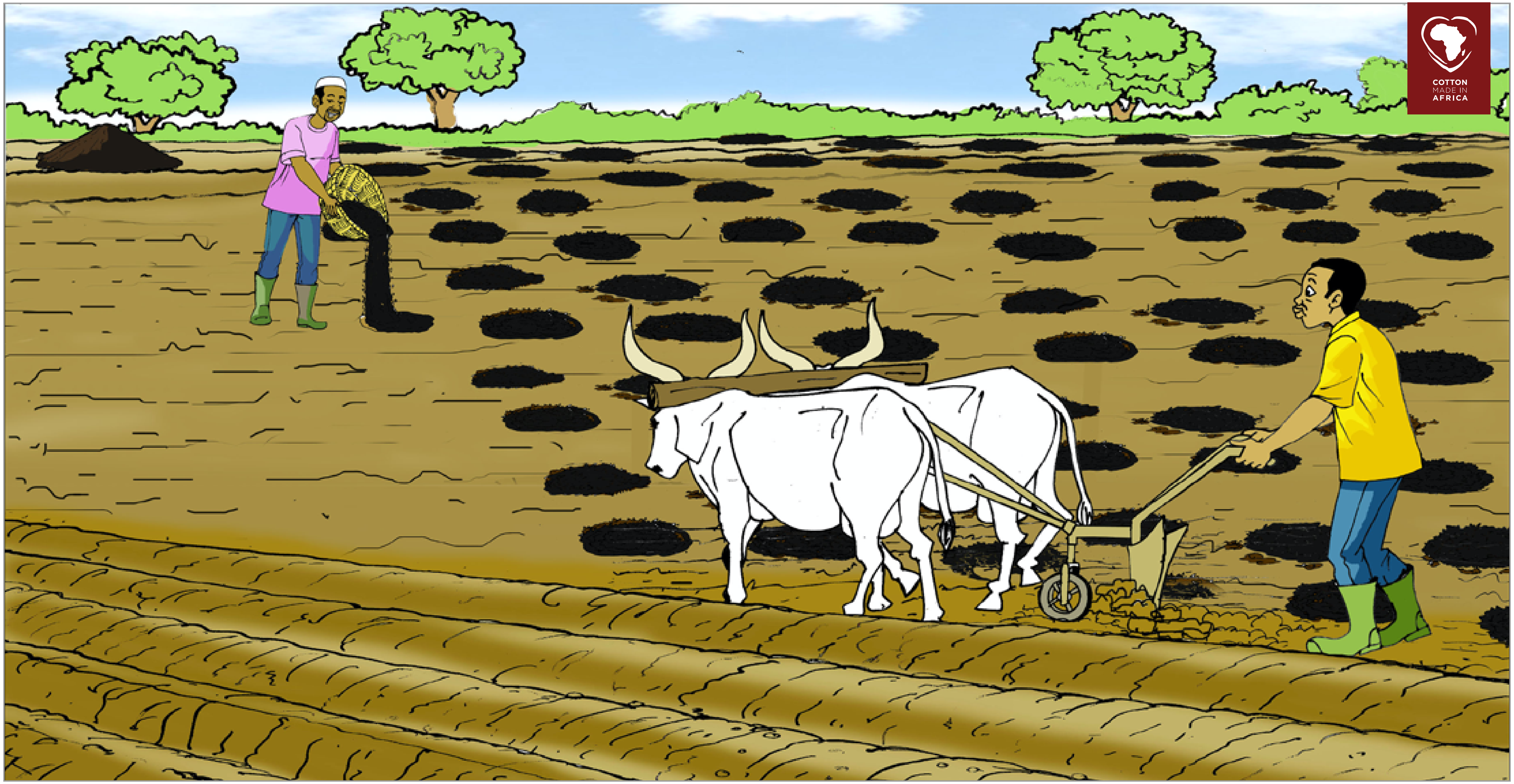
Soil Fertility

Biochar production

COTTON MADE IN AFRICA



Overview of CAR-iSMa, an innovation project

Project background:

Small-scale cotton farmers face challenges due to climate change. Weather conditions such as extreme drought and irregular rainfall have a considerable impact on the farmers' harvests and incomes. There is an urgent necessity to adapt to the changing climate and to build resilience, in terms of both agricultural systems and the farmers' livelihoods, throughout Africa South of the Sahara. Farmland in Africa is increasingly affected by the loss of topsoil and of nutrients in the soil. Over time, this will considerably reduce soil quality, leading to soils with lower water-retention capacity, less oxygenation, and greater vulnerability to erosion and degradation.

