

Biochar Picture Block

How to Make and Use Biochar on Farms



COTTON
MADE IN
AFRICA



REGENERATIVE
COTTON
STANDARD



Preface



Founded in 2005 by the entrepreneur Prof. Dr Michael Otto, the Aid by Trade Foundation (AbTF) is an internationally renowned non-profit organisation that works around the world to promote sustainable raw materials. It makes a decisive and measurable contribution to improving the living conditions of people and animals while protecting the environment.

AbTF puts these principles into practice through its standards for verified raw materials: Cotton made in Africa® (CmiA), Cotton made in Africa Organic (CmiA Organic), Regenerative Cotton Standard® (RCS), and The Good Cashmere Standard® (GCS).

These standards are crucial to the resilience and sustainability of small-scale farmers and textile companies, who face growing challenges due to climate change and market developments.

AbTF works closely with animal-welfare, environmental, and industry experts.

«Biochar Production» is part of a series developed by AbTF to support the training of small-scale farmers.

The image library focusses on best practices and biochar use for sustainable agriculture. Through this training material, AbTF equips field teams with practical knowledge and useful skills to pass on to farmers.

**Learn more at: www.aidbytrade.org; www.regenerative-cotton.org;
www.cottonmadeinafrica.org**

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Published by: Aid by Trade Foundation

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Version: 12.25



How does this image library work?

Please note: Presenters should thoroughly familiarize themselves with this image library before conducting a training session.

The image library is a teaching tool for use in small-group training sessions. The images are intended to be shown systematically. Each page consists of an image on the front and text on the back. The presenter can use the questions quickly (if needed) and spark an interactive exchange with participants. Presenters can encourage reflection and discussion amongst participants by addressing their concerns through an ongoing dialogue in the form of questions (Q) and answers (A).

During the sessions, the front images should be shown one after the other to the participants, allowing them time to interpret and discuss the depicted activities. The aim is for participants to understand the what and the how of each aspect of the topic. The library is designed so that only the trainer can see the page with the questions and answers. The questions and answers are only a guide for the trainer and should not simply be read aloud to the participants. If the participants' answers do not immediately hit the key message, the trainer should ask leading questions to help them discover the desired message. These questions should begin with who/what/when/where/why/how in order to elicit relevant information. While possible answers are provided after each question, the answers given are not exhaustive and may vary depending on local circumstances. After discussing the corresponding image and reviewing the questions, presenters should ask one of the participants to summarise it again in order to ensure that the image's message was understood. The following image can then be shown and discussed in the same way.

The story in this image library revolves around a farming couple who grow cotton and food crops. To create a familiar atmosphere and allow participants to identify with the characters, the names of family members are based on common names used in the country where the training takes place.

Since this topic is broad, this material can be improved on an ongoing basis. Suggestions are welcome for both technical aspects and design.

I. Definitions



I. Definitions



Q1: Have you heard of biochar? What is it?

- It is crushed charcoal for agricultural use.

Q2: How is biochar produced?

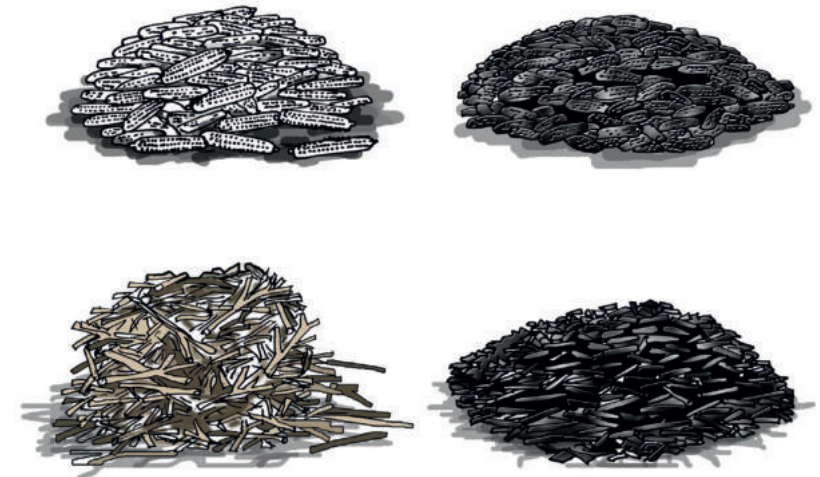
- Biochar is produced through the pyrolysis or carbonisation of plant residues.
- It is combustion with or without an oven and with little air.

