

What do we want from our farms
and why don't we get what we need?

The Warm Heart Biochar Team

We want

enough food



We want something to sell in the market



We need things we cannot grow

We need cash.

- We grow food to eat and sell for cash.
 - If our crop is too small, we do not earn the cash we need.
 - We need cash for cooking oil, soap, clothing, tools and lots more.
- Even if we have a good crop, we sometimes don't get enough cash, because we can't get to market.
 - The roads are bad.
 - There is no truck.
 - The weather is bad.
 - What we need is not in the market.



We need markets. We must sell to buy what we can't grow



Are we poor because we are lazy?

Are you kidding?

Do you have any idea
how hard it is to raise a
crop in our fields?



So why do our farms fail us?

- Because our soil is bad.
- Because of climate change:
 - The world hotter.
 - The rains are less predictable or fail entirely.
 - The storms are worse.
 - The pests are hungrier.



Our soil betrays us



If only we had fertilizers – but we cannot afford them.

Our soil is just dirt.

- It is acid.
- It is clay.
- It is infertile.
- It sheds rain but won't retain water.
- It is dead.

The weather is against us



No money! No one will help us.



Can we do anything to help ourselves?

Absolutely!

We can biochar.



What can I do with biochar?

Biochar is powerful stuff with many uses

- Biochar helps slow climate change and reduce the bad effects of smoke from burning fields
- Biochar improves crop yields by improving soil and retaining water.
- Biochar in animal feed improves animal health, weight gain and productivity.
- Biochar can purify water to keep you from getting sick.

Remember: biochar is not charcoal

Biochar may look like charcoal, but it can do many things that charcoal cannot do.

- It can cool the climate and does not smoke.
- If you put it in your soil, it will improve your yields, hold water, bring back the worms and make the soil better
- It will make your animals healthier, fatter and more productive.
- It can purify your water.

Biochar is also not NPK

Biochar is not a fertilizer. It is a "soil amendment."

So what?

- Fertilizers are used up immediately; biochar remains in the soil.
- Fertilizers work very fast, but do not last long; biochar improves for at least four years.
- Fertilizers are costly and often do not arrive when needed; biochar you make yourself any time you need it.

Biochar, the climate and smoke

- As you already know, making biochar stops climate change.
 - Making biochar helps cool the atmosphere
 - Making biochar helps reverse the effects of climate change on you.
- Making biochar stops smoke.
 - Making biochar stops the smoke from burning crop waste in the field.
 - Making biochar reduces the health problems caused by breathing smoke.

Biochar and your farm

Your yields

- With bad soils, biochar will increase crop yields 30% to 100+%
- If you use NPK fertilizers, apply biochar and reduce the amount of NPK you apply by 25% to 50%.
- Your plants get molds and other diseases, applying biochar can stop them.

Your soil

- Biochar will reduce soil acidity
- Biochar will increase soil fertility
- Biochar will improve water penetration and retention
- Biochar will vitalize soil life.
- Biochar will protect you crops against diseases the persist in the soil.

Biochar on the farm



Biochar and your animals

Your animal's problems

- Whether you have chickens or cows or chickens or goats or pigs, your animals get sick.
- They don't give enough milk or eggs
- Your animals' poop stinks and attracts lots of flies.
- Biochar will increase your animals' weight gain
- Biochar will reduce the smell of their manure and the flies.
- This will slow diseases' spread among your animals and family.

Biochar to the rescue

- Fed to animals as part of their feed, biochar will reduce digestive illnesses.

Biochar and animals



Fat, productive cows, chickens, and pigs.
No more diarrhea.



Stink = flies = sick animals and family
Biochar in food = no stink

Biochar and clean water

What is the problem?

- Dirty water makes you and your family ill every day.
- There is no public water filtration facility.
- You do not have a family water filtration system.

Biochar to the rescue

- Biochar not only absorbs (retains) a lot of water, it also adsorbs (locks up) dangerous chemicals
- A simple sand filter with a biochar core will remove all microbial pollutants and all chemical pollutants.
- A biochar filter combined with simple soft iron will remove arsenic.
- Biochar fertilizer in the soil will prevent chemicals from leaching into drinking water sources.

