

BIOCHAR: SUSTAINABLE VALUE FOR YOU



THE DO WELL BY DOING GOOD TRAINING

WHAT ARE YOU GOING TO LEARN?

In Part 1 (Smoke) you learned:

- Why we care about the smoke
- How much smoke there is
- How to make a biochar machine to get rid of it

In Part 2 (Biochar) you will learn:

- **How to make value from biochar**
 - How to make biochar fertilizer
 - How to make improved animal feed
 - How to keep your animals healthy
 - How to keep your family healthy
- **In short:**
 - How to reduce costs
 - Increase income



BIOCHAR: A SUSTAINABLE, LONG-TERM SOLUTION TO THE SMOKE PROBLEM

- This training is about **value**. It is about the rewards of eliminating smoke by making biochar.
- This training is not about forcing people to do something; it is about showing them how to do something valuable to them.
- **Biochar can...**
 - Reduce agrochemical costs, increase crop yields and raise income in agriculture.
 - Make farm animals fatter and chickens lay more eggs, make all animals healthier, and get rid of their smell.
 - Save you from pesticides – although that is for another training.



IF ONLY, RIGHT?



WHAT'S THE REAL TRUTH ABOUT FARMING IN NORTH THAILAND?



Our soils are terrible. They are...

- Nutrient Poor
- Too Compacted
- Poor at Water Absorption/Water Retention
- Too Acid (Very Low pH)
- Deficient in Organic Matter
- Dead – No No Soil Life, No Microbes, Fungi, Worms

BIOCHAR SOIL AMENDMENT CAN SOLVE ALL OF THESE PROBLEMS

Used properly, biochar can:

- Improve soil structure
- Improve water penetration
- Improve water retention
- Increase pH (make your soil less acid)
- Increase soil life (microbes, fungi, worms)
- Increase organic matter (the other half of plants' diet)

And...

- It's free
- You can make it yourself

WHY NOW? CLIMATE CHANGE AND YOU

What's happening to the weather? What's happening to the rainy season? What's happening to the rains?

- The weather is getting hotter.
- North Thailand is getting drier.

The rainy season is getting later and less predictable.

- When rain falls we get big storms and floods that rush off down the river leaving nothing behind in the ground.

These conditions will continue to get worse and worse.

- If we do not change how we farm now, climate change will soon destroy agriculture in North Thailand



WHY NOW? – MONEY

Thailand just joined ASEAN.

- Thai farmers make less money for every ton of rice or fruit or vegetables they raise than farmers in any other ASEAN country.
- Why? Because you spend so much money on chemicals!



WHY NOW? – YOUR MONEY



- A woman I met in MaeJo is selling compost for 30 THB per kilogram
- At this price you can sell biochar for 30,000 THB per ton.

Think about it.

- Our training is about stopping smoke.
- But **this** is about why stopping the smoke is not a burden, it is a business opportunity for...
 - Farmers
 - House wives
 - Tambons
 - Clinics



If you have leaves, straw, stalks, wood chips, etc, you can make biochar ***and make money.***

This is different from the usual anti-smoke training.

SOIL STRUCTURE AND WATER RETENTION



What is the problem?

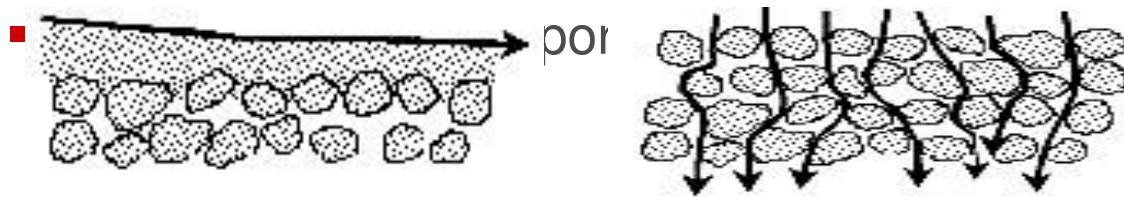
- **Our soils are mostly clay**
 - They are dense, heavy when wet, hard when dry
 - Water just runs off when it rains or we irrigate

Result?

