

# Sustainable Rural Development And Low Tech Biochar Production



# BIOCHAR





Biochar is a high grade of fine-grained, highly porous charcoal that helps soils retain nutrients and water which is put into soil as a soil conditioner to promote plant growth, remediate soil contamination, and/or sequester carbon from the air. As a soil enhancer it can hold carbon, boost food security and discourage deforestation.

Biochar is found in soils around the world as a result of vegetation fires and historic soil management practices.

It can be an important tool to increase food security, cropland diversity in areas with severely depleted soils, scarce organic resources, and inadequate water and chemical fertilizer supplies.

Biochar also improves water quality and quantity by increasing soil retention of nutrients and agrochemicals for plant and crop utilization. More nutrients stay in the soil instead of leaching into groundwater and causing pollution.



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# For use as:

- ✧ a soil conditioner

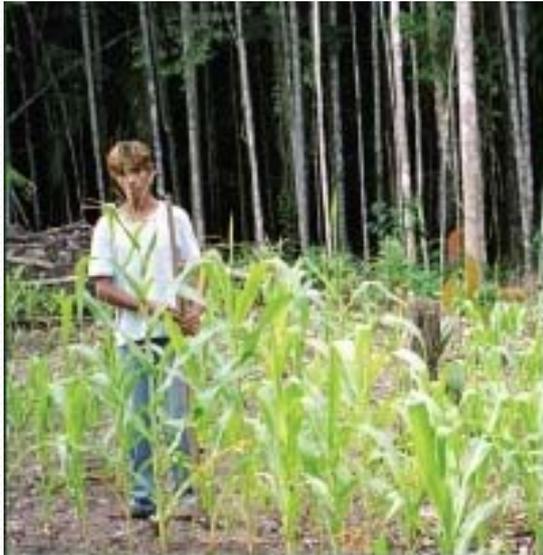
- ✧ for carbon sequestration

# *Terra Preta*

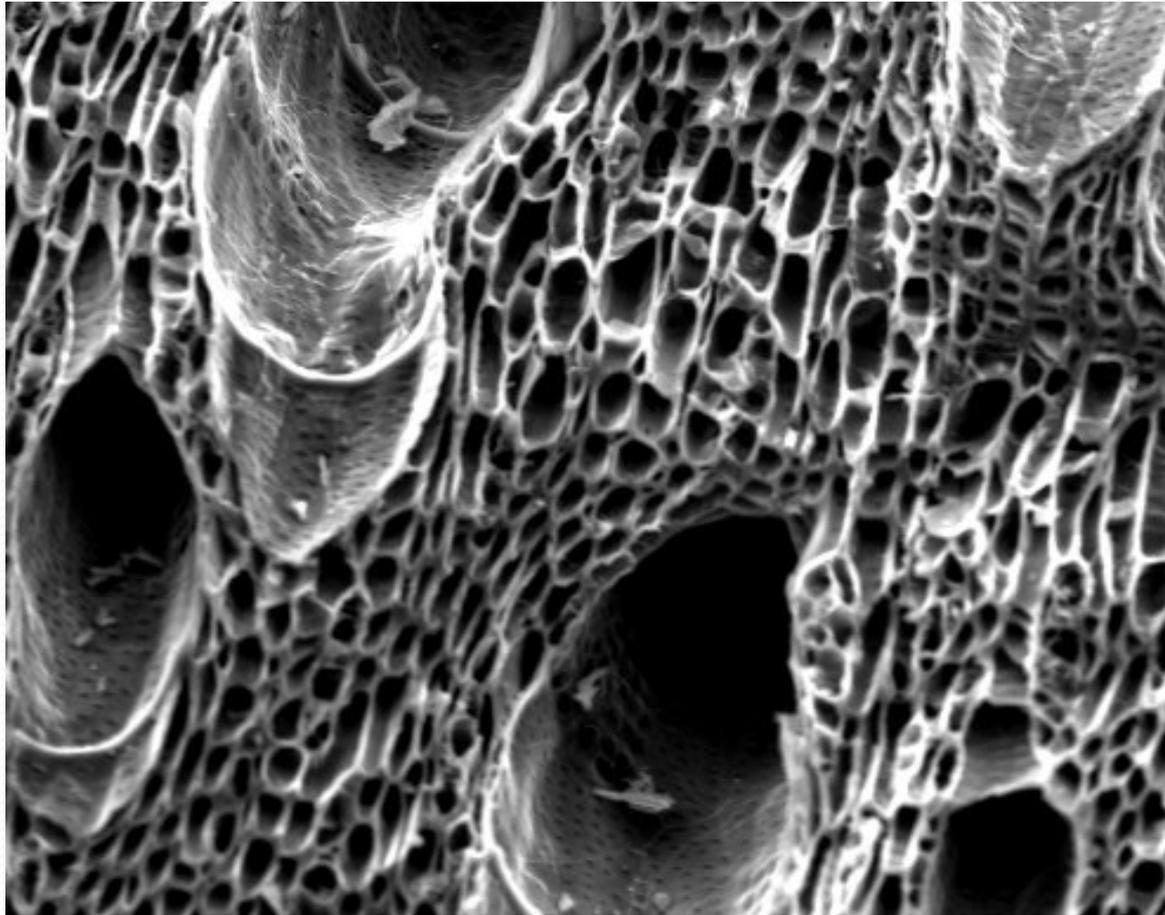




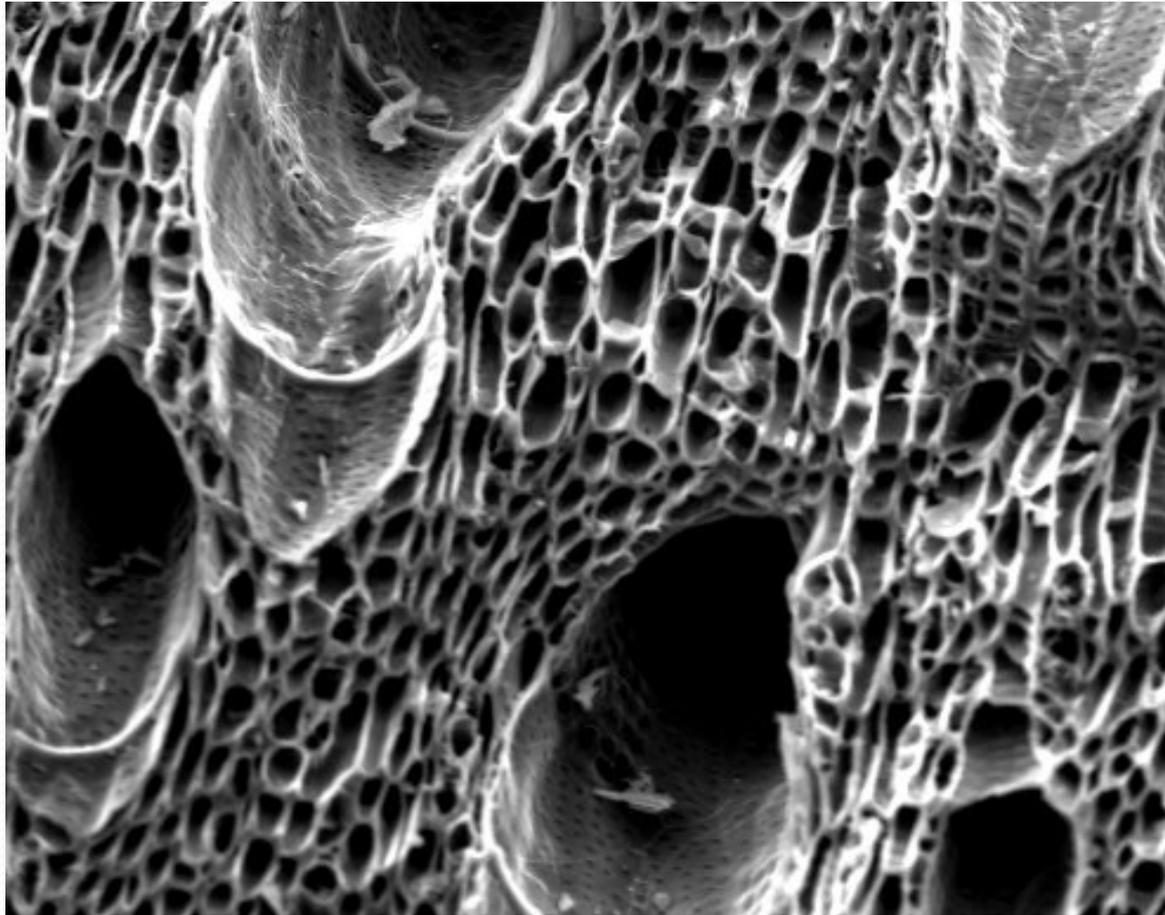




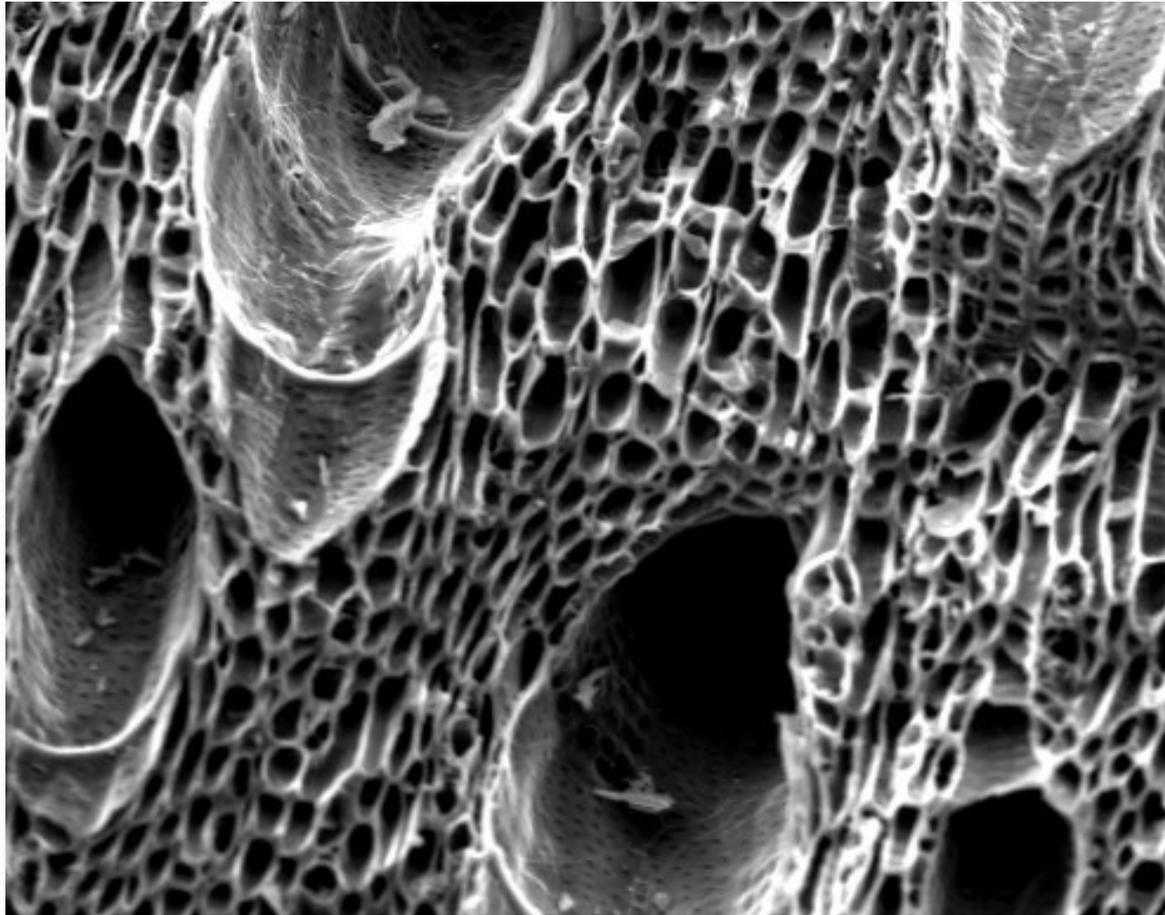
# How does biochar work?