Biochar and water filtration

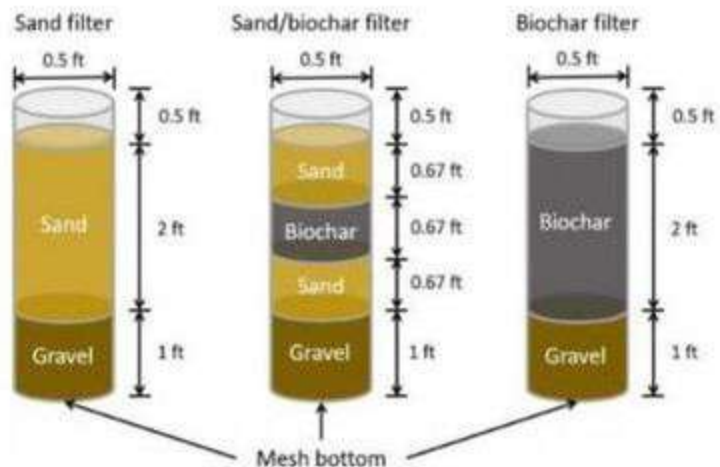
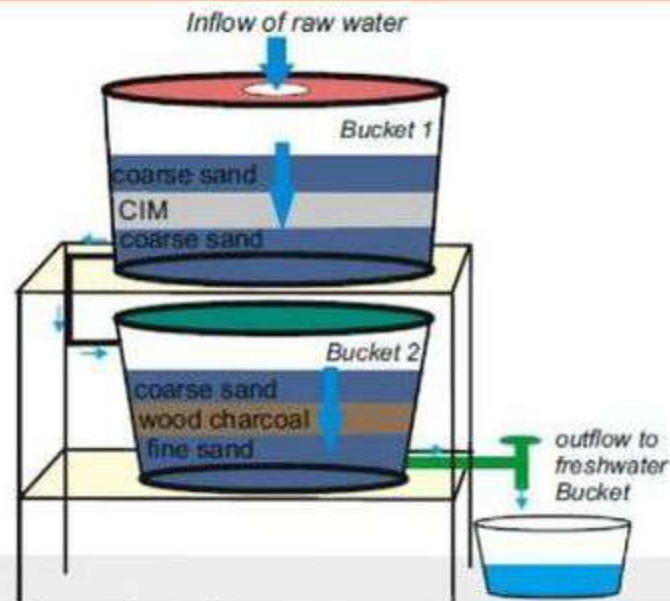


Diagram of the three wastewater filtration columns.



Clean water for your family: a bucket, biochar, gravel and sand.

How do I make biochar?



Charcoal versus biochar



Inefficient
and
smoky



Efficient
and
Not smoky



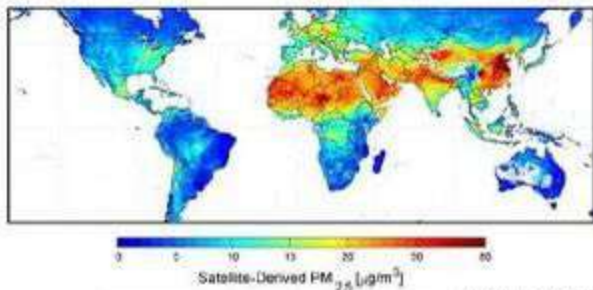
Biochar is not charcoal

Biochar may look like charcoal, but:

- Neither making nor using biochar produces smoke.
 - You may not know it, but smoke kills.
 - How? Its most dangerous component is PM2.5, particles so small that they go through the walls of your lungs right into your blood stream.
 - The blood carries the PM2.5 to your brain, heart, kidneys and liver, where it kills you with a stroke, heart attack, and cancers of all sorts.
- Making biochar could save your life or your baby's.

