

Vetiver Latrine Guide

A “how to” guide to successfully install a natural, sustainable latrine using vetiver grass.



The use of vetiver grass (*Chrysopogon zizanioides*) replaces the need for a concrete block lined pit, creates privacy and actively helps decompose the waste. Jiji grass (*Achnatherum splendens*) can be used as an alternative in colder or harsh conditions where vetiver does not grow.

The most up-to-date version of this guide, in multiple translations, can be found at:
http://www.healthy-mind-body.com/humanitarian/vetiver_latrine.html

Benefits:

- Far less expensive than traditional latrines (\$25-50 instead of \$500).
- Easily upgraded so that an elevated toilet, ventilation and a privacy shelter can be added if desired.
- Far less materials needed making installation in remote regions possible.
- Vetiver roots reinforce pit walls effectively. In Haiti, of 365 vetiver latrines installed during a rural project, only 2 (0.5%) of the pits had collapsed during a survey performed 2.5 years later. Both pits failed because of unstable ground. One had been abandoned. Normally signs of pit failure will show long before collapse and with proper maintenance the process can be halted.
- Easily moveable concrete slab allows for reuse of materials after latrine pit is full.
- Vetiver provides a privacy screen, but can be cut regularly and has multiple uses (fuel, animal feed, compost, crafts, thatch roofing, earth wall construction, etc)
- Vetiver roots actively help decomposition of the waste and reduce pollutants leaking from the pit.
- Easy to build, so that all in need can master the process and make latrines for themselves.
- Self cleaning and repairing, the slope of the slab allows rainwater to wash into the pit and clean the latrine and damage to the vetiver will grow back.

Cons:

- Vetiver grass has some minimal needs that must met: 1) watering if planted in the dry season; 2) at least a partially sunny location; 3) protection from grazing animals (until plants are established).
- Vetiver grass takes 1-2 growing seasons to reach full size, to enjoy the benefits of the privacy screen.
- Local sanitation laws may prohibit the use of a vetiver latrine.



Vetiver prevents erosion even in severe conditions. This image shows a vetiver hedge holding a wall of soil in place despite the fact that the soil around it, without established grass, completely washed away.

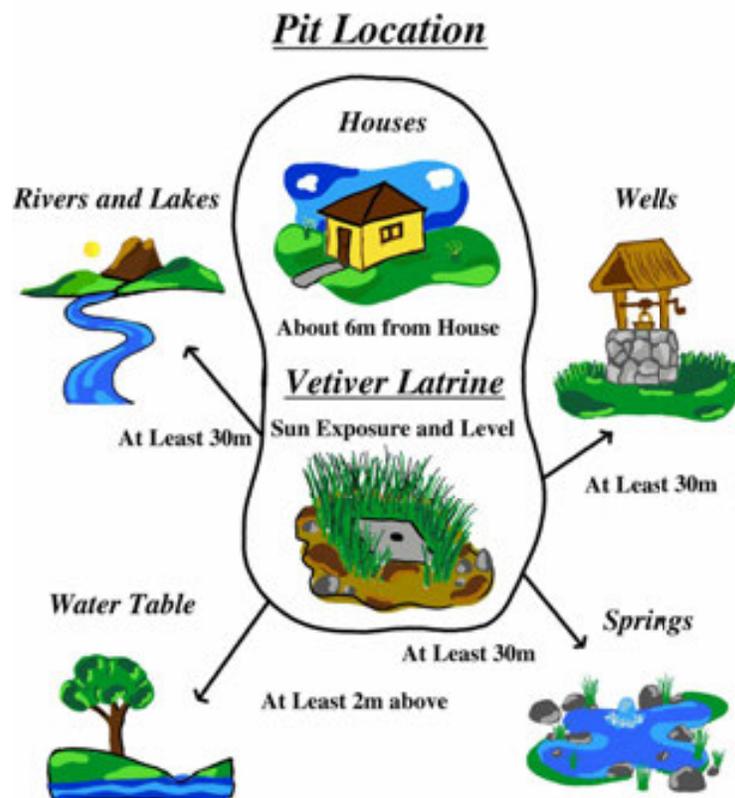


Vetiver roots are massive, up to 4-5 meters deep. This image shows a clump of vetiver (leaves and stems have been cut back) after being dug up by three men using hand held hoes aided by a wood tripod to help lever the clump out of the ground.

