

Composting Toilet

Aydee, Chad, Joel

Ecuador

Demographics

- In general, [water service quality](#) is low in Ecuador. Water supply services are interrupted in 50% of the urban areas. Water pressure is well below standard, particularly in poor outlying areas. In 30% of the urban areas, there is no treatment of drinking water. 92% of wastewater is discharged without any kind of treatment.

Jaime and their toilet

- We hope to work along with Jaime and her team in Ecuador to help solve sanitation problems in their community.
- We intend to design a composting toilet suitable to the local parameters of Ecuador and test it at the Cal Poly student experimental farm.



Sanitation in Ecuador

"In 2010, an estimated 2.5 billion people were still without improved sanitation. 15% of the world population still practices open defecation, defined as defecation in fields, forests, bushes, or other open spaces. This represents 1.1 billion people. The majority of those practicing open defecation (949 million) live in rural areas, with 17% living in Latin America and the Caribbean. Sanitation issues can be difficult to discuss due to social taboos." -Waterecuador.org



Student experimental farm

Interview with student from the experimental farm:

Student: The university didn't like the idea of having a composting toilet because of the liability.

Joel: What about the toilet you have on the farm now?

Student: It's a portable toilet. It's working terribly, it is gross, it is way down there at the bottom of the hill. It is inconvenient, it smells weird, we don't really like it. We have to pay for it. It is wasteful. It is taking the waste and putting it somewhere else. If we had a composting toilet we would take care of that waste onsite. Which is what we want to do.

Joel: If you would have one what would you expect from it?

Student: It would need to do what it needs to do onsite.

The most we expect is some productive output because what else would you do. Sanitary, conveniently located and does everything on site. Not adding things to it to make sure it's composting. Automating it in some way to make sure there would be minimal contact because people don't like working with shit.

Joel: Would you mind having to dump the composting toilet if you had one?

Student: No, we are pretty hearty people, we understand what it means to have a composting toilet, but if the technology exists to make it as no hassle as possible then that is ideal but if it costs a lot of money it is not worth it.

Design Parameters

- Remove the user from waste (poo)
 - Maximize compost/ break down before storage is filled and needs to be handled
 - Kill dangerous pathogens of human waste before contact
- Cheap
- Looks Good
- No Water Input

Design Basics

All Improvisable Materials

-2 5-Gallon Bucket (scalable for larger storage)