- Poor water penetration.
- Poor fertilizer penetration.
- Poor water retention.
- Floods down stream.
- No water early in the dry season, poor crop growth.

BIOCHAR, SOIL STRUCTURE AND WATER RETENTION

Biochar added to soil, even clay, makes the soil more porous

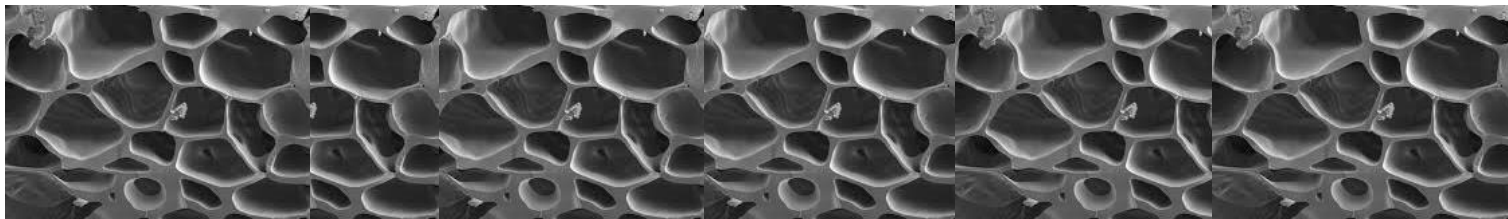


Water runs off hard packed clay

Water penetrates easily where biochar particles have made spaces

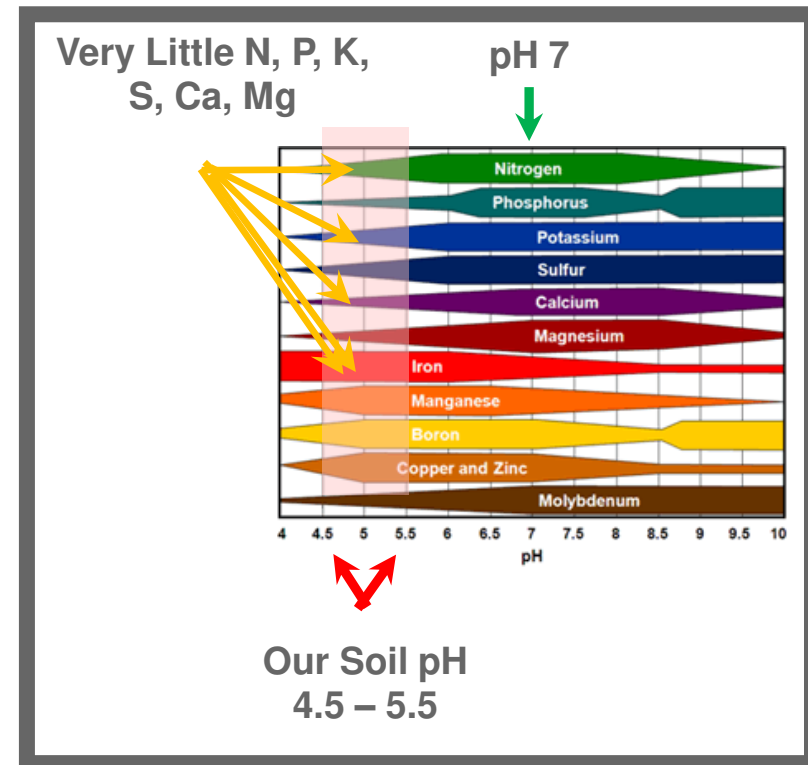
Biochar in soil will absorb lots and lots of water

