

Critical Practices LLC

The Earth Auger

An Ecological Toilet: *mechanized and 100% decentralized*

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Vision:



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To reinvent the toilet so that it is sustainable and accessible to all families.

We are developing several prototypes of decentralized toilets that are comfortable, safe, affordable and sustainable. These are ideal for rural and peri-urban areas that don't have sewer or where water is expensive or scarce.

Global Situation

Worldwide, 2.5 billion people still

lack access to improved sanitation.

FUNDACION IN TERRIS





Regional Situation

In Latin America the picture is similar: 120 million people lack access to improved sanitation, mostly in rural areas.



In Ecuador, it is estimated that about 3 million people do not have access to improved sanitation.



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Población estimada para Latinoamérica en 2010: 590'082.000 Fuente: JMPD-UNDP, 2012. /Text: Infolatam, 2010

Our Project

We have been working on a project to "reinvent the toilet" since 2002.







We have designed and tested many composting toilets, mainly in the US and Ecuador, but also in Asia and Africa.

In 2011 we were selected by the Bill & Melinda Gates Foundation from among 2,600 proposals and received a Phase I grant to conduct an 18-month investigation of our new toilet concepts.

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We developed two improved prototypes, with these features:



- They are low cost (as low as \$150 depending on the prototype),
- They do not use or pollute water and require no power to operate,
- They have little odor problems, or flies and other disease vectors,
- They are safe, comfortable, and are easy to operate and maintain,
- They produce soil amendments through the separate handling of urine and solids; transforming the solids into compost.

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Our prototypes were operated by a pedal that activated up to three simultaneous mechanisms:

- 1. A "flush mechanism" captured and released the fresh deposits to the processing chamber.
- A "sawdust dispenser " released and 2. distributed a layer of sawdust on the solids.
- An "auger" mixed the fresh material 3. with the sawdust, aerated the mix, and moved it through the processing chamber, promoting "composting".



* Versions tested in 2012. Currently the prototypes use gears instead of chains and have other improvements.



Our prototypes were tested by lowincome families in a peri-urban area of Guayaquil.





WIDE ACCEPTANCE: After 1.5 years, these families are still very satisfied with their "Earth Augers"

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Yet, we've improved!

New project: scaling up

FUNDACION

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In July we received a Phase II grant from the Bill & Melinda Gates Foundation to continue development of our prototypes and begin the process of commercialization. Our goals are now to:

- To develop large-scale demonstrations of our new prototypes (a total of 300 to 500 toilets built and installed in Ecuador) in order to assess the acceptability, logistics, utilization of by-products (fertilizers) and fate (destruction) of pathogens.
- To develop a business plan for production, marketing, assembly and distribution that is sustainable and competitive, focusing first on Ecuador and Latin America, then the global marketplace.
- To develop a plan that promotes local economy and job creation.





We modified, tested and improved our prototypes

Steps Completed



We developed smallscale mass production techniques





We have the commitment of Ecuadorian partners

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2013 Basic Plus Prototype







Why do we think that Ecuador... Latin America... the world is ready for a 'toilet' change?

1. Water flush/centralized treatment for family housing projects of >1000

people.

Fuente: Tilley, Elizabeth et al, 2008. Compendium of Sanitation Systems and Technologies. Swiss Federal Institute of Aquatic Science and Technology (Eawag). Dübendorf, Suiza.

- The investment per household is approximately \$1,740. All sanitary fittings, bathroom sanitary components, cost of the treatment plant and its maintenance and operation for three years are included.
- If managed properly the treatment plant ensures that the wastewater has the quality to be discharged to a receiving body of water.





2. Water flush/septic infiltration for a house



Fuente: Tilley, Elizabeth et al, 2008. Compendium of Sanitation Systems and Technologies. Swiss Federal Institute of Aquatic Science and Technology (Eawag). Dübendorf, Suiza.

- The basic investment is \$1,150, excluding the cost of housing and electrical installation.
- Groundwater contamination is possible, and soil infiltration capacity is not guaranteed.





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pantalla para moscas @>11cm tubo de ventilación desviación de orina tangue de orina

Fuente: Tilley, Elizabeth et al, 2008. Compendium of Sanitation Systems and Technologies. Swiss Federal Institute of Aquatic Science and Technology (Eawag). Dübendorf, Suiza.

The investment can range between \$560 and \$650 per household.

- It is the best choice in places where there is no water, because the system does not use or contaminate water. Does not use energy normally used to transport and treat wastes.
- In addition, by recycling human wastes and turn them into nutrient rich compost, added value to the system is generated.

3. Eco-toilet with reuse of by-products

4. The Earth Auger



The Earth Auger as a complete system. Including housing (can be adjacent to an existing structure), rainwater collection, sink and urinal, and underground greywater and urine 'fertigation' system.



- The investment can range from \$200 to \$350 per household.
- It's the best choice in places where there is no water, because the system does not use or contaminate water. Also doesn't use energy normally used to transport and treat wastes.
- In addition, by recycling human wastes and turning them into nutrient rich compost, added value to the system is generated.

The monetary investment... is less than all other options for improved sanitation in Ecuador...

\$ 1840	Portable toilets
\$ 1737	 Water flush/central treatment > 1000 people
\$1497	• Water flush/sealed & pumped tank
\$1154	 Water flush/cesspool & infiltration (shown prior)
\$1054	 Water flush/public sewer connection
\$564	• Eco-toilet (shown prior)
\$200 - \$350	Our prototype eco-toilet**
\$188	• Pit toilet

Notes:

Pit toilet and water flush/cesspool are considered unimproved sanitation systems. ** The price can drop by more than 30% if purchased on a large scale. Source: Creative Environment, Environmental health, FCME, Mr. Martínez (2012).

- Composting toilets such as our prototypes would be the ideal complement to housing programs such as those by the Ecuador Housing Ministry. Currently, they annually average build of 13,600 houses/year. Other organizations average well over 10,000/year without any sanitation facilities.
- These toilets would also be ideal for:
 - Rural and agricultural farm
 - National parks and protected area
 - Ecological hostels



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The Earth Auger 2013 Prototype



Our vision: Within 1.5 years, to achieve an effective, commercially available and inexpensive eco-toilet, that produces usable by-products (fertilizers), with added benefits of increasing local economy by job creation.















