

Risks and Safe Handling of faeces from Urine Diversion Dry Toilets (UDDT)

Urine Diversion Dry Toilet (UDDT):

Is a toilet in which urine is separated from faecal matter; it consists of two processing chambers each with a volume of about 0.3 cubic meters. It is built entirely above ground with the processing chambers placed on a solid floor of concrete, bricks or clay. The floor is built up to at least 10cm above ground so that heavy rains do not flood it. The processing chambers are covered with a squatting slab that has two drop holes, foot rests and a groove for urine. At the back are two openings 30cmx 30cm for the removal of the dehydrated material.



Inside



Backside

BENEFITS OF USING FEACES IN AGRICULTURE

Faeces are a good soil conditioner due to their possession of very high organic matter. The content of organic matter in faeces increases the water holding/ retention and ion-buffering capacities of soils, which is of importance for improving soil structure and stimulates microbial activity.

Although the total amount of nutrients excreted is lower in faeces than in urine, the concentration of [especially] phosphorus and potassium is higher in faeces than in urine.

RISKS ASSOCIATED WITH HUMAN FEACES FROM URINE DIVERSION DRY TOILETS

The main cause of disease is the entry of disease causing pathogens into some one's body. When a person excretes a pathogen which is not contained or destroyed, it contaminates the environment through fingers, fluids, food and flies, which become pathways of disease transmission. Uncontained pathogens also contaminate crops, soil, surface water and ground water.


Some of the human illnesses that arise from using untreated or poorly treated faeces include inflammation of the intestines, diarrhoea, abdominal pain, fever, nausea; arthritis; Typhoid/paratyphoid fever - headache, dysentery, vomiting, Cholera, joint pains,



One gram of faeces can contain:

- ◆ 10,000,000,000 viruses
- ◆ 10,000,000,000 bacterial pathogens
- ◆ 1,000,000,000 protozoan cysts
- ◆ 100,000 helminth eggs

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<p>Hepatitis and Poliomyelitis.</p> <p>These illnesses may result in poor health, death or effects that last a lifetime.</p>	
<p>SAFE HANDLING OF FEACES FROM A UDDT</p>	
<p>Safe handling using multi-barrier approaches which involve treatment of the faeces, risk reduction during handling and in agricultural practices as well as the individual behavioral (hygiene) aspects, minimize the risks associated with reuse of excreta. Safe handling of Ecosan by products aims at maximizing the protection of human health and the beneficial use of important resources.</p> <p>The faeces in the UDDT are sanitized on the principle of dehydration and elevated pH due to ash or lime addition. Dehydration deprives the pathogens of the moisture they need to survive. The long storage period and increased pH further reduces the pathogen content.</p>	
	
<p>Composted human faeces in a UDDT</p>	
<p>Primary processing of excreta from a UDDT</p>	
What to do	Reason
User interface at the toilet	
The faecal vaults should be above ground.	To avoid leaking into the groundwater or the surrounding environment.
Divert the urine and do not add water to faeces.	To keep the volume of the faeces low and less moist.
Add dry material (ash, sawdust, husks, dry soil) after each defecation.	<p>To lower the moisture content of the faeces in the processing vault to less than 25%.</p> <p>To eliminate bad odour.</p> <p>To make faeces less attractive to fly breeding.</p> <p>To raise the pH (acidity/alkalinity) of the contents of the pit/vault to 9 or higher, which also enhance the die-off of pathogens.</p> <p>To make it easier to handle and transfer the material.</p>
<p>It is wise to premix the dry soil and ash at a ratio of 4 parts of soil to 1 part of ash, put in a container and store in the toilet for use</p>	

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Children's faeces should also be put into the faecal compartment.	The faeces of babies and young children are often dangerous because they may have a high concentration of pathogens.
More addition of ash, lime or sawdust is needed when diarrhoea is prevalent.	To increase absorption of moisture and facilitate pathogen die-off.
The paper/ leaves used for anal cleaning may be directly dropped into the faecal vault or put in a box for burning, and the remains put in the fecal vault.	They are biodegradable.
Broken bottles, condoms, sanitary pads, plastic bags, stones and any other non-biodegradable material should never be put into the faecal vault.	So that they don't interfere with the dehydration/ decomposition process and be a nuisance in the reuse practices. To maximize the volume of the vault. They should be disposed off else where, incinerated or recycled.
The chamber/ vault cover should be made of dark colors (blackened).	To allow for solar heating in order to increase the temperature in vault, which will facilitate pathogen die-off.
Primary storage and treatment on-site	
When the chamber is full, keep the faeces contained and well stored in the chambers for 6-12 months.	To provide ample time for pathogen to die off. The containment prevents the dispersal of material containing pathogens until safe for recycling.
During excreta storage there should be no additions of fresh faecal material. This ensures a secure die-off period without later contamination. <div style="background-color: #90EE90; padding: 5px;">The process of drying starts after the last input of fresh faeces.</div>	To avoid re-hydrating the dehydrated excreta because this will make dormant bacteria become viable again and multiply under the more favorable conditions.
Secondary processing	
To render human faeces safe for agricultural use, secondary treatment is recommended, regardless of the time the human faeces have been kept in the vaults of the UDDT. Some pathogens (e.g. ascaris) may still be infective after six months of primary processing because it may not be adequate time to dehydrate and thus sanitize human faeces.	
What to do during secondary processing (these are options)	Reason
The secondary treatment site should be fenced off. <div style="background-color: #90EE90; padding: 5px;">Secondary processing can take place either on site (in the garden) or off site (at an eco-station).</div>	To ensure no access for children.
(1) Incineration/ burning of faeces in locally	Incineration/ burning is used if a completely sterile