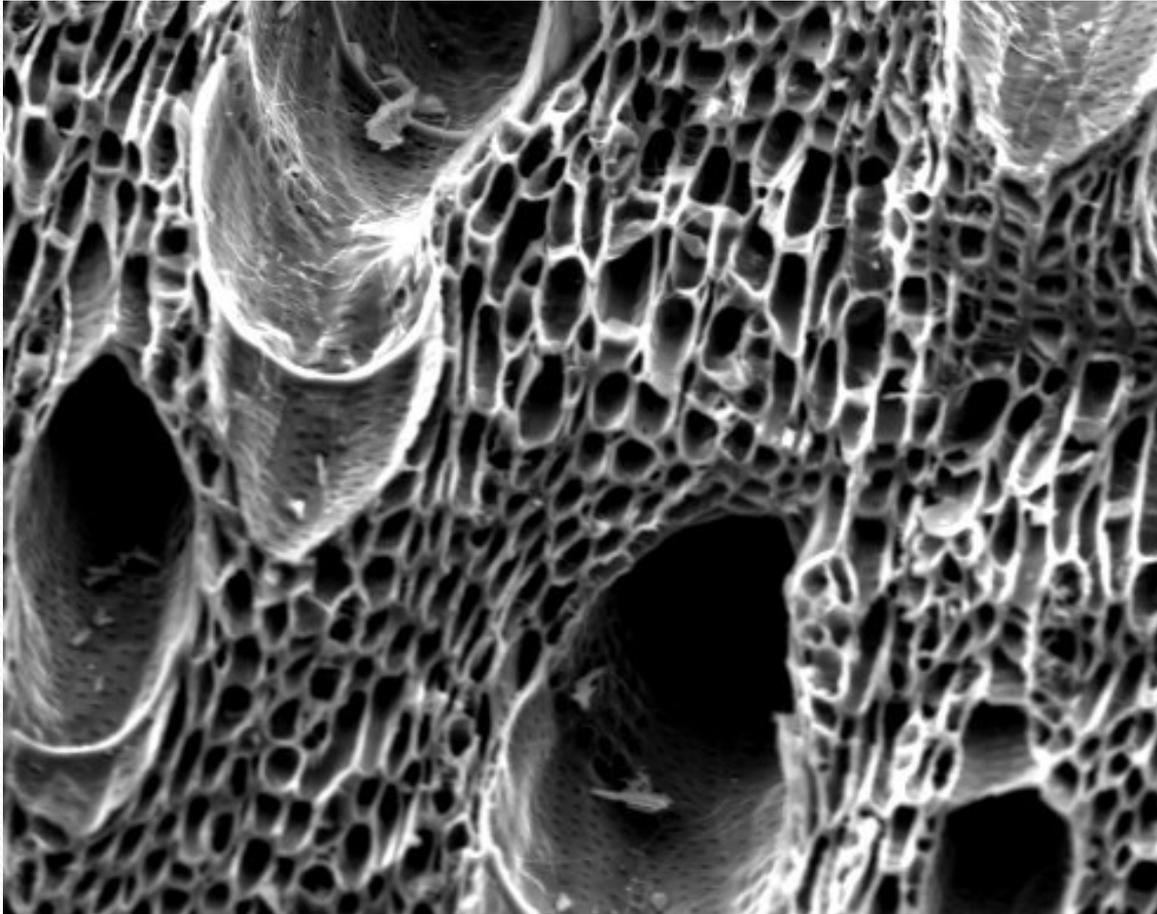
# Chemical

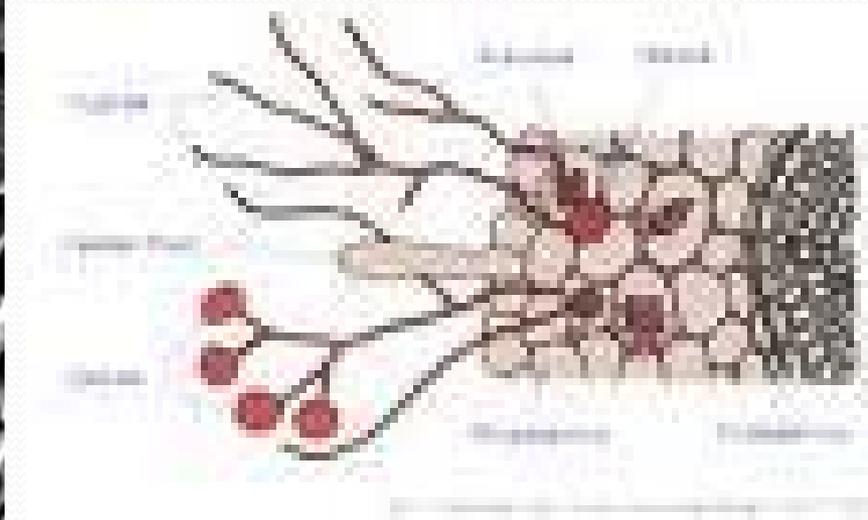


# Shelter



# Biological Interactions





Commercially  
available rice  
seedlings



Organic rice seedlings  
raised with rice husk  
biochar

# Use

xx

- Benefits
- Cautions





Control