Q3: Why is biochar used?

- Biochar can be used to improve soil quality.

Q4: What needs to be considered when using biochar?

- It must be activated (charged with nutrients and microorganisms) before applying it to the soil.



Remember:

Plant residues can include cotton stalks, corn cobs, or grain husks.

II. Usefulness of Biochar



II. Usefulness of Biochar



Q1: What is biochar good for?

- Biochar is used mainly to improve and restore poor and depleted soils.

Q2: What problems does biochar help solve?

- It improves soil fertility by helping retain nutrients and stimulating microbial life.
- It increases water retention by reducing water stress and irrigation need.
- It corrects acidity by raising the pH of acidic soils, making nutrients more easily available to plants.
- It protects the climate and harvests: biochar helps against climate change and protects fields when it rains too much or not enough.
- It reduces pollution by efficiently re-using agricultural waste.



Remember:

Biochar makes soils more productive, saves water, and contributes to sustainable agriculture.

III. Input Materials



III. Input Materials



Q1: What materials are needed to produce biochar?

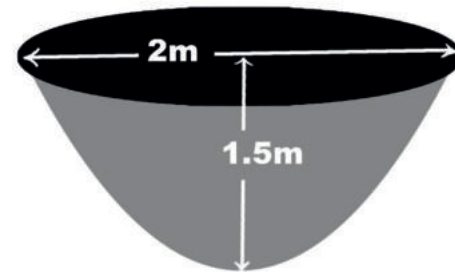
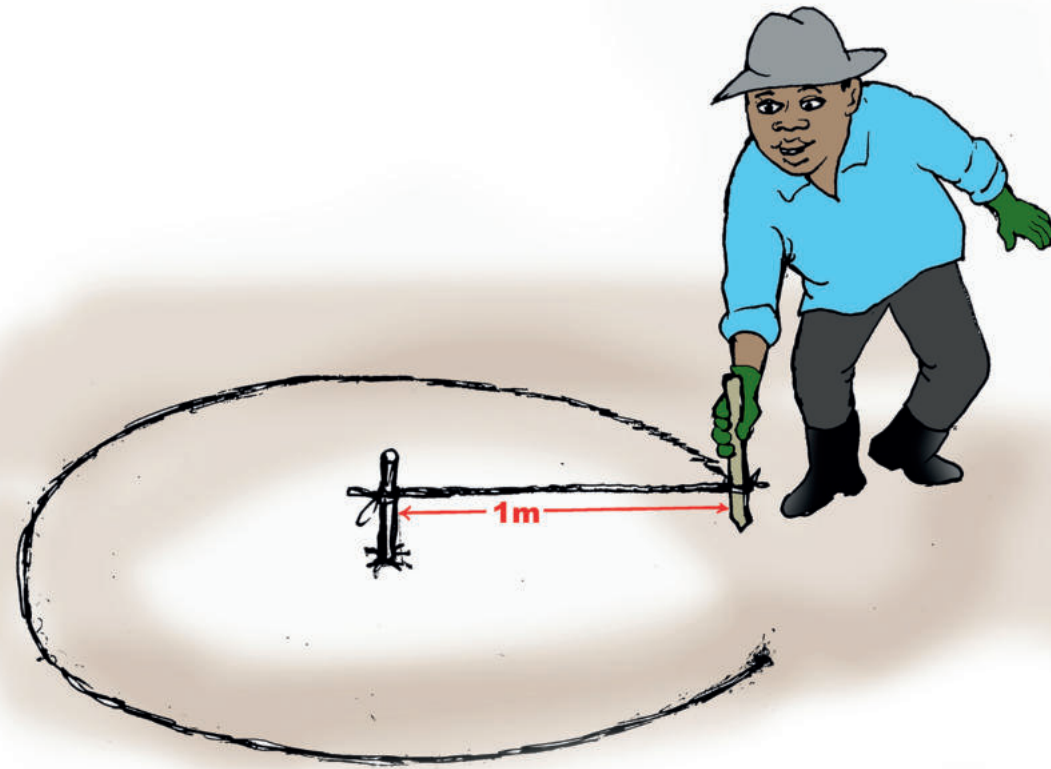
- Biochar can be produced using simple, locally available materials.