- Wet biochar holds enough water to add two extra days between waterings



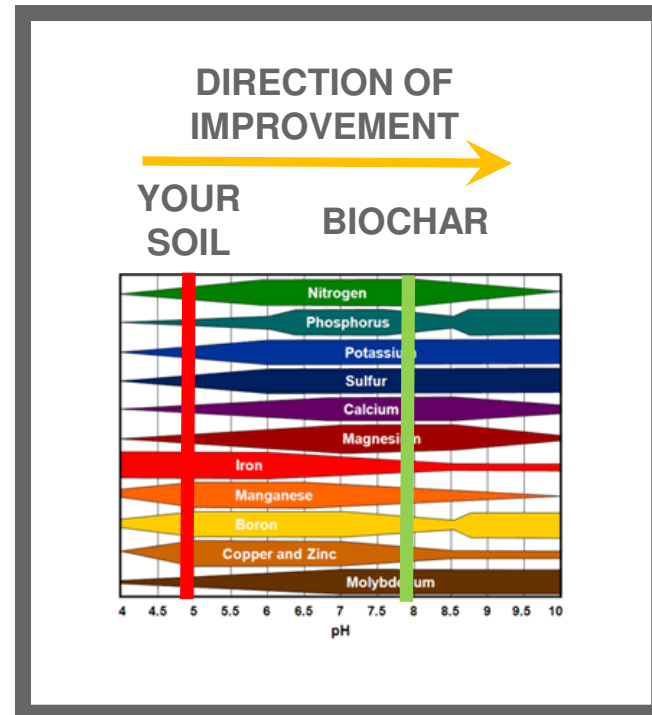
SOIL pH AND YOU

- pH measures how acid your soil is
- pH runs from 1 (acid) to 14 (alkaline)
- A pH of 7 is neutral and most plants like soil that is around pH 7
 - They grow best at pH 7 because all of the nutrients in the soil are available to them.
- Our soils are very acid – pH 4.5 -5.5
- In acid soils the most important nutrients are **not** available to plants.



BIOCHAR, pH AND NUTRIENT AVAILABILITY

- Biochar has permanent pH of 8
- Adding biochar raises soil's pH in the direction of 8
- Raising the pH unlocks access to many nutrients in soil
- We will teach you how to make biochar fertilizer with pH 10!



SOIL LIFE AND YOU

Healthy soil is alive with microbes, fungi and worms

- Live soil feeds your plants

Plants cannot eat N, P, K or other mineral nutrients; they need soil life to eat them first – then pee!

- You plants take up bug pee

Soil life needs oxygen

- Worms and fungi open the soil to let the air in



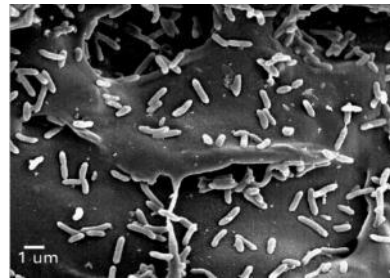
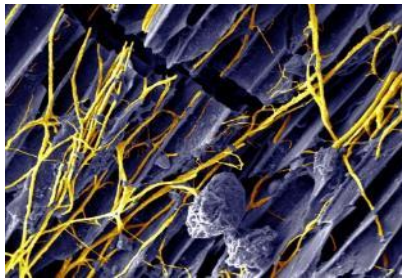
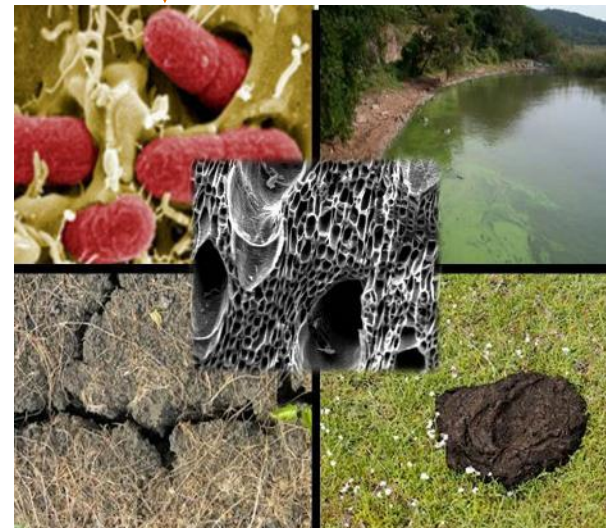
BIOCHAR AND SOIL LIFE