To address these challenges, the Aid by Trade Foundation (AbTF) launched the CAR-iSMa project under the Cotton made in Africa initiative (CmiA). CmiA is an initiative by AbTF that aims to improve the social, environmental, and economic conditions of African small-scale cotton farmers and their communities. The CmiA standard prescribes regular training to improve the professional skills and capacities of small-scale cotton farmers.

Project objectives:

CAR-iSMa stands for “Climate Adaption and Resilience: A Pan-African Learning and Knowledge Exchange Project on Improved Soil Management”. Created at the behest of the Aid by Trade Foundation, the project is supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) with funding from the German Federal Ministry for Economic Cooperation and Development (BMZ); it is being implemented in collaboration with the agricultural company LDC Suisse and three CmiA-verified cotton companies: CIDT in Côte d'Ivoire, SAN-JFS in Mozambique, and LDC in Zambia.

The project's aim is to continually improve the sustainable production of cotton by equipping 100,000 farmers under contract with the three CmiA partners (CIDT, SAN-JFS, and LDC Zambia) with better soil management methods. As soil health improves, so do the livelihoods and the resilience of small-scale cotton farmers, while climate change is mitigated.

coopération allemande
DEUTSCHE ZUSAMMENARBEIT

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

AID BY TRADE FOUNDATION

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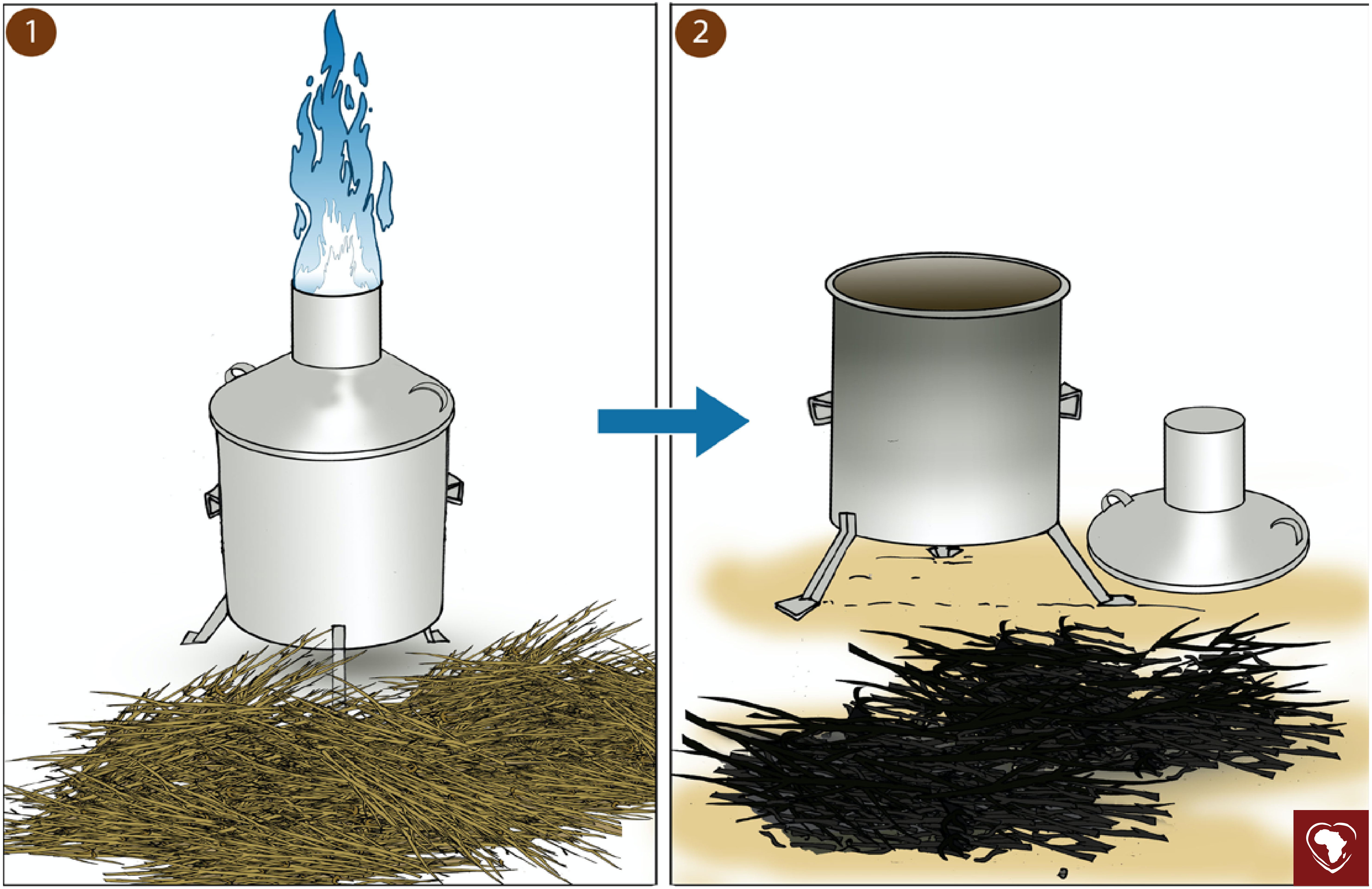
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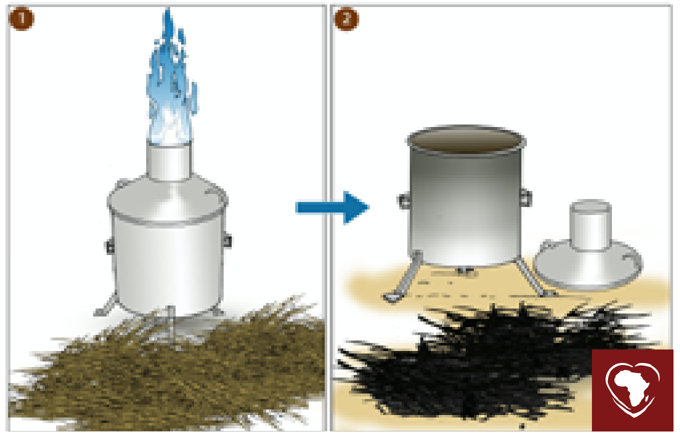
Definitions