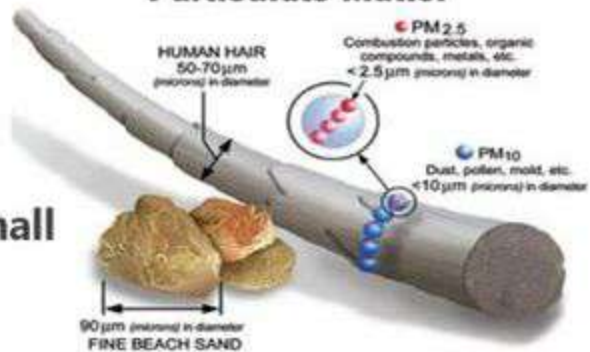
PM2.5 (smoke) and your health

Densest in the developing world



Affects the whole body

Relative Size of Particulate Matter

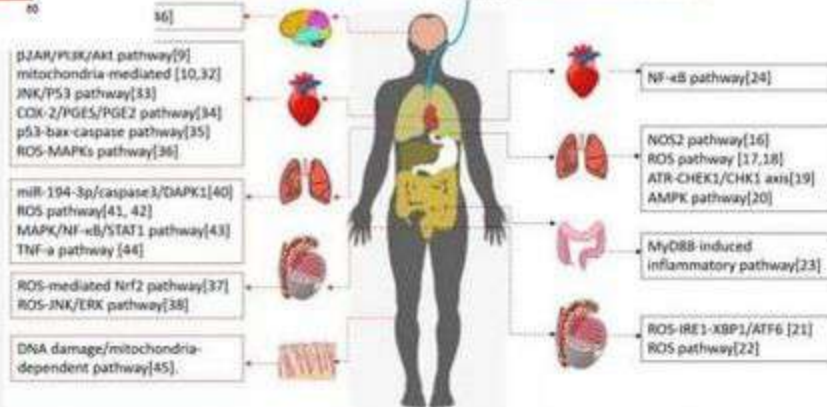


Very small

PM_{2.5} induced apoptosis

PM_{2.5}

PM_{2.5} induced autophagy



Biochar and forests

Biochar may look like charcoal, but:

- You do not need wood. Any dead plant will do. Biochar can be made with everything from tree branches to straw.
- If you use crop waste, you do not need to cut forest trees. This saves work and time – and it saves disappearing forests.
- Making charcoal takes days. Making biochar takes 1-2 hours.
- As much as 25-30% of what you put in comes out as biochar (as opposed to charcoal where you get 7 to 10%).

Biochar stops deforestation



Farmers without biochar could grow more crops only by cutting forest



The was once forest



Can you tell what is deforested?

Three ways to make biochar

You can make biochar three ways. You can

- Make a trench.
- Make a trough.
- Make a TLUD (*T*op *L*it, *U*p-*D*raft oven)



Trench



Trough



TLUD

But what is “good biochar”? How do I know it?

Good biochar should

- Not leave a black mess on your hands.
 - Any black should wash off with water. If it requires soap, the biochar is no good.
- Retain the most minute detail of the original feedstock.
 - All original material (too much un-charred feedstock), not done.
 - All the details burned off, over done.
 - All the details, well done.
 - You ought to be able to see every detail – miniaturized.

The trench in action



The trough

What do I need?

- A welder.
- Sheet steel
- 1" angle iron
- Ideally, a recycling yard

How do I do it?

- Locate the trough close to the feedstock
- Start a fire at the bottom.
- Add crop waste until trough is full of biochar.

How do I put it out?

- To smother in the trough, cover with wet canvas. Take care not to let the canvas burn through.
- Quench with water.
- Dump on ground and cover with dirt.

Benefits of the trench

- High volume (up to 250 kg/day); fast.

Drawbacks of the trench

- Expensive
- Requires constant attention

The trough in action

Khun Tie, Warm Heart Field Manager, making corn stalk biochar using a 2,000 liter trough.



The TLUD

What do I need?

- 200-liter oil drum, 1 sheet roofing metal
- 2x1.2 m metal, spacer bars (2.5 cm)
- String, marker, metal chisel, wire, and 3 bricks or stones.

How do I do it?

- With barrel set on stones, fill with chunky feedstock
- Start fire across the top.
- When feedstock is lit, place metal spacer bars across opening. Set top on them centered above barrel.

How do I put it out?

- Pour in buckets of water.
- Carefully dump on ground. Cover with dirt.

Benefits of the TLUD

- Can be left alone while in action.
- High output (5 kg/barrel); fast.

Drawbacks of the TLUD

- Some costs. Time to build
- Feedstock must concentrate in 1 place.
- Not appropriate for stalks or branches.

The TLUD in action



Big operation, five families, five barrels each family



All the barrels in action. No smoke.



How do I actually use biochar?

Biochar is easy to make and easy to use

Our aim is to teach you how you can make and use biochar yourself to improve your quality of life.

- In this class we will teach you how to:
 - Make biochar fertilizer.
 - Make biochar infused animal feed.
 - Make biochar water filters.
- Biochar fertilizer, feed and filters should cost you nothing and you should be able to make them with stuff you already have.

Making biochar fertilizer

- Technically, biochar is not a fertilizer. It is a soil amendment.
- We call it a fertilizer because the way we make it, it works like a fertilizer - only better.
- To make biochar fertilizer
 - If you are using lumpy char (for example, corn cob char), crush it to the size of corn kernels
 - Mix biochar and manure (any kind), 50: 50.
 - If you have a real forest nearby, add several handfuls of rich, forest dirt and leaf litter to the mix.
 - Ask the little boys to pee on the pile and mix until the pee runs out on the ground.
 - Leave for a day and then apply.