- Tiny holes in the surface of biochar make nice condos for soil life.
- The minerals adsorbed to the surface of biochar particles attract microbiota.
- Microbe colonies that develop around biochar particles control the growth of microbes that make plants sick.
- The microbes and fungi attract worms that make holes in the soil to bring oxygen underground.



Tiny fungus grows on the biochar surface

The best of bug condos



Microbiota on surface of biochar seen through scanning electron microscope

SOIL ORGANIC MATTER AND YOU

- Organic matter is dead stuff, plant or animal, that is rotting
- Organic matter provides food and living space for microbia - microbes, fungi and worms.
- The microbes, fungi and worms turn organic matter into food that your plants can take up.
- Organic matter should be 2-10% of soil; not less than 1.3%
- Our soil typically has less than 1.3%, often less than 1%.



BIOCHAR AND SOIL ORGANIC MATTER

- Where we live organic matter rots quickly because in the heat the microbiota grow rapidly and eat fast.
- With rapid decomposition, much of the potential nutrition is lost before plants can take it up.
- When the organic matter is gone, more must be added to the soil or the soil (and plants) will die.
- But if we have mixed biochar into the compost and soil the nutrients stick to the biochar and stay.

BIOCHAR AS FERTILIZER



Biochar itself is NOT fertilizer. In fact, if you put it into your field right after making it, your plants may die.

ALWAYS – always *age* your biochar for at least **three months** before you use it.

Biochar **FERTILIZER** – To get the biggest effect from your biochar, mix it with what your soil needs. The biochar will make it better and it will make the biochar better.

- Pour as much pig pee on your biochar as it will absorb. (If you do not have pigs, any kind of pee will do, even yours!)
- Mix biochar, good compost and manure 1:1:1 (If you do not have compost or manure, substitute the other.)
- Spray well with EM and mix, spray again and mix again
- Cover the pile and let it sit for 3 months.

USING BIOCHAR FERTILIZER

- **Potting mix** – add a few handfuls to your normal recipe (Do not overdo it. Biochar retains a lot of water and if you are not careful you will have problems with damping off.)
- **Planting seeds** – make hole, add small handful of biochar fertilizer, cover with dirt, place seeds, cover with dirt, sprinkle a small handful of biochar fertilizer on top
- **Planting seedlings or trees** – dig large hole, replace one half of the dirt with biochar fertilizer, toss 2-3 handfuls of biochar fertilizer at the bottom of the hole, plant
- **Mechanical field planting and orchards** each rai:
 - **Fields/paddy** – mix 800 kg of biochar fertilizer into mud 2-4 weeks before planting for 4 years (benefits in year 1)
 - **Orchard trees** – spread 10 kg of biochar fertilizer in shallow trench around tree at the “drip line”, cover with dirt, repeat every 3 months

BUT DOES IT WORK?



Biochar alone No fertilizer



Biochar + NPK No fertilizer



NPK alone Biochar + NPK



Biochar alone NPK alone

WHAT ABOUT FARM ANIMALS?

- *Our animals are...*
 - Skinny
 - Sick
 - Smelly



ADDING A LITTLE BIOCHAR CAN SOLVE ALL OF THESE PROBLEMS

The addition of biochar to animal feed and pens can:

- Increase weight gain by as much as 20%
- Improve pastures
- Improve animal health
- Reduce smells and flies

And just like biochar fertilizer

- It's free
- You can make it yourself



ANIMAL FEED

- The rainy season is not so bad, but nine months of dry season are hard
 - Either you feed them on straw and dry stuff – which may fill them up, but has no nutritional value
 - Or you buy feed
- The quality of feed is critical because you get paid for eggs or kilograms of meat; both depend on feed quality
 - Bad feed, too few eggs, skinny animals, bad prices
- But feed costs determine whether you make a profit.