Pit Location

Four factors are important to consider when determining the best location for the vetiver latrine.

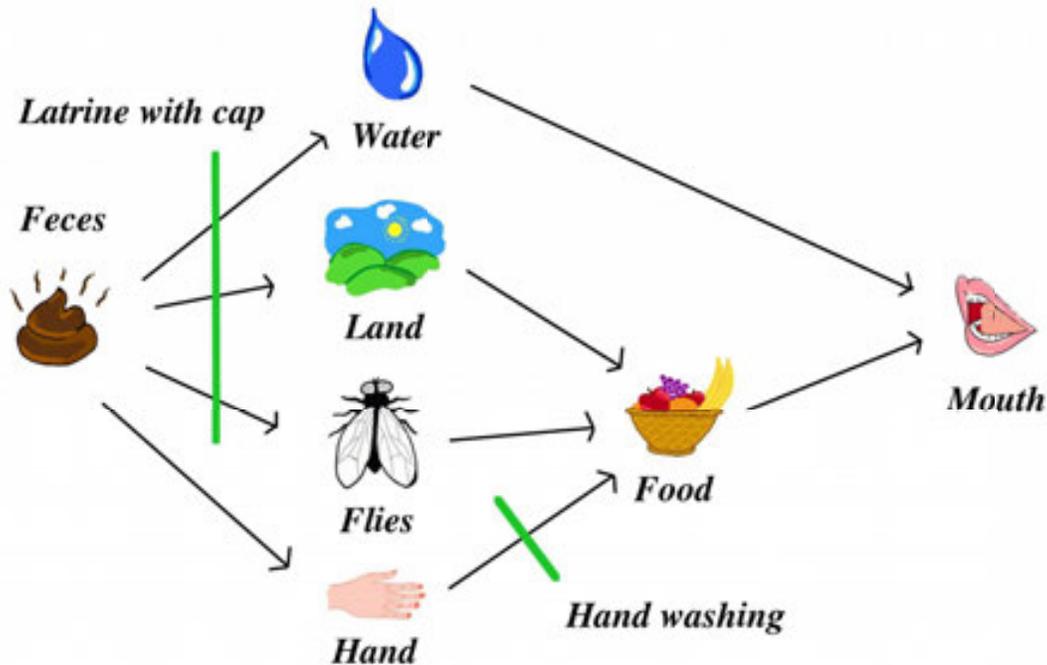
- 1. Sun:** Vetiver loves sun and at a minimum needs partial sun exposure throughout the day. If an area has dense overgrowth, then it is best to prune back some of the surrounding trees and shrubs.
- 2. Contamination:** It is important that the contents of the latrine pit stay safely in the pit. Simple precautions can be taken to prevent any effluent leaking from the pit (leachate) from contaminating drinking water or local waterways. The pit should be located downhill from water sources whenever possible, especially sources of drinking water such as springs and wells. Even then, the pit should be 30 meters from water sources. The pit should be about 2 meters above the groundwater table and above flood level during the wet season. In some cases, the features of the site maybe more important than the distance.
- 3. Convenience:** The latrine should be close to the family's dwelling, so that a sick person can reach it in the middle of the night, but far enough away so that the flies from the latrine cannot contaminate the kitchen or odors penetrate the house. Placing the latrine within 6 meters of any home, is a good rule of thumb.
- 4. Level Surface:** Although the pit can be located on sloped ground, the concrete slab once in place needs to be level.



Sanitation

Some diseases are caused by germs that live in feces and can only spread by the fecal oral route. The common ways a disease can spread from feces to the mouth are contamination of: water, land, flies, hands and food. The combination of the use of clean water, a well-built latrine and hand washing completely blocks these routes of infection and promotes health.