Q 1 : What is biochar?

- Biochar is produced by crushing charcoal into small particles.
- Biochar is a by-product of the pyrolysis of plant biomass, whether on a small or industrial scale.
- Biochar is sometimes called agrichar when used to enrich farming soils.
- Biochar is organic material stabilised by an aromatic macromolecular structure.
- This aromatic macromolecular structure makes biochar resistant to microbial decomposition.

Q 2 : How is biochar produced?

- Biochar is produced through the pyrolysis or carbonisation of plant residues.

Q 3 : What is pyrolysis?

- Pyrolysis, or carbonisation, is a process of slow incineration with little or no oxygen.

COTTON MADE IN AFRICA

Manufacturing equipment

Q 1 : What do you see in this image?

- An oven on a tripod with a lid and a short chimney, a 50 kg sacks, a shovel, a water jug, some sand, a basket, two wooden sticks, and a box of matches
- Boots, gloves, and a face mask

Q 2 : What is the equipment for?

- The oven is used to produce biochar through pyrolysis or charcoal produced through heat.
- The matches are used to light the biomass on fire once loaded into the oven.
- The shovel is used to put sand over the biochar to reduce the biochar burning.
- The pail is used to store water for extinguishing the biochar burning.
- The sand is used to extinguish the biochar burning.
- The sack is used to store the biochar.
- The wooden sticks are used to crush the biochar inside the sacks.
- The boots, gloves, and face mask protect the people manufacturing biochar.

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Raw materials

Q 1 : What do you see in this image?

- Maize stalks and cotton stalks have been collected in a field.
- Two people are carrying an oven towards the collected stalks of maize and cotton.

Q 2 : What are the maize and cotton stalks used for?

- The maize and cotton stalks will be transformed into biochar.