Q2: What are the most useful materials?

- An improved furnace or a pit dug in the ground, wide and deep. A handmade furnace (pyrolytic furnace, made of metal or bricks) can also be used.
- Agricultural residues: Cotton stalks after harvest, rice hulls, corn stalks, wood, or dry branches. The drier the waste, the better the biochar will be.
- A crushing tool: A hoe or traditional pestle to reduce the biochar into finer pieces after carbonisation.
- Gloves, a mask, and a pair of boots for protection; sand, a water tank, and a bucket to extinguish the glowing biochar when it is ready.



IV. The Preparation Process

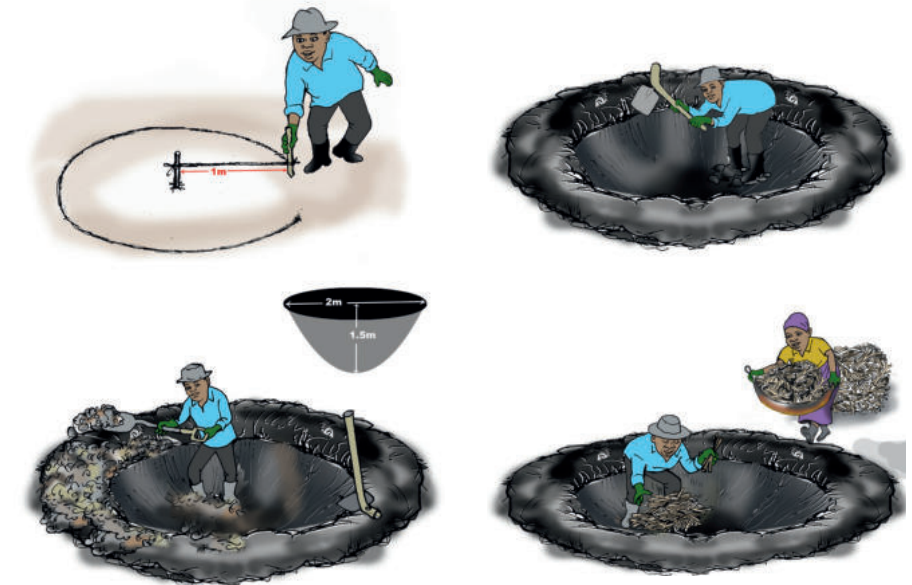


IV. The Preparation Process



Q1: Can you describe the biochar production process?

- Dig a pit: Make a hole in the ground with a radius of 1 metre and a maximum depth of 1.5 metres. The pit can be round or rectangular.
- Prepare the biomass: Use dry plant residues (branches, corn stalks, hulls, dry leaves, fine wood, etc.).
- Cut some of the residue into small pieces, about 30 centimetres in length, then others slightly longer, about 60 centimetres.
- First, place the small sticks (30 cm) in the bottom of the hole.
- Add a fistful of straw or dry leaves.
- Then, arrange long sticks (60 cm) in a chimney shape between 20 and 30 centimetres high.



Remember:

- Dig the pit away from houses or other structures to avoid fire hazards.
- Lign the outer edges of the pit with stones or soil.
- Do not store the raw materials for the biochar near the pit, where they might catch fire.
- Do not fill the hole all at once.

V. Pyrolysis: The Heart of the Process



V. Pyrolysis: The Heart of the Process



Q1: What is the woman in this image doing?

- She is lighting the collected organic matter on fire. This is the beginning of the pyrolysis stage.

Q2: How do you start pyrolysis?

- Light the fire: Light the dry material at the bottom of the pit from the top to minimise smoke and to create a layer of embers. Let the chimney burn until the upper-most sticks glow red and the outer bark becomes grey ash.
- Gradually add biomass: As soon as the embers are glowing, begin adding more residues gradually. Each time, add another 10 to 15 centimetres of material. Always wait until the embers are glowing before adding the next layer.
- Continue adding layers until the pit is filled.



Remember:

- Cover the flames with more layers of biomass to limit oxygen; this facilitates pyrolysis, i.e. slow combustion without oxygen.
- Wait until the embers are glowing before adding the next layer.