Fecal Oral Route



Construction

The Pit:

Dig the pit in stable ground and make the sides directly vertical (as opposed to a funnel) to minimize the risk of pit collapse. The shape, width and depth of the pit can vary. The table below outlines important factors to consider when choosing the pit shape. For example, if minimizing expenses is a priority or if the slab needs to be transported short distances (100m or so), then a round pit will be a better choice. It uses less materials and can be rolled to its final location. However if the slab is made on-site and there is enough money for a larger, longer lifespan pit, then a square pit may be the right choice. Whichever shape is chosen, make sure the concrete slab matches the pit shape. For example, a round pit has a round slab and a square pit a square slab. This way when the vetiver is planted next to the slab, the roots will be close to the vertical pit walls and capable of reinforcing them.

Round	Square
Pros: <ol style="list-style-type: none"> 1) A round pit has stronger walls 2) Less materials are needed for the concrete slab 3) It is easier to move the slab, as it can be rolled 	Pros: <ol style="list-style-type: none"> 1) The pit lifespan is longer because a square pit has a greater volume than a round one 2) The concrete slab is easier to make
Cons: <ol style="list-style-type: none"> 1) The concrete slab is a little more difficult to make 2) A round pit has less volume than a square one, making the lifespan shorter 	Cons: <ol style="list-style-type: none"> 1) The concrete slab is harder to move, it weighs about 200kg 2) More materials are needed and hence it is more expensive 3) Square pit walls are not as strong

The width and depth of the pit can be modified. The final volume of the pit will determine its lifespan. A square pit that is 1 meter wide and 2.3 meters deep, as shown in these designs, will serve a family of six for five years. This calculation accounts for the top ½ meter of the pit being filled with earth when it is retired. This is done to avoid contamination of the surface soil. To determine the lifespan of a pit expect a volume of at least 0.06 cubic meters per person per year. A greater volume, such as 0.1 cubic meters, should be expected if anal cleansing materials such as corn cobs or stones are used. Experience has shown that anything less than 1.2 meters will last only about a year. This calculation is based on a conventional latrine. A vetiver latrine may last longer because the waste is at least partially decomposed by the vetiver roots.

Calculation of Pit Size: Example
Expected Usage: 6 people x 0.06 cubic meters x 5 years = 1.8 cubic meters
Usable Pit Size: 1 meter x 1 meter x 1.8 meters (2.3 m – 0.5 m to fill top) = 1.8 cubic meters

If the width of the pit is altered, modify the size of the concrete slab and beams accordingly. The slab should be 20 cm wider than the pit and the concrete beams 70 cm wider than the pit.

The Slab:

A strong concrete slab can be made from the following standard mix: 3 parts sand, 3 parts gravel and 1 part cement. If the slab is made on-site in a remote location, the sand and gravel can be sourced locally. The gravel should be “thumb sized” or smaller. The sand should be free of dirt and debris. A simple mesh screen placed over a bucket can be used to separate the sand from any debris and water can be used to remove any dirt. The ratio of sand, gravel and cement can be modified slightly depending on the availability of local resources. For example: 2 parts sand, 4 parts gravel and 1 part cement will work. Alternatively: 4 parts sand, 2 parts gravel and 1 part cement will also work. Add water to the mix until the concrete is workable. Plan on at least 3 buckets of water for the mix and for cleaning tools.

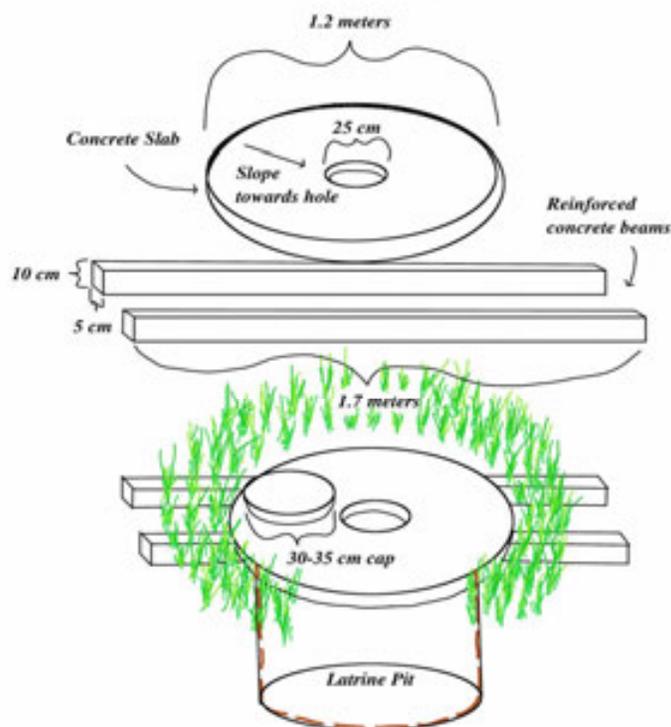
The slab and beams can be shaped by using wood forms placed on level ground or by digging a depression into level ground. In either case, reinforce the concrete with 3/8" rebar (9mm) as shown in the design. Once complete the rebar should be embedded inside the slab and beams, so no metal is protruding out of the concrete. Before pouring the concrete, small stones can be used to elevate the rebar so that it is in the proper location. A bucket or template can be used to create the hole in the center of the slab. This hole should be no larger than 25 cm in diameter, so that a small child will feel safe using the latrine. Remove the bucket when the slab starts to harden (about 3 hours) and then cover with damp cloths, cement bags, hay, sand or a sheet of plastic to allow the concrete to dry slowly. Although some masons use concrete within 6 days of pouring it, a curing time of 21 days will insure a strong slab. Placing large stones under edges of the slab when it is moved to the latrine pit, will help reduce the risk of pit collapse.