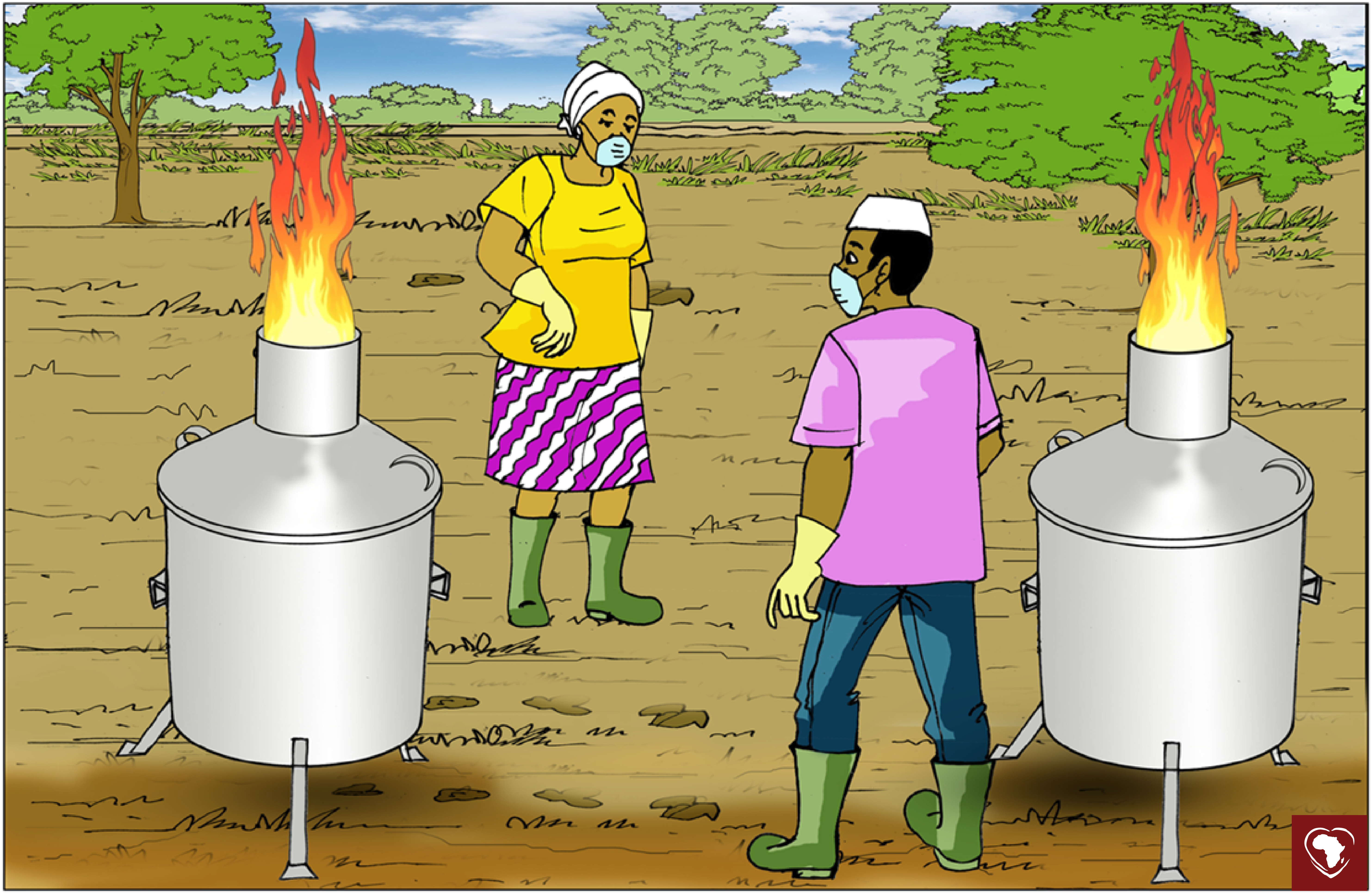
Biochar production process

Q 1 : What do you see in this image?

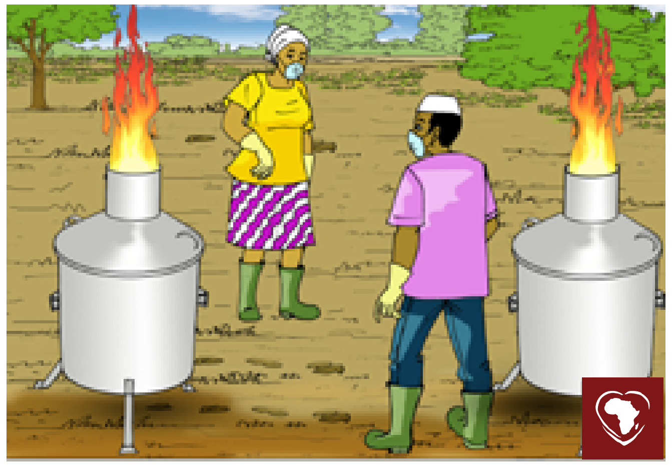
- A person is loading cotton stalks into the oven.
- Another person is loading the oven with maize stalks.