A note about compost

- Compost is great stuff. If you are already making it, don't stop.
 - But please enhance it with biochar from now on.
- When you make compost, the pile emits a lot of GHGs.
 - Adding biochar will stop this.
- When you make compost, many nutrients leach from the pile.
 - Adding biochar will capture these nutrients.
- If you make compost, you can substitute compost for manure when making fertilizer or simply add compost to plants happier.
 - But whatever you do, whenever you make compost, add biochar!

Using biochar fertilizer

- You do not use biochar fertilizer as you would chemical fertilizers.
 - Chemicals are very expensive. You use just a few grains put on top of the soil.
 - Biochar is free. You put lots of it in the ground under the seeds or around the growing plants.
- If you plant by hand with planting stick
 - Make hole with planting stick, put a handful of biochar fertilizer at the bottom, push in a bit of dirt, drop in two seeds, push in the rest of the dirt, pat down.
- If you plant in raised rows
 - Make a raised row, dig a shallow trench along the top, fill with biochar fertilizer, cover with a little dirt, plant the seeds or seedlings, push in the rest of the dirt, pat down.
- If you plant in "fertility pockets"
 - Using a hoe, make hole as wide and deep as the blade. Half fill hole with biochar fertilizer, push in a little dirt, mix more fertilizer with remaining dirt and push it in to cover seeds, pat down.

Using the stuff



Biochar animal feed

- Biochar mixed into animal feed will make animals healthier, gain weight faster and more productive
- Mixing biochar animal feed
 - For chickens, use biochar pieces the size of large grains of sand, For other animals (cows, goats, pigs) size does not matter much. (Too much biochar dust makes chicken food black and discourages eating.)
 - Add between 5 and 25% biochar to you animals' daily food ration (that is, 1 scoop in 20 to 1 scoop in 4).
 - Mix thoroughly and feed.
 - Cows really like salt and sweet. If you can, add salt (preferably iodized) and molasses to the biochar.
- Biochar is **NOT** a substitute for other food; it is a **supplement**.

Biochar and happy animals



Water filters

- How many people you are filtering water for: just one; a family; a school; the community?
- All sized filters work on the same principles.
 - You put in layers of bigger gravel, smaller gravel, and sand to clear the biological contaminants.
 - The top sand layer will grow a layer of bacteria that will eat bad bugs
 - This “mat” is critical. Stir it every 2 months and do not use the filter again for 2 full days after.
 - You put in a big layer of biochar under all this to clear the chemical contaminates
 - You put in another set of gravel and sand.

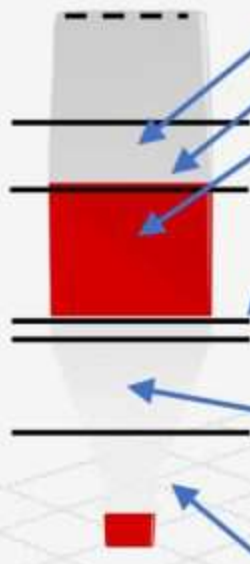
Water filter for one (take it to the field)