Fertilizer

Fertilizer  
+  
Charcoal



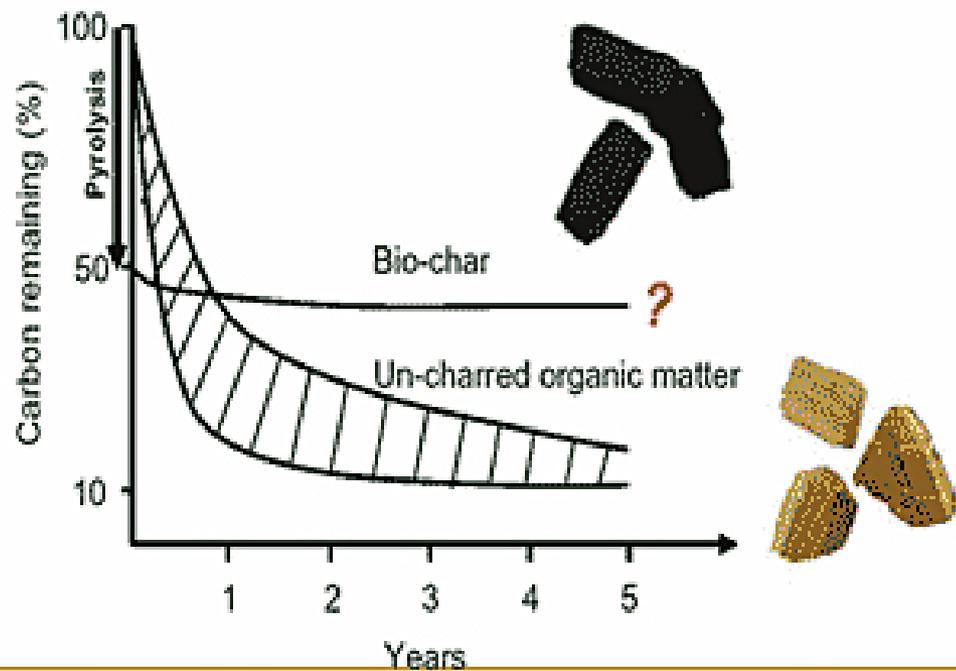
Biochar + Manure

Chemical Fertilizer (DAP)

© rechar inc

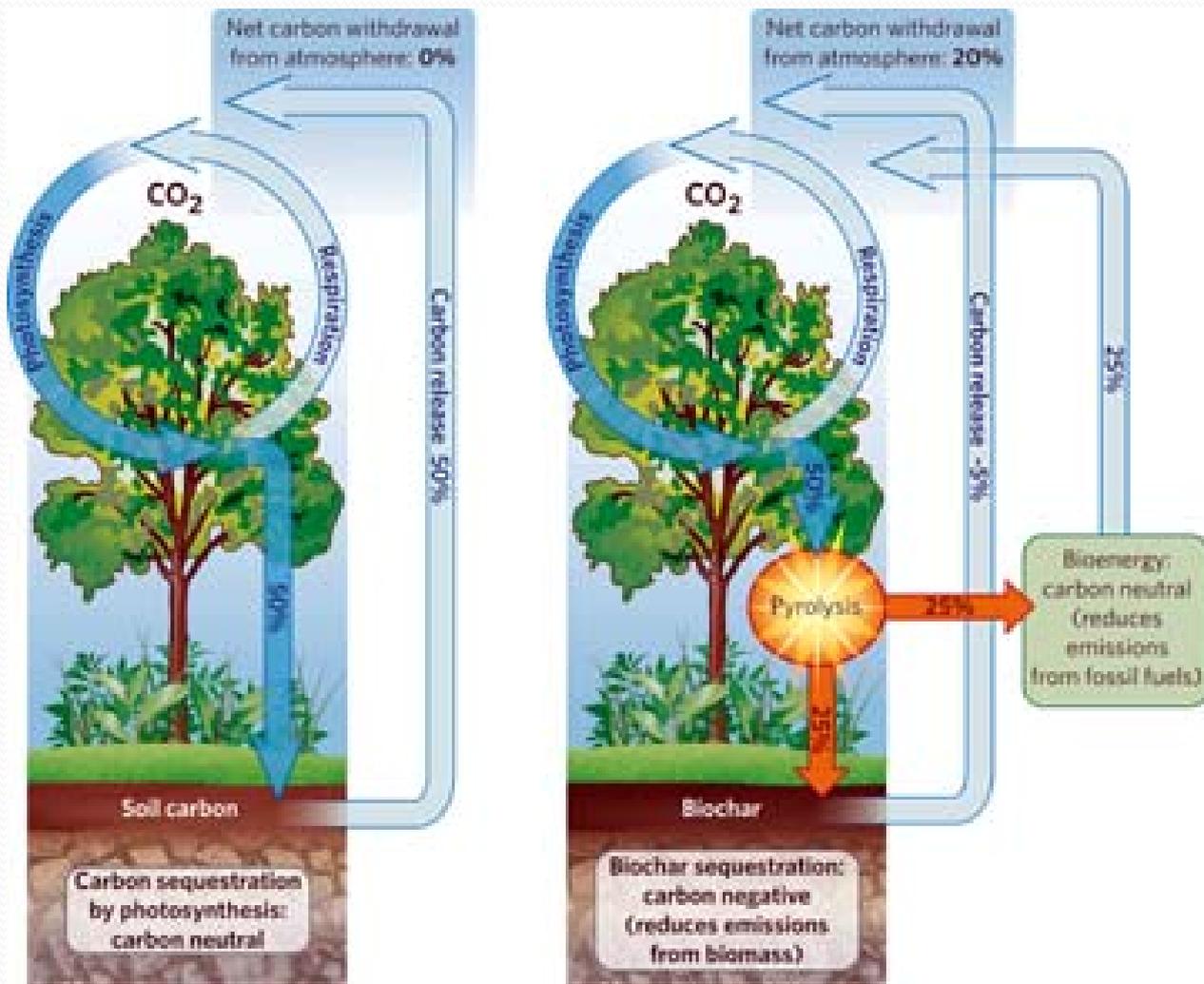






Lehmann et al. 2006. *Mitigation and Adaptation Strategies for Global Change* 11, 403-427





