a god option but we should also add a lacto-bacteria mix. They smell too often, even if it is very little this can be improved with very small amounts.

OK, with "let us build soils with plenty of living humus - and keep feeding it!" regards

Ralf

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by Otterpohl - 25 Feb 2013 19:14

Dear Martina,

Dear All,

Lactic Acid fermentation is firt and formeost to supress smell and to allow container / tanc collection of excreta without or with UD.

Sanitisation is a very welcome "side effect", but only with going down to pH 4 we have a strong influnce. This can not always be reached and requires lots of sugar waste, however odor avoidance does work even up to pH 7.

I recommend 10 years non-food for all stuff from toilets, for helmith eggs, pharmaceutical residues, synthetic hormines. All this will be soved to a large extent by time, unfortunately by washing out to groundwater for the micro pollutants.

Sanitisation is a lot more serious than we belived, by the clear fact that plants "eat" even e-coli and salmonella (see Plos One: Turning the Table, Endocytosis) makes it impossible to have a short cycle.

Ralf

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by joeturner - 25 Feb 2013 22:37

Otterpohl wrote:

I recommend **10 years non-food** for all stuff from toilets, for helmith eggs, pharmaceutical residues, synthetic hormines. All this will be soved to a large extent by time, unfortunately by washing out to

groundwater for the micro pollutants.

Sanitisation is a lot more serious than we belived, by the clear fact that plants "eat" even e-coli and salmonella (see Plos One: Turning the Table, Endocytosis) makes it impossible to have a short cycle.

Ralf

Ralf, thanks for this, which I consider to be not only extremely good advice but something that can/should change the language of ecosan.

I think this is the paper you are talking about above. Remarkable stuff, is there any indication that the pathogens taken up in plants are viable as sources of infection?

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by g_itchon - 26 Feb 2013 01:41

Hi Martina! Sorry it took a long time to answer to your query about terra preta sanitation. I (Dr Gina S Itchon) was the principal author of the paper from the Philippines. We undertook the study on terra preta principally because we wanted to find out if the process of lacto-fermentation will be able to get rid of or minimize the number of Ascaris lumbricoides eggs which in an earlier study proved to be very resistant to drying. After 60 days, we reported in the paper that there were no more Ascaris eggs seen, or none seen. This is the way helminth eggs in feces are reported. We do not presume that they are completely gone but we could not see any in the samples taken after 60 days. Admittedly, more studies need to be undertaken and up to the present time, I remain very hesitant about re-using human feces for agricultural use because in my country Ascaris infestation is a public health problem with infection rates going up to 80% of the population in certain places. Pathogenic bacteria are not a problem since bacteria die very quickly if their environment is changed. As of the present time, I understand that our study remains the only one about the hygiene aspect of TPS. If there are other studies similar to our study, I would certainly like to be informed about them.

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Note by moderator (EvM): I have created a separate new thread to discuss how to measure helminth eggs in a reuse context, please see here:

forum.susana.org/forum/categories/17-fer...s-in-a-reuse-context

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Re: What is Terra Preta Sanitation (TPS) all about? Hype or ingenious?

Posted by Florian - 26 Feb 2013 12:02

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And back to the topic of Terra Preta Sanitation...

I have to say that my doubts towards this concept have not really dissipated from the discussion so far. At best it sounds like an interesting vision, but currently way too complicated and with too many questionsmarks attached to be something that I can apply in projects to solve problems.

Florian

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