-Half a Bicycle

-Cone

-Plunger Head

-Funnel

-Glue/ Resin

-Tubing

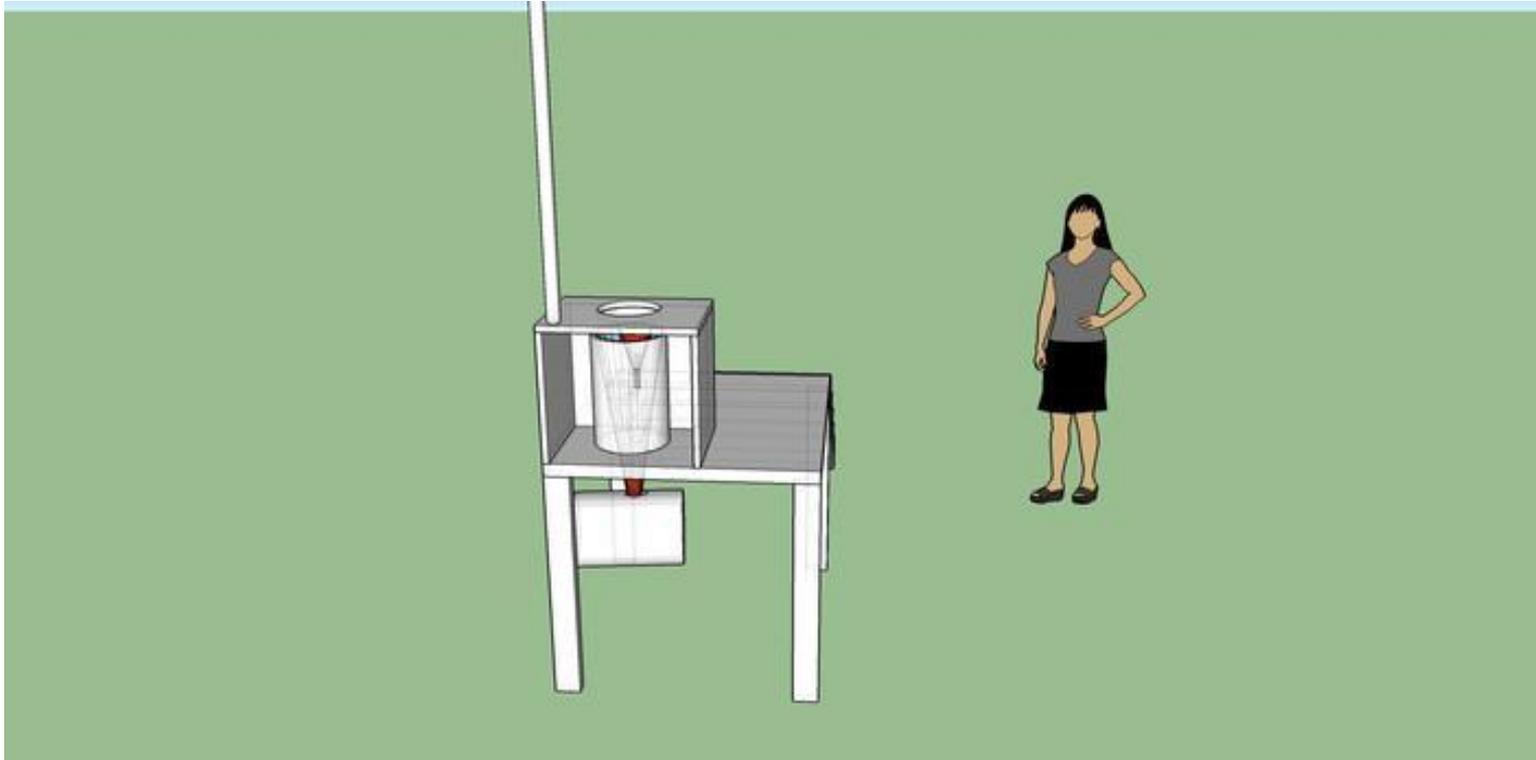
-Wood Platform

Cost

-Half a used Bicycle	~\$30
-2 5-Gallon Bucket	\$ 10
-55 Gallon Drum	\$ 20
-Cone	\$ 3
-Plunger Head	\$ 1
-Funnel	\$ 2
-Glue/ Resin/ Weld	\$ 10
-Tubing	\$ 2
-Wood Platform	\$ 5

Roughly \$80 if materials need to be bought

Design



Composting Basics

2 Effective Processes

- Heat (Mesophilic and Thermophilic Phases)
 - Aerobic Bacteria
 - Mesophilic bacteria proliferate and populate
 - Thermophilic bacteria kills pathogens in 24 hours at 50 degrees C
 - Much of human waste is “consumed”
- Time
 - Slow, cold process
 - Complex bacterial and microorganism interaction
 - Kills human waste pathogens in ~ 3 months
 - Decomposition of organic matter

Science behind the rotating drum

- Supplies oxygen throughout pile
- Mechanical breakdown
- Speeds initial compost processes
- Facilitates pathogen death
- May reduce smell
- Manages moisture content

Hopes for our future design?

Modifications that would be made

- a) Scalability
- b) Making it more attractive to third world countries (making it pretty)

Overall is this a feasible design for ecuador and the student experimental farm?

a) Can parts be found in the country

YES!

b) would they use it....

References

Humanure Handbook: <http://humanurehandbook.com/downloads/H2.pdf>

Envirolet: <http://www.envirolet.com/compostmyths.html>

Home Composting: <http://www.homecompostingmadeeasy.com/turningcompost.html>

Let's Go Green: <http://www.letsgogreen.com/how-composting-toilets-work.html>