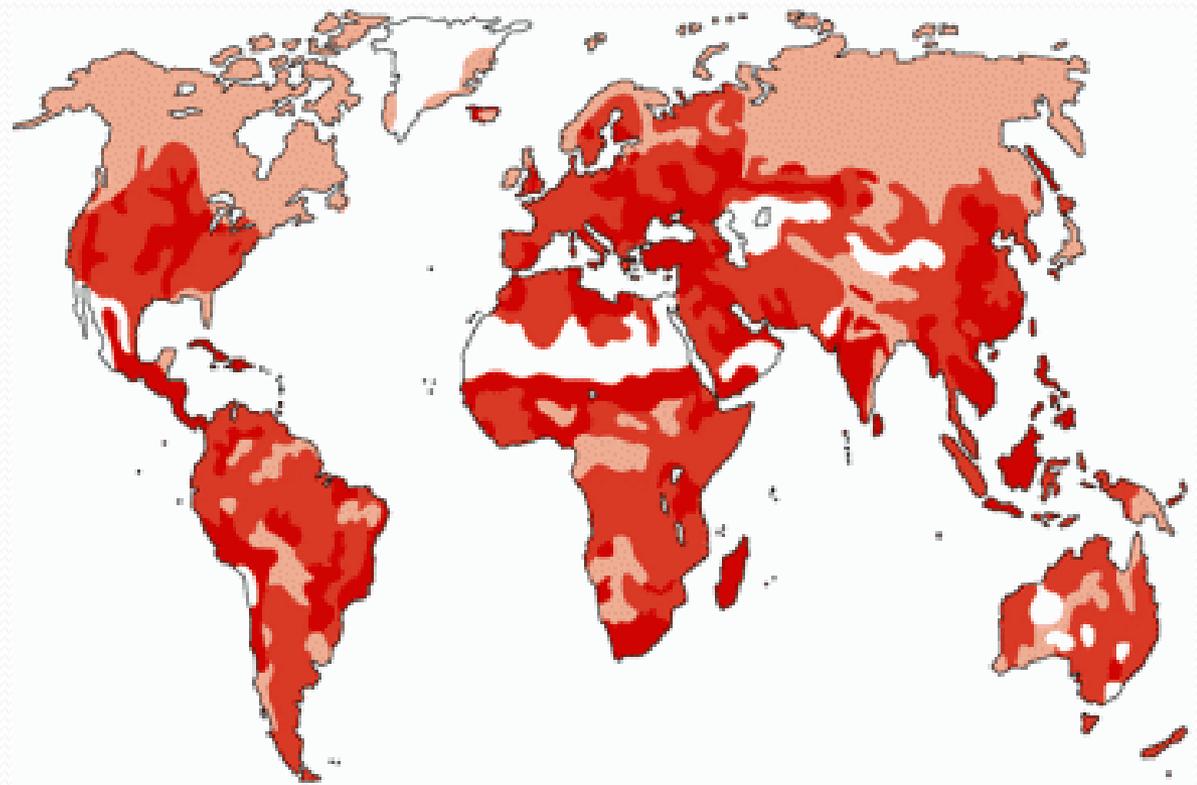
# Biochar & Soils (IBI) [biochar-international.org](http://biochar-international.org)

- Biochar enhances soils. By converting agricultural waste into a powerful soil enhancer that holds carbon and makes soils more fertile, we can boost food security, discourage deforestation and preserve cropland diversity.
- Sustainable biochar is a powerfully simple tool to address some of the most urgent environmental problems of our time

# Research is now confirming benefits that include:

- Reduced leaching of nitrogen into ground water
- Possible reduced emissions of nitrous oxide
- Increased cation-exchange capacity resulting in improved soil fertility
- Moderating of soil acidity
- Increased water retention
- Biochar can improve almost any soil. Areas with low rainfall or nutrient-poor soils will most likely see the largest impact from addition of biochar

(not all biochars are the same)



Very degraded soil    Degraded soil    Stable soil    Without vegetation

## Predominance of small-scale farms (via: Eastwood et al. 2010)

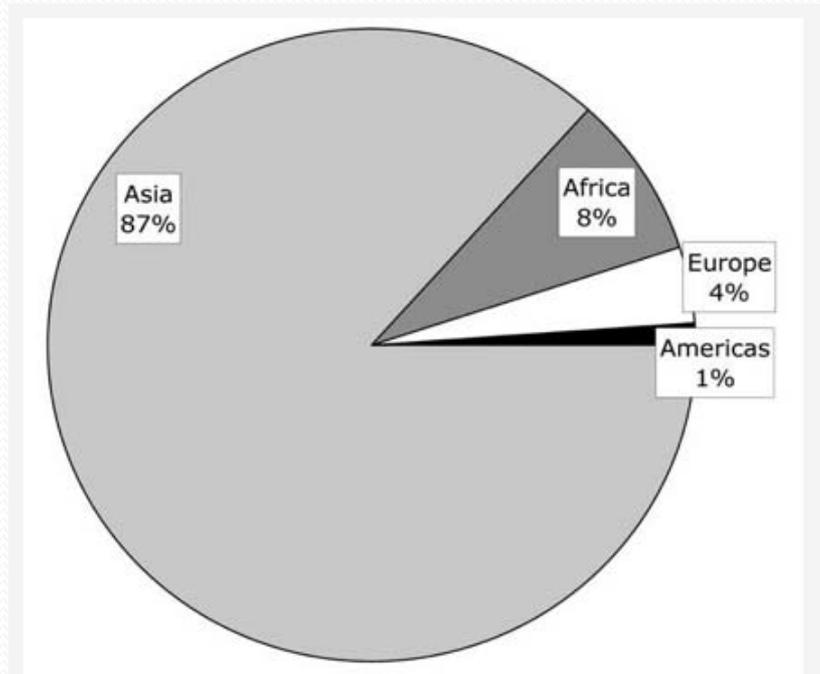


Figure 1-3. *Regional distribution of small-scale farms. Source: Nagayets, 2005 based on FAO 2001c, 2004c and national statistical agencies.*

Note: Small-scale farms are defined as those of less than 2 hectares. The total number of small-scale farms is 404 million.