BIOCHAR AND ANIMAL FEED



Biochar improves animal feed.

- Add 1-3% biochar to cattle and pig feed to increase weight gain by up to 20%
 - With cows, mix into dry feed or mix with molasses
 - With pigs, mix into any feed, homemade or commercial
- Add 1-3% biochar to chicken feed to increase weight gain in broilers and egg production in layers
 - Mix into any feed. Chickens are also scavengers and will eat biochar bits scattered on the floor

How does this work?

- Not settled, but scientists believe it is because the biochar improves the animals digestion so that they get more nutrition from the food they eat

BIOCHAR AND PASTURE IMPROVEMENT

- Our cows depend on the quality of pasture available, but it is very expensive to improve pasture
- Biochar offers a unique way to improve pasture
 - Add biochar to your cattle feed. (Mix it with a little molasses and they will love it!)
 - The biochar will protect your cattle from many digestion problems and will be improved by the microbes in the cattle's guts.
 - As the cattle graze, they manure the pasture with a high quality “fertilizer mix” of biochar and manure.



ANIMAL HEALTH

- Animals get sick
- The more animals you own, the more often they get sick
- Medicine and the veterinarian are expensive
- Sick animals make other animals sick, do not lay or do not gain weight or die
- You must keep your animals healthy, but the cost of keeping them healthy comes straight out of your profit



BIOCHAR AND ANIMAL HEALTH

- Our grandparents understood biochar's health benefits
 - Before Western medicine took over, anyone with a stomach ache and diarrhea took charcoal pills
 - ***Works even better for animals***
- Cows and pig have complex digestive systems that are prone to illness – and animals raised in pens are likely to get some form of digestive problem
- Why does an animal get an intestinal disease?
- A “bad” microbe has grown out of proportion and is overwhelming the immune system.
- Biochar encourages the growth of complete microbe ecologies which produce intense competition for the bad microbes. This reduces them to their normal (small) place among all of the many microbes in the animal's system

THE STINK AND FLIES

- If you have three chickens in the yard, this is not a problem
- If you have three pigs in a pen, this is a big problem.
 - The pigs' stink pisses off your neighbors
 - Not much fun for you, either
- Where there is stink, there are also flies and disease
- After visiting the pig stink, those same flies are going to visit your dinner
- But shit stinks, right?

- Wrong



BIOCHAR TO THE RESCUE



- Ok, this is not about money, but it sure is about value
- Biochar absorbs smells like a sponge
 - Feed it to your animals and their poop does not stink
 - Spread biochar on the floor of your cow or pig pen, on the floor litter in your hen house - no more smell
 - Spray EM on everything and it works even better
- According to the scientists, chickens that do not have to live with their own stink are happier.
 - How do the scientists know?
 - The chickens lay more eggs and fight less.

BACK TO THE BEGINNING



- Remember biochar fertilizer?
- Using biochar in animal feed, to keep your animals healthy and to keep their poop from stinking improves the quality of the manure they produce.
- Use it alone – it already has biochar in it
- Use it to make super fertilizer
- But here is the real beauty of biochar:

You stop the smoke by making biochar from field waste. Then you turn the biochar into valuable fertilizer or feed. And when you have fresh manure at the end of the process, the biochar is still there, better than when you started, ready to help you again.

LEARN MORE

- Do you have questions?
- Do you want to learn more about biochar?
- Do you want plans to make your own biochar machine?
- Would you like to organize a group training in the greater Chiang Mai area?

Warm Heart Foundation is here to teach and share

We are ready to serve you – and our trainings are free to the public and NGOs

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DO WELL BY DOING GOOD

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