If a seat is desired, this can be constructed with cement blocks, bricks or wood. Be sure the hole is covered to prevent flies from accessing the pit. The cap can be made from cement as shown in the design or other materials such as wood. A larger bucket (30-35 cm diameter) can be used to form the cap. It is best to make the cap without a handle to encourage the use of the foot to slide it on and off the hole. This helps prevent hand contamination.

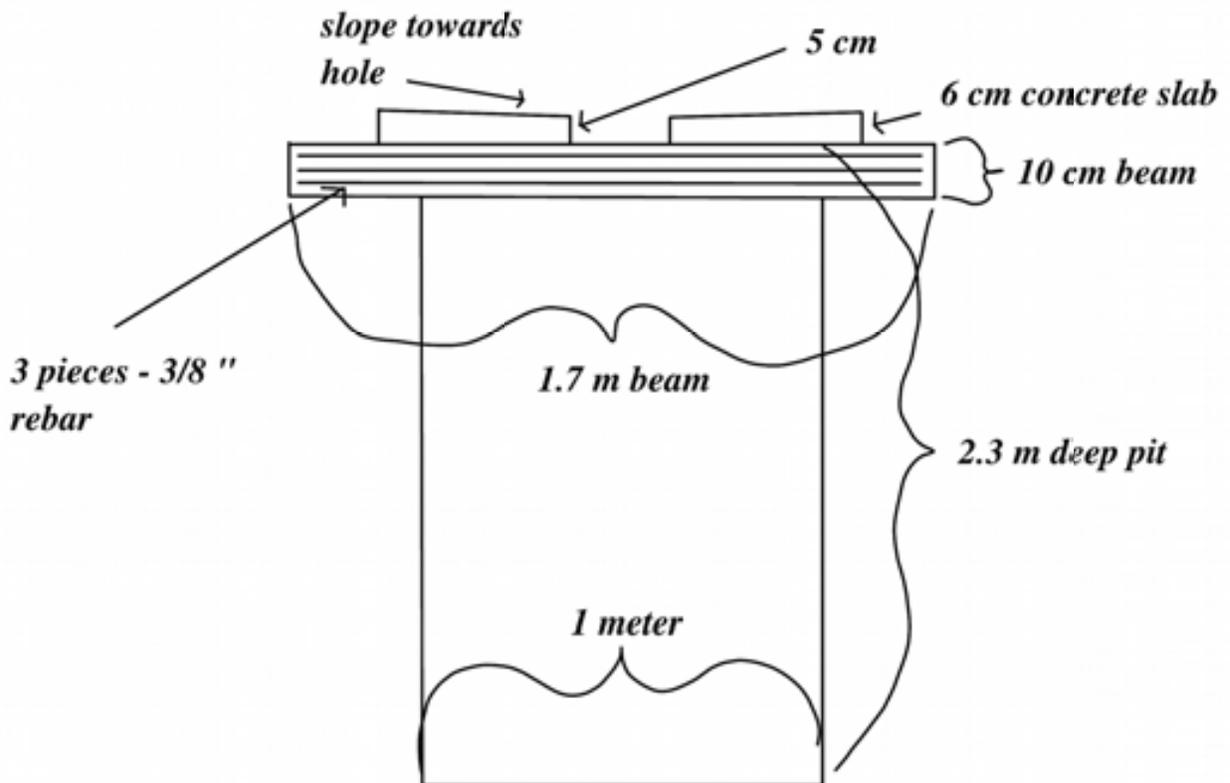
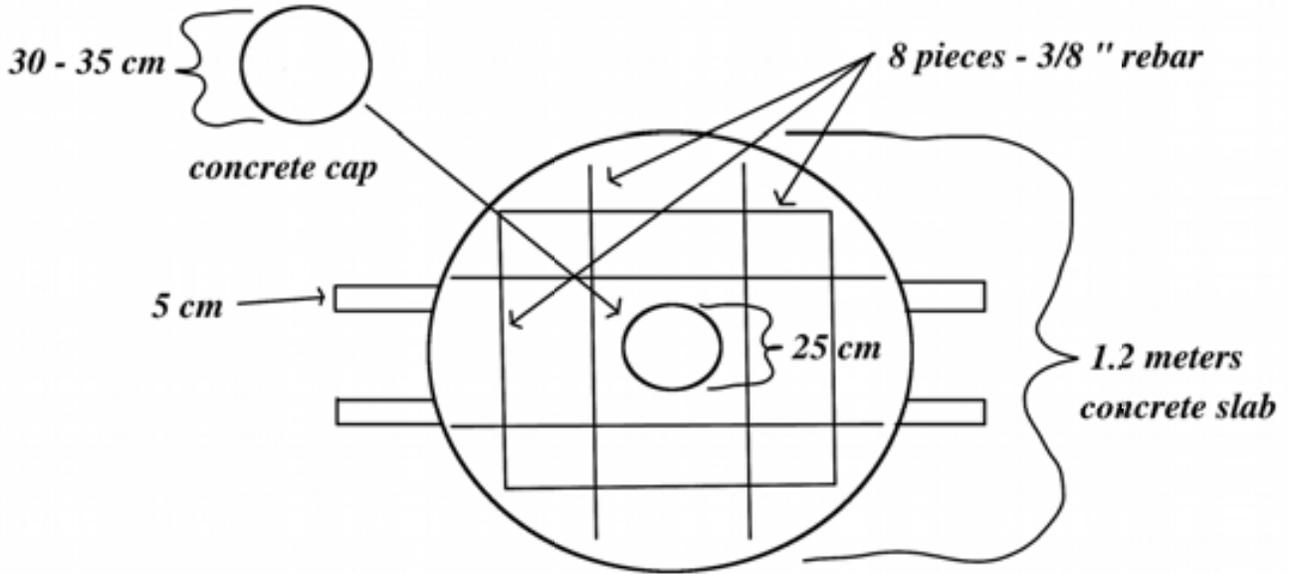
Rot-resistant wood or bamboo can be used as an alternative to a concrete slab. The wood should be shaped similarly to the slab and covered with mud and cement mortar. These materials are less expensive, but will have a shorter lifespan than a concrete slab. It is unlikely they can be reused for future latrine pits.

The Design:

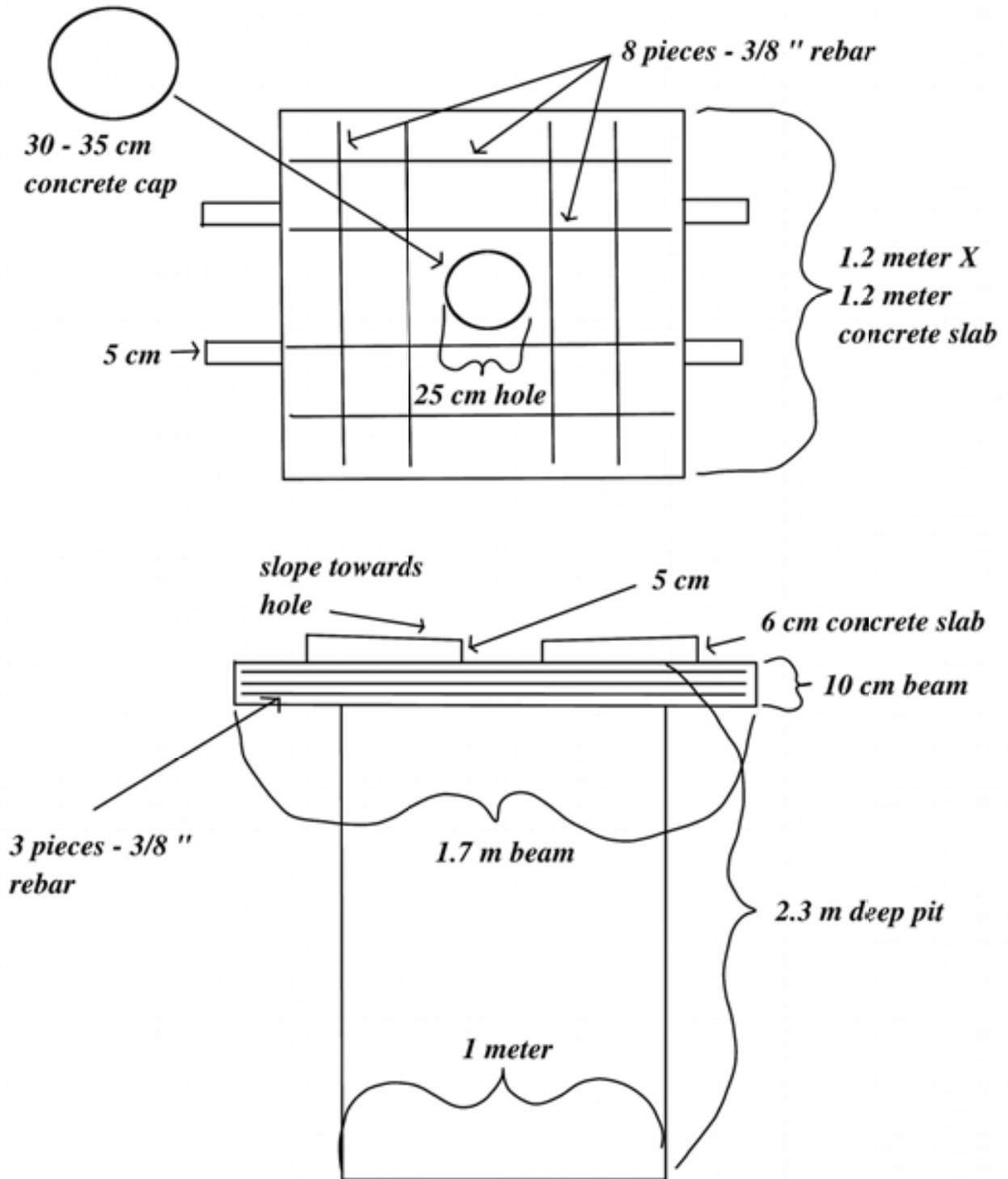
Vetiver Latrine Design



Round Vetiver Latrine



Square Vetiver Latrine



Vetiver Planting:

Plant the vetiver slips at 10-15 cm spacing (about the width of your fist) in three separate rows around the latrine with 30-40 cm between the rows. Leave an opening on one side for an entrance to the concrete slab. The row of vetiver plants closest to the latrine, must be within 30 cm of the pit wall (10 cm from the edge of the concrete slab) so that roots can easily reach the pit wall. Vetiver roots develop downwards vertically, not horizontally. Plan on purchasing about 50 vetiver slips when making a latrine the size depicted in the designs here. It is best to plant the grass in the rainy season as they will not require manual watering as they develop. If it is planted shortly before dry season, water the grass every four to five days if there is a lull in the rain until new shoots at the base of the plant are growing well. They may look dry and gray the first few months after planting but keep watering them and know that they are just concentrating their energy forming roots. Cover the bare soil with organic matter or mulch. The vetiver grass can be cut to provide mulch as it grows. Leaves, wood chips, other grass clippings, plant prunings and even cardboard or paper can be used to cover the soil. This is important as it prevents weeds and helps the soil retain moisture. While the vetiver is developing it should be protected from grazing animals. Goats can eat the grass down to the ground if given a chance, but if the plants are already established (more than 4-6 months old) then they will spring back easily within a few weeks of being eaten.