# Use

- Benefits
- Cautions

# Sequential or Parallel



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# The UBI Concept

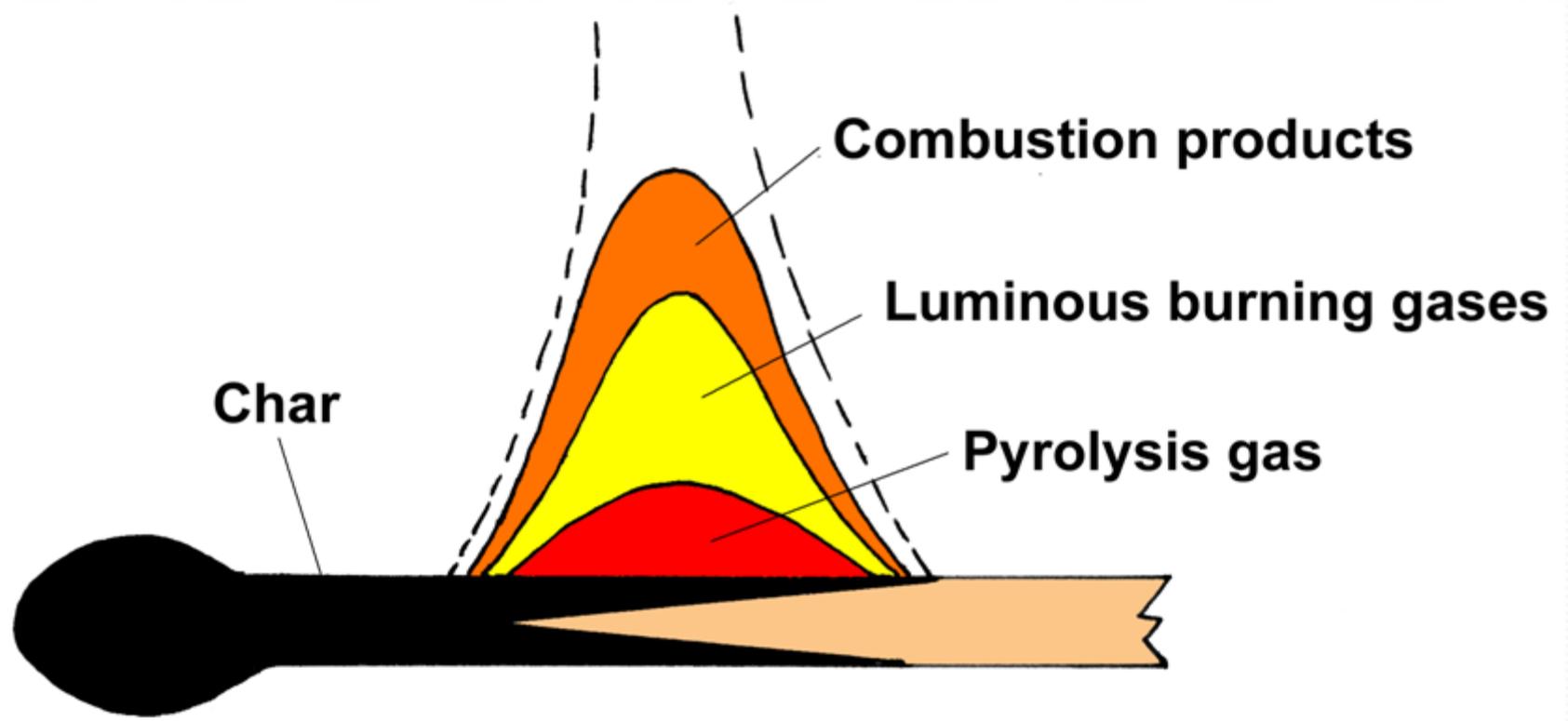


in Sustainable Rural Development and  
Significant Global Warming Mitigation

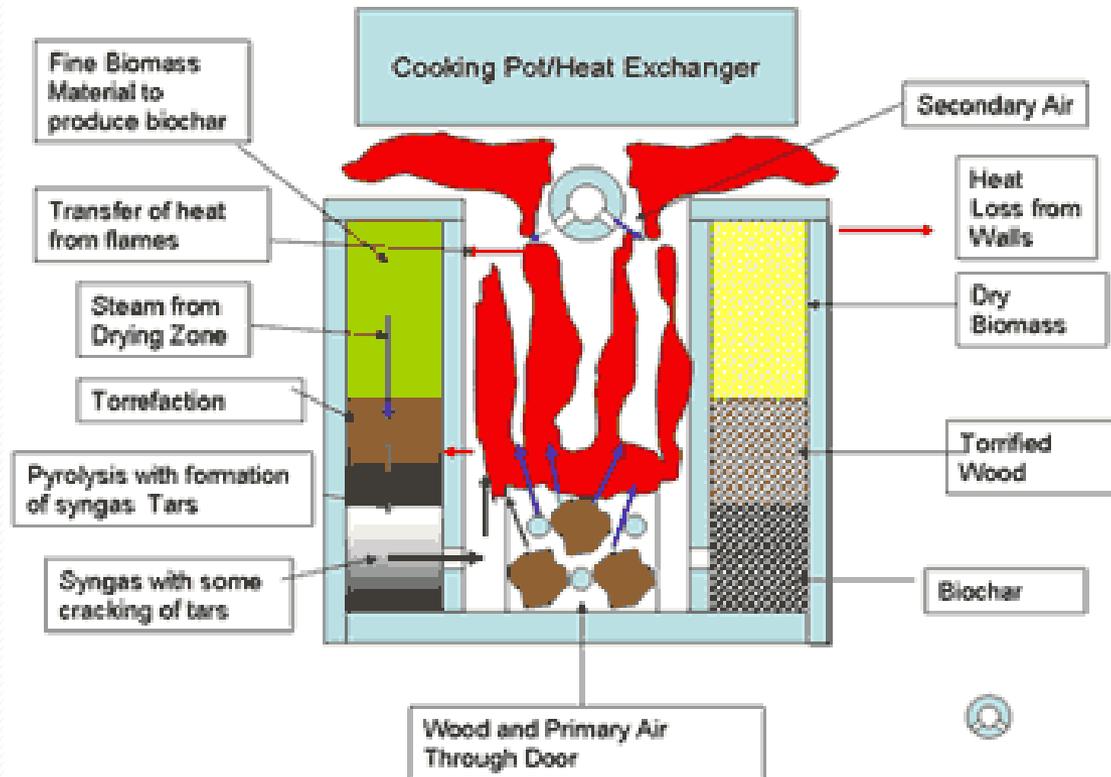