KEY MESSAGES:

- **Other useful raw materials include wood chips, crop residues, organic waste material, and rice husks.**



Biochar production process



Q 1 : What do you see in this image?

- The oven lids are closed, and a column of flame is rising out of the chimney.

Q 2 : How were these flames produced?

- The two people lit maize stalks and cotton stalks on fire before closing the oven with the lid.

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Biochar production process

Q 1 : What do you see in this image?

- The yellow flames have changed into blue flames in both ovens, which are still closed.

Q 2 : What do the blue flames indicate?

- The blue flames indicate that the crop residues are not burning but rather glowing or transforming due to the heat.

Q 3 : How do you recognise when the biochar in the oven is ready?

- When the blue flames get smaller.
- Observe if the stove changes its colour from top to bottom due to the heat; when the change moves towards the bottom of the oven, the biochar is ready.

Biochar production process

Q 1 : What do you see in this image?

- Biochar has been produced in the two ovens and put on the ground.
- The shape of the crop residues is preserved.
- There are two methods of cooling the biochar:
  - One person is cooling the pile of maize-stalk biochar using water.
  - Another person is cooling a pile of cotton-stalk biochar using sand.

Biochar production process

Q 1 : What do you see in this image?

- The cotton-stalk biochar on the left and the maize-stalk biochar on the right have both been cooled down.

Biochar production process

Q 1 : What do you see in this image?

- Four people are crushing the biochar, which has been put into sacks with the wooden sticks.

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Using biochar

Q 1 : What do you see in this image?

- Two people are mixing biochar with compost before application.

Using biochar

Q 1 : What do you see in this image?

- One person is making small piles of the biochar–compost mix on the field.
- Another person is incorporating the biochar–compost mix into the soil using oxen.

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For trainers

ADVANTAGES OF 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 creates a habitat for micro-organisms and protects them from predators; and
- when combined with compost, it maintains and protects nutrients against predators and leaching.

PLEASE NOTE:

The incorporation of biochar can influence the structure, texture, porousness, particle size, and density of the soil; it can also affect its air and oxygen content as well as its ability to retain water and nutrients. By improving soil fertility, biochar can increase crop yields. This fertilising effect can be attributed in part to the stimulation of microbial life and the resultant increase in nutrient availability for plants; it is also partly due to the size of the specific surface area of biochar, which increases its water-retention and cation-exchange capacities. Biochar's impact on the soil depends on the type of soil, climate, and plant cover as well as technical details and any conducted experiments.

PLEASE NOTE:
EFFECTS OF BIOCHAR ON PLANT GROWTH

Applying biochar can have a positive effect on plant growth. Significantly faster sprouting is noticeable in fields treated with biochar compared to untreated control areas. Although adding biochar can have benefits, it can sometimes have neutral and even harmful effects on plant growth. This can depend on the physicochemical properties of biochar (Manya et al., 2012). This is the case with biochar produced from chicken manure, which generally has a high concentration of sodium. On the other hand, a recent study reported that adding biochar (a mixture of rice husks and cotton husks) in sandy loam made it possible to reduce the input water without affecting crop yields. Due to increased water retention capacity in soil treated with biochar, the irrigation frequency can be reduced. However, results may differ depending on nutritional requirements, crop types, and the developmental stage of the plants. Although any organic material could theoretically be used for pyrolysis, the physicochemical properties of biochar can vary considerably due to differences in pyrolytic variables (primarily temperature, heating rate, and time in the oven) and the input materials.

AID BY TRADE FOUNDATION

The Aid by Trade Foundation (AbTF) was founded in 2005 by Prof. Dr. Michael Otto, an entrepreneur from Hamburg, Germany. The aim of the foundation, which operates independently of the Otto Group, is to help people to help themselves through trade, thereby preserving vital natural resources and securing the livelihoods of future generations.

With the Cotton made in Africa (CmiA) initiative, AbTF is putting its principles into practice. The trade partners of the CmiA Demand Alliance source African cotton produced according to the CmiA standard and pay the foundation a volume-based license fee that is reinvested in the cultivation areas. Consumers recognise products by the CmiA label and make a valuable contribution to protecting the environment and supporting smallholder farmers and their families in Africa.

Aid by Trade Foundation

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