Vetiver latrine with newly planted slips, notice that the slips are planted right next to the slab and will not interfere with the slab as the roots grow down vertically and not horizontally.

Vetiver Care:

Over the first year, the vetiver will grow together to form a solid hedgerow. The hedgerow will remain as such for several decades and the three rows will ultimately look like a solid planting after a few years. It should be cut back annually at the end of the dry season to promote new growth. It can be cut more often (3 times a year) and will grow back more vigorously each time. When pruning, leave about 30 cm of grass at the base. The grass clippings can be used for many purposes. They make excellent animal feed when freshly cut and can be composted. They can be pressed into bricks manually with a Byrant Press and used as a clean, smokeless fuel. It can also be used for handicrafts, thatch roofs and to reinforce earthen walls. After the first growing season, the plants will flower sending up very stiff flower stems that can be 1-2 meters tall. These can be cut and serve as reeds to provide a stiff backing for crafts such as woven mats.

Latrine Care:

It is important to keep the concrete slab clean on a regular basis using soap and water. Do not use chlorine or bleach products to clean the latrine. This is harmful to the roots of the vetiver and can arrest its natural cleaning process. If a shelter is not constructed over the slab, then rain will help the cleaning process because the water will naturally run down the slope of the concrete slab into the pit.

If the latrine pit shows signs of collapse, such as a hole forming near the slab's edge, measures can be taken to stop this. Fill the hole with wood, then cover with earth and plant vetiver on top. The vetiver roots will stabilize the hole and prevent further collapse. Alternatively, large rocks can be used to prop up an unstable slab. If the collar of the pit has opened to the point where it cannot be repaired, then a new pit should be dug and the vetiver and slab transferred over.



A latrine with mature vetiver providing a privacy screen

Reuse:

When the latrine pit is full, the concrete slab and vetiver grass can be moved to the new pit location. Dig down along the side of a vetiver clump about 30 cm. Then cut horizontally and pull the clump out of the ground. Do not worry about the roots being cut. New roots will begin to form from the root crown (the woody heart of the clump just below the surface of the ground). The clump should have about 15 cm of roots intact as well as the crown. Trim the leaves to a height of 15-20 cm and divide it into slips containing about 3-5 individual slips using a machete, hoe or axe, replant these as they were planted when latrine was first built. The old pit should be covered by ½ meter of earth. In two years this space can be gardened or alternatively a fruit tree can be planted immediately.



Vetiver slips planted in row



Vetiver slips with root crown at the base

Modifications:

The basic vetiver latrine shown in this tutorial is easily upgraded. Adaptations may be important for the latrine to be accepted in different cultures depending on the local norms. A shelter can be built on the concrete slab for more privacy. Also, an elevated toilet seat can be constructed directly above the hole in the concrete slab. A 4-inch diameter ventilation pipe (PVC pipe is an ideal material) can be cast into the concrete slab. If there is a shelter, the pipe extends ½ meter above the peak of the roof to carry odors away. It is important to place a screen or mesh over the pipe to prevent insects from accessing the pit.

In regions where vetiver cannot grow, the latrine can be modified by using jiji grass (*Achnatherum splendens*) instead. Vetiver is a warm weather plant and only grows in tropical and subtropical zones (USDA hardiness zones 9 and above). Jiji grass however, is tolerant of extreme winters, hot summers

and poor, saline soil conditions. The root structure of the grass is extensive and like vetiver stabilizes the soil. Jiji grass is an ideal alternative to vetiver grass if needed.



Jiji grass roots prevent erosion, similar to vetiver

Credits:

- 1) Owen Lee (www.vetiverlatrine.org); Vetiver latrine creator, guide editor and owner of most of the vetiver latrine photos.
- 2) TVNI (The Vetiver Network International, www.vetiver.com); Owner of the vetiver and jiji grass photos.
- 3) Dale Rachmeler, PhD (drachmeler@mac.com); Guide editor.
- 4) Roger Gietzen, MD (www.healthy-mind-body.com & roger@healthy-mind-body.com); Guide creator, illustrator and owner of some of the vetiver latrine photos.

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