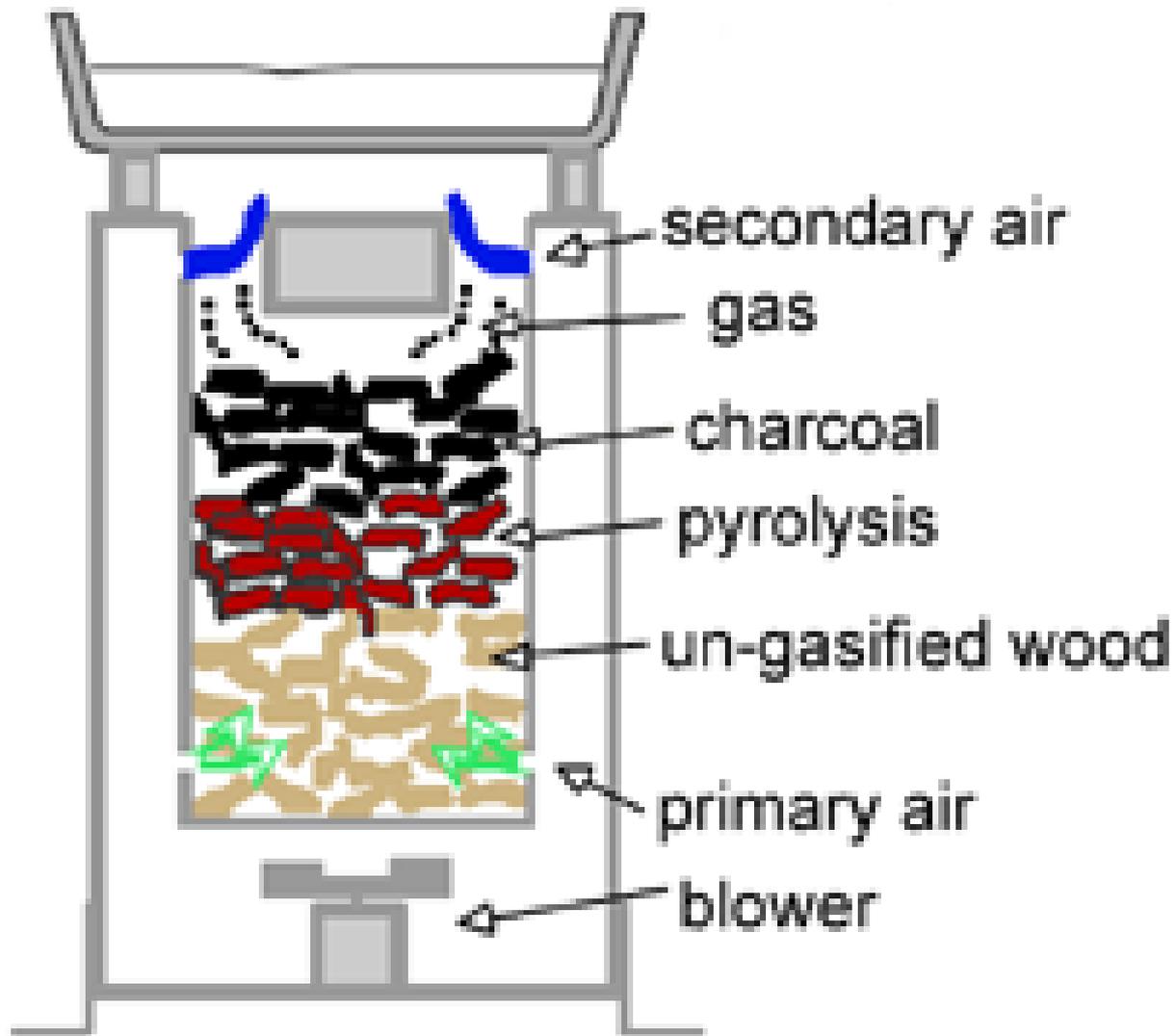
# Low Tech Biochar Production

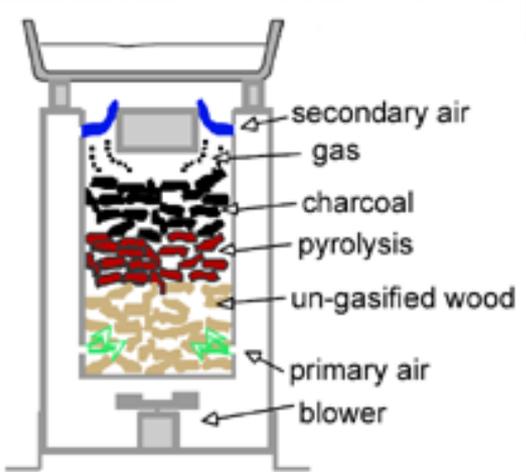




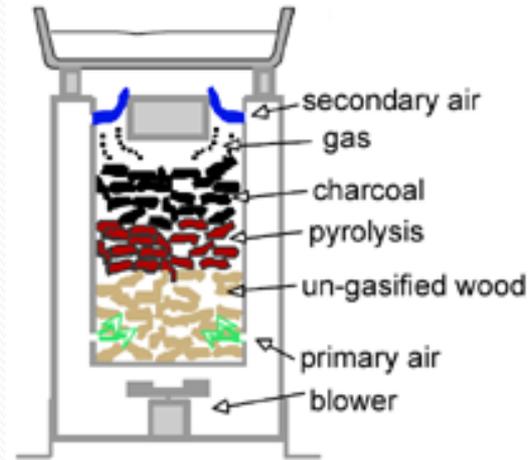
### Pyrolysis Heat and Mass Transfer in Biochar Stoves and 2 Chamber Biochar Kilns with Heat Exchanger