Cut the bottom off a 2 liter bottle



Remove cap of bottle

Add a piece of cloth at the bottom



Add sand

Add cloth

Add biochar

Lay a piece of cloth over the sand

Next add clean sand

Add small gravel as the bottom layer

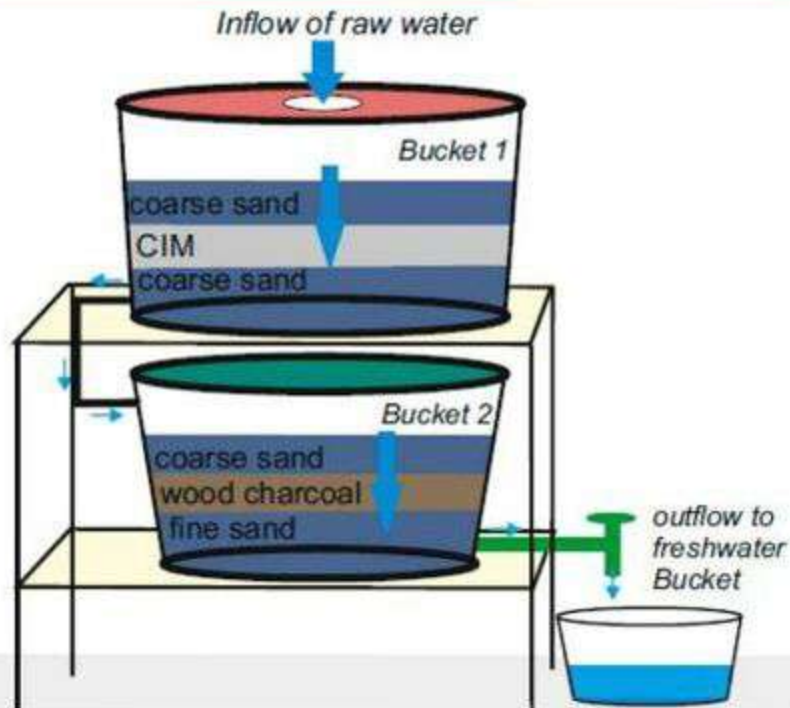
Dirty water in



Clean water out

Water filter for a family

- Start with 2 20-liter plastic tubs. Punch holes in the bottom of one and put an outlet on other.
 - Bottom tub: Add a layer of fine sand at the bottom that is about 10 cm deep. Then add a layer of biochar that is about 30 cm deep. Finally, top the tub with a second layer of fine sand. Leave the rest of the tub empty to hold water.
 - Top tub: Repeat the same process, this time with a layer of coarse sand at the bottom, biochar and a topping layer of fine sand.



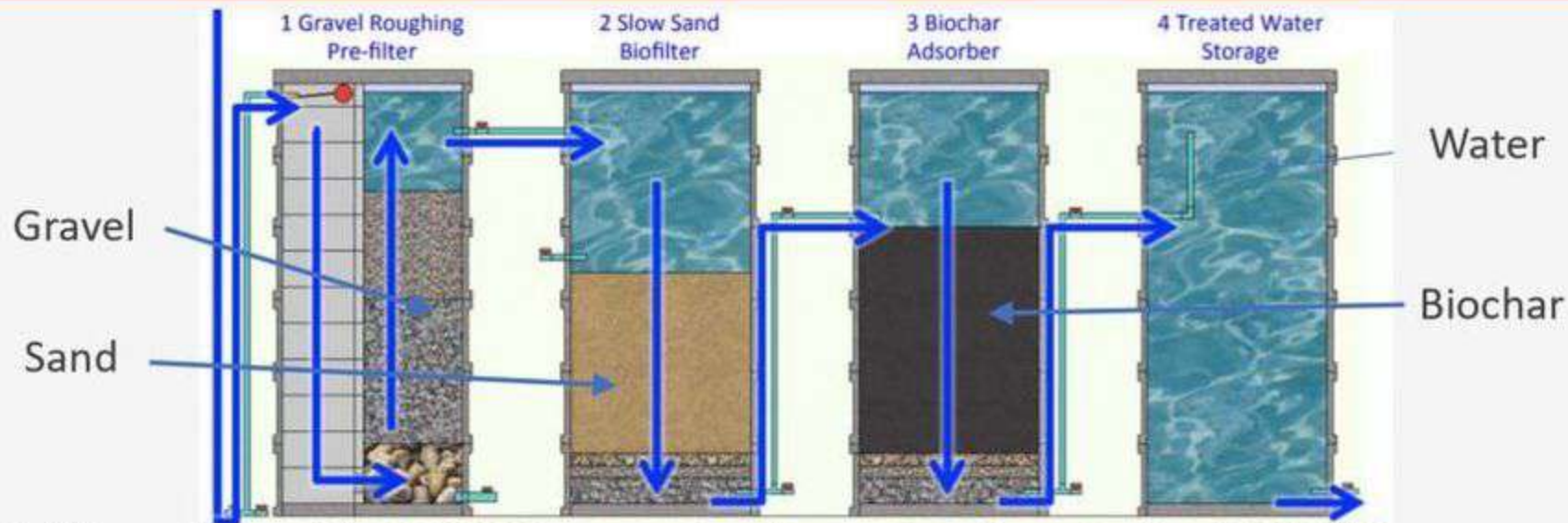
Water filter for a school

Building a water filter for a school requires more volume. The best system we know is the kind that we built at Warm Heart following designs from Aqua Solutions.

This system uses four 200-liter plastic drums. (Please be very careful with blue drums. They are often used for transporting pesticides and other dangerous chemicals. Wash them extremely well and make sure that the wash water is dumped on a pile of biochar.)



Water filter for an entire village



This filter will provide 2,000 liters per day. It requires four stacks of cement "septic tank" rings. Each stack is 1.5 – 2 meters high. The biochar and all of the sand and gravel need to be replaced every year.

Got questions? Please ask.

Thank you for your attention.
See you next time.

For special questions, please email us at
info@warmheartonline.org or visit us at
www.warmheartworldwide.org.