VI. Cooling: A Critical Step



VI. Cooling: A Critical Step



Q1: What is happening in this image?

- Pack down and monitor: Continue adding and lightly packing down material to prevent the fire from burning too quickly. The goal is for the biomass to carbonize rather than burning completely to ash.
- Push any unburnt sticks to the center.
- Stop combustion: When the topmost layer has become red, with the outer bark turning to ash, extinguish it by throwing on 50 to 100 litres of water or by smothering it with sand or soil. This process avoids losses, stabilises the biochar, and makes it easier to handle.
- Let it: cool completely. After 15 minutes, check that it has been completely extinguished, then scoop it out.



Remember:

- Cooling is an essential step in ensuring the quality of the biochar.
- Ensure that all material has burnt and that the fire is completely extinguished.
- Wait about 15 minutes before removing the biochar.
- Keep the water bucket handy, just in case!
- Protect yourself from heat and smoke by wearing a mask or by breathing through a scarf.

VII. Crushing: An Essential Step



VII. Crushing: An Essential Step



Q1: What are the farmers doing in this image?

- They are crushing bagged biochar using bats.

Q2: Why are they doing this?

- This makes the biochar finer, making it easier to activate and use.

Q3: Why are they wearing masks?

- To protect themselves from dust; this is very important.



Remember:

- Crush the biochar well for better activation.
- Wear a mask.

VIII. Using Biochar



1



2



3

VIII. Using Biochar



Q1: How do I process the biochar once it is ready?

Biochar needs to be activated before use. Options for using biochar in the soil include the following:

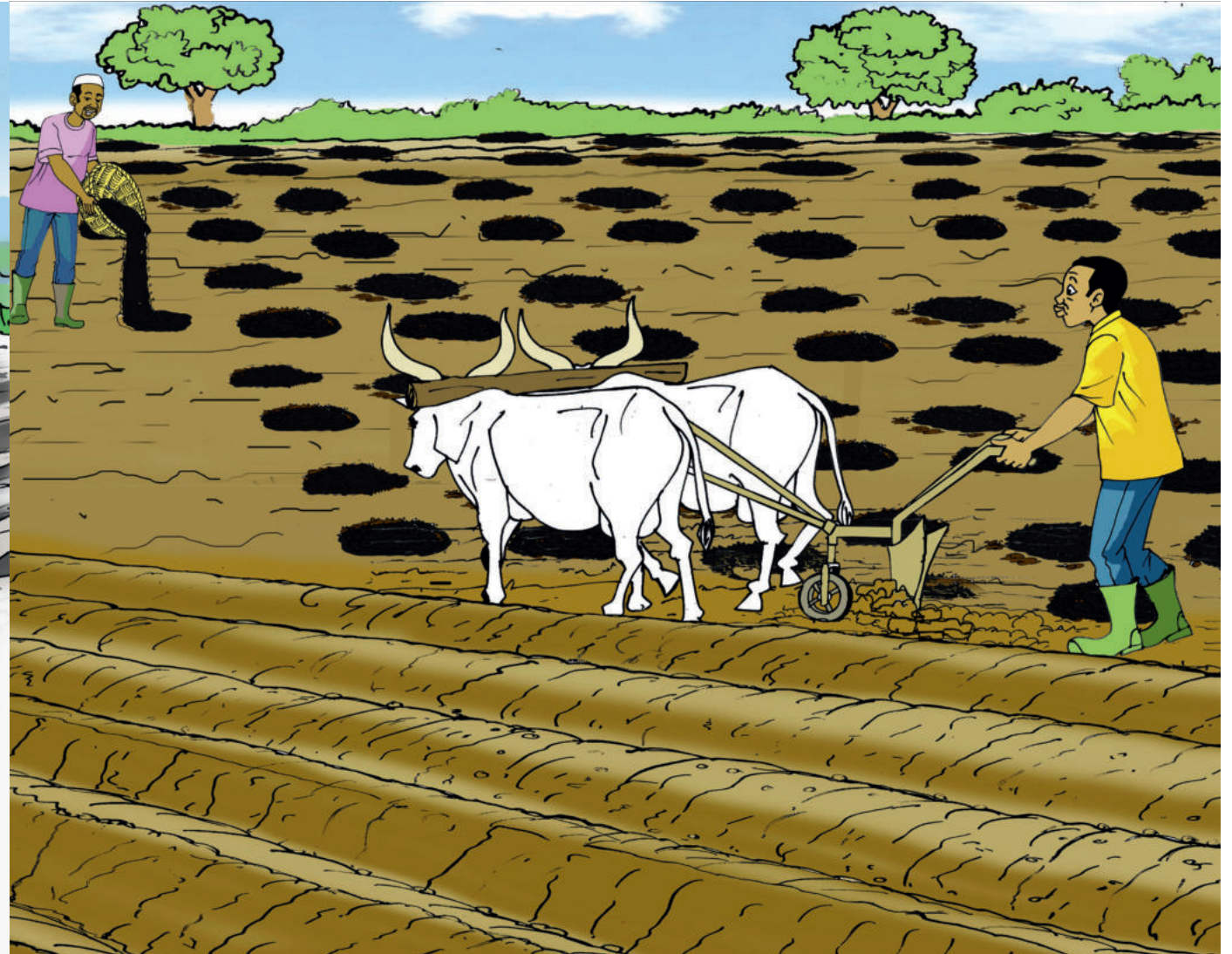
- Incorporate biochar while setting up a compost heap.
- Mix finished compost with biochar before spreading it on the fields.
- Mix the biochar with cow manure in the pastures and use the mixture to fertilise the fields.