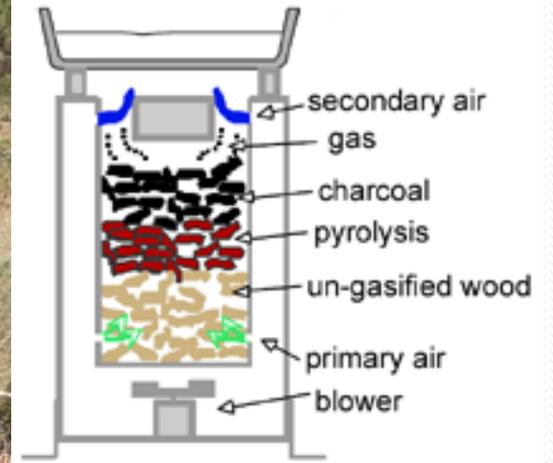


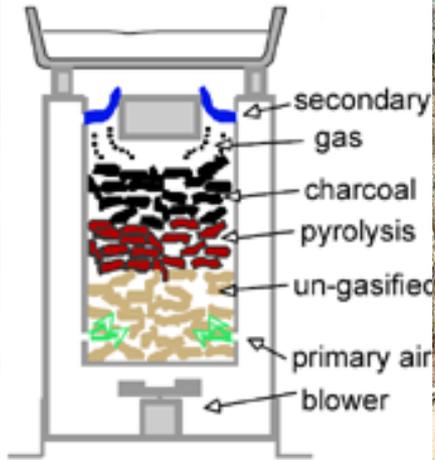






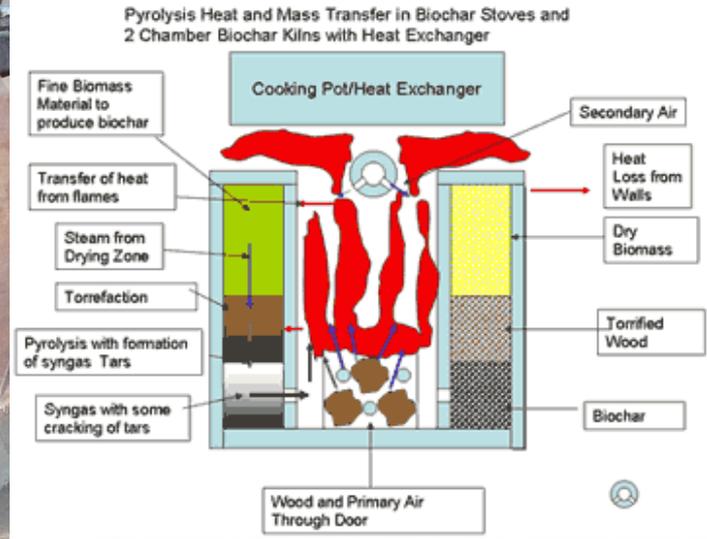




















"Piglet"  
Batch Pyrolyser



"Daisy Mk1"  
Batch Pyrolyser



"Daisy Mk2"  
Batch Pyrolyser



"Daisy Mk3"  
Batch Pyrolyser



"El Toro"  
Continuous Pyrolyser



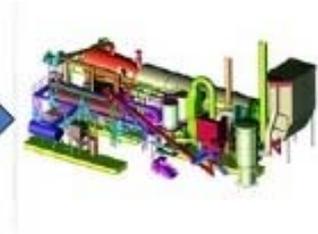
"Moree Demonstration"  
Relocatable Continuous Pyrolyser



"PyroChar 300 Mk1"  
Fixed Continuous Pyrolyser



"PyroChar 300 Mk2"  
Fully Integrated Continuous Pyrolyser



"PyroChar 4000"  
4tph Commercial Pyrolyser

## Making “Kuntan” -- Rice Husk Charcoal 2000s





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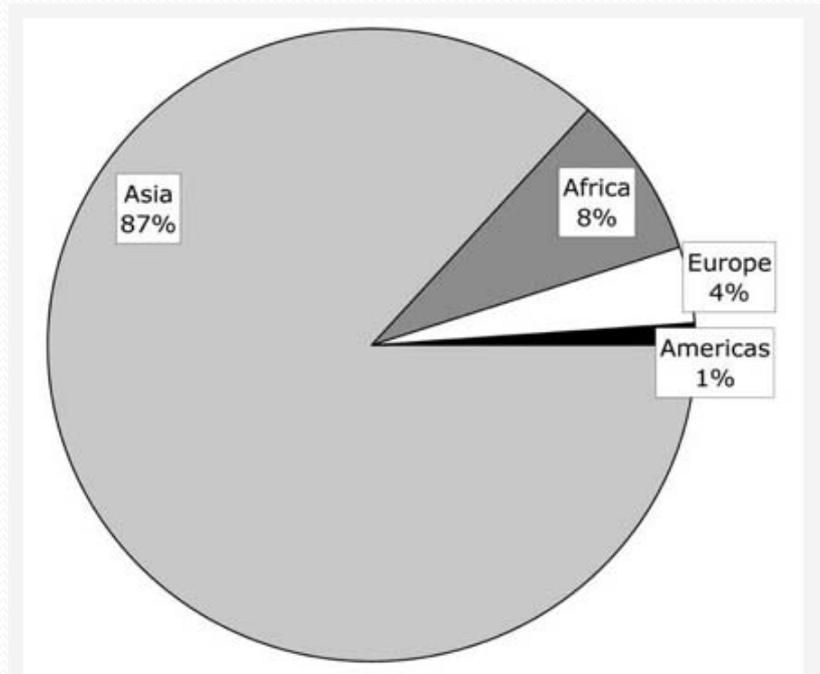


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