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<p>manufactured incinerators.</p> <p>The ash from incineration of faeces contains large proportions of phosphorous and potassium which can fertilize the soil for agricultural purposes. However the nitrogen and sulfur are lost in the atmosphere.</p>	<p>end product is needed.</p>
<p>(2) Bury faeces at shallow depth in such a way that the plant nutrients can be utilized. However faeces should not be buried in areas with shallow ground water.</p>	<p>It is expected that additional sanitization takes place in the fields due to natural die-off and out-competition by the more resistant soil organisms.</p>
<p>(3) High temperature composting by insulating large heaps of compost [in a garden compost pile or manure pile] using materials such as tarpaulin or heavy duty polyethylene to cover to the heap. They are good cover to the compost and decrease both heat and water losses.</p> <p>Alternatively application of a layer of soil or old compost will also act as an insulator.</p> <p>You can use grass for insulation though it allows heat loss through its voids via convection and radiation.</p> <p>Continuously turn the compost so that the outer compost also gets exposed to the internal sanitizing temperatures by insulation from heat loss. Turn 4-6 times in 2 weeks at 50°C.</p> <p>Add more urea or lime.</p>	<p>In composting, several processes kill pathogens. These include competition between indigenous microorganisms and pathogens, antagonistic relationships between organisms, the action of some antibiotics produced by certain fungi and natural die-off in the compost environment. In addition, all pathogens have threshold temperatures beyond which their viability ceases. The compost product is usually free of pathogens.</p> <p>To increase the pH (alkaline treatment)</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>If secondary offsite treatment is not feasible due to limited logistics, deploy some health protection measures e.g. suitable crop restriction such as planting crops, which are not eaten raw.</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p>In areas where ambient [surrounding] temperatures reach up to 20 °C, a total storage time of 1.5 to 2 years (including the time stored during primary treatment) will eliminate most bacterial pathogens In areas where the ambient temperatures reach up to 35 °C, a total storage period of 1 year is ok. In areas with higher temperatures, the storage time is further reduced.</p> </div>
<p>In urban homesteads, the faecal material can be transferred into a cement jar or container that doesn't allow filtration of the faecal matter into the ground. This is done because of lack of space in urban homesteads.</p>	
Application techniques	
<p>Avoid putting fresh excreta on crops.</p>	<p>Crop fertilization with raw excreta causes excess infection with intestinal nematodes, in both field workers and consumers of the crops.</p>
<p>Treated faeces should be incorporated in the soil before crop establishment.</p>	<p>A safety barrier to protect workers.</p> <p>To reduce contact in the garden especially with the</p>

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	edible parts of plants.
General safe handling practices of Ecosan byproducts:	
Safe handling of Ecosan byproducts operates on the principle of reducing contact with the material	
What to do	Reason
Wear gloves, rubber boots (shoes), and overalls when emptying processing chambers or pits. Careful hand washing with clean water and soap should be done after handling the Ecosan byproducts.	This is to avoid contact between people and excreta. To block the faecal-oral route.
Only adults and not children should empty the chambers/pits.	Children may fail to adhere to the hygiene rules.
Use proper handling tools.	Reduce contact with excreta.
Dig or plough the treated faecal material into the soil immediately upon application.	Reduce contact in the garden.
Handling and transport systems should involve minimal contact with the faeces.	This is to avoid contact between people and excreta thus limiting the secondary spread of pathogens through equipment
Clean the used equipment well afterwards especially if they are to be used for other purposes.	
Hygienic food handling and food preparation practices e.g. washing and peeling (if possible) or cooking the harvested crops before consumption.	For disease vector intermediate control
Summary of safe factors in handling Ecosan by products	
Good pathogen reduction in latrine + Good post-latrine handling + Good hygienic behaviour = Safe (ecological) sanitation	

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