Remember:

- Mix the biochar with compost or manure before spreading.
- Mixing with compost will not only enrich the biochar but also avoid leaching and bad odours.
- If biochar is not activated before use, it will absorb the nutrients in the soil instead of releasing them.

IX. Spreading Life to the Soil



IX. Spreading Life to the Soil



Q1: How is biochar applied?

- Spread the biochar out well so that the necessary nutrients can be absorbed.
- It can be spread by hand or by cattle, either spot-wise or on ridges, before planting.
- It is also possible to consult a technician, who will analyse the soil and give a recommendation on the type and amount of mixture needed.



Remember:

Biochar can be spread spot-wise or on ridges, by hand or by cattle.

X. The Benefits of Biochar



X. The Benefits of Biochar



Q1: What are the benefits of using biochar?

- Biochar promotes water retention, and plants benefit from the more gradual release of water. It increases how long moisture lasts in the soil.
- It loosens compacted soils, making them softer.
- It balances the pH of overly acidic and alkaline soils, thereby improving the availability of plant nutrients.
- When mixed with compost or manure, it stores nutrients, preventing leaching and making them available to plants for longer. The plants grow better with less fertilizers.
- It creates a habitat for many different micro-organisms and protects them from predators. Micro-organisms can make soils and plants healthier.
- It protects the environment by reducing emissions from burning or decomposition while storing carbon in the soil.



Overview of Biochar Production and Use



Overview of Biochar Production and Use



The process for producing and using biochar takes place across several successive stages:

1. Preparation: Gather tools, protective equipment, and water or soil; dig a hole.
2. Plant residues: Collect corn stalks, rice hulls, cotton residues, or other dry agricultural waste.
3. Pyrolysis (controlled carbonisation): Transform these residues into coal by heating them with little air, avoiding complete combustion.
4. Cooling: Extinguish the fire using water or soil.
5. Removal: Take the biochar out to stop it from continuing to burn.
6. Crushing: Reduce the biochar into fine pieces to increase its contact surface and maximise its ability to retain water and nutrients.
7. Activation/loading: Mix the biochar with compost, manure, or animal litter to charge it with nutrients and microorganisms.
8. Spreading:
 - Spot-wise: deposit biochar in small holes near where plants will grow.
 - Using cattle: to cover large areas quickly, spread in ploughed furrows.



By following these steps, farmers turn agricultural waste into a sustainable “magic sponge” that improves soil fertility, retains water, and supports crops in the long run.

The Aid by Trade Foundation (AbTF) is an international non-profit organisation renowned for promoting sustainable raw materials. It makes a decisive and measurable contribution to improving the living conditions of people and animals while protecting the environment.

The required funds are provided by our marketing company, ATAKORA GmbH, through the activation of market forces, primarily licensing and services.

Innovations are essential to the ongoing development of our organisation.

AbTF was established in 2005 by the Hamburg-based entrepreneur Prof. Dr Michael Otto.

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