

# Making charcoal using the RecyCoal pyrolysis system

For an optimal result, we strongly advise you to use materials that have been properly dried and are not bigger in size than a banana. Therefore, when using banana tree trunks, you might need to cut it down to have a proper fit. Exposing the material for a few days to sunlight and allowing it to have enough airflow/wind beneath it is enough to achieve a properly dried input.

Also please take appropriate safety precautions. Wear working gloves at all times, as well as using respirator protectors for your own safety. During the last steps consider soaking your gloves in water for additional protection when handling and emptying the hot barrel.

## 1. Setting up the system

**1** In order to function well, the system needs to be raised allowing airflow through the openings at the bottom of the barrel. Placing the barrel on top of three bricks is sufficient but keep the system as even as possible avoiding canting it.

Now, insert the inner tube into the barrel. Make sure to place it central to allow the secondary air to flow between the inner and outer wall.



## 1. Filling with material

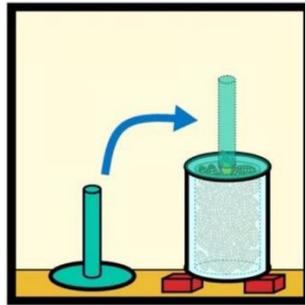
**2** Fill the inner tube with dry material but not any higher than the tube itself. Do not compress the material. Compressing restricts the airflow and may result in a decline of the quality of the final product.

## 2. Starting the pyrolysis

**3** Ignite a small fire on top of the material. For that purpose, use fine biological waste or charcoal. Please do not use any material containing plastics or including any other synthetics.

### 3. Closing the system

If the small fire starts catching on, close the system by putting on the lid with the attached chimney/afterburner. Secure the lid with the clamping ring.

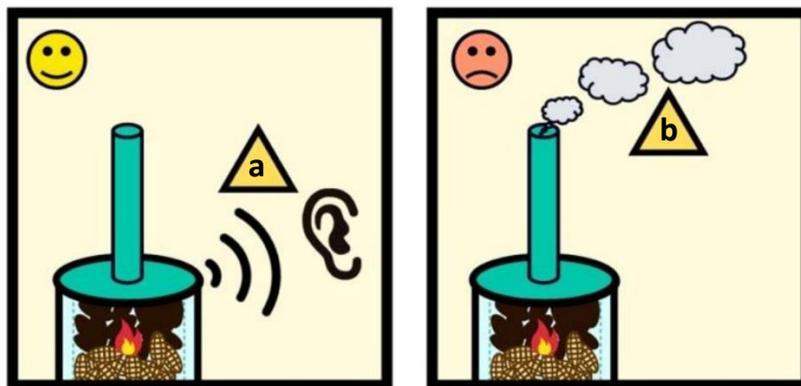


### 4. During the process

**a** Ideally, around ten minutes into the process, a subtle roaring sound should start to emerge from the system and flames are visible through the slits in the chimney. This means the process is well underway.

**b** If the system is emitting a lot of smoke, try manually lighting the smoke through the slits in the chimney/afterburner. This might take a couple of tries.

If the smoke is white and cannot be ignited, the raw material was not sufficiently dried. Do not take any action (e.g. opening the system). Let the process finish completely, although this might take a bit longer than usual. Also make sure that the next batch can dry for long enough and does not get wet after drying.



### 5. How to tell when the process is finished

In an ideal case, the process ends when the roaring sound is no longer audible and the flames inside the chimney cannot be re-ignited manually. This may take up to one or two hours in a big and around thirty to sixty minutes in a small system.

#### 6.1 Damp / smoking material

If the used material is too damp, the end of the process will not be recognizable by listening. Instead, pay attention to the smoke. When finished, the smoke will change from a steamy

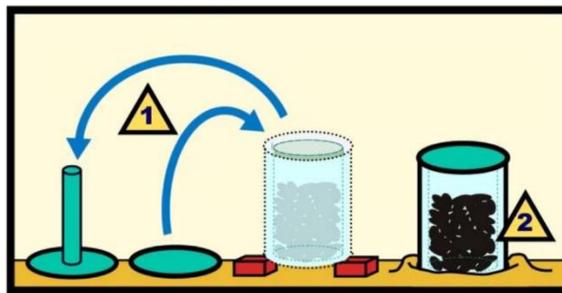
looking white to a more smoke-like looking darker color. Confirm the end of the process by either measuring the temperature at the bottom of the barrel (approx. 350° C) or by splashing water at the bottom. The abrupt evaporation of this water is also an indicator for the end of the process.

## 6. Cooling the coal

When the pyrolysis is finished, there is only charcoal left in the barrel. Caution: The coal is hot and will start to burn when the Barrel is opened! There are two ways to bring down the temperature:

1. Deprive the coal of oxygen/air

**2** Carefully take the barrel from the spacing stones and seal the bottom of the barrel with some dirt, so no air can enter through the slits. **1** Take the lid with the afterburner of and replace it with a closed lid. Caution: the coal will ignite as soon as you open the lid. Let the barrel sit until its only warm to the touch, this might take up to three hours. Now you can open the system and take the coal out.



2. Cool the coal with water

Carefully open the barrel (the coal will ignite) and spread the coal on the ground. Extinguish the fire with water. Once the now wet coal is dried again it is ready for use.

## 7. Applications for the bio-charcoal

### 7.1 Charcoal for direct use/cooking

The coal can be used for cooking, just like regular charcoal or wood.

### 7.2 Charcoal for soil improvement

You can use charcoal to improve your soil quality. It does not have to be dry for this application, so you may use water for extinguishing the coal.

To improve soil quality, crush the charcoal into pea-sized bits. Work them into the top layer of approx. 20 cm of your soil, but do not exceed 20% charcoal per volume of soil.

Since charcoal holds on to nutrients, the soil now will need a one-time nitrogen boost, which can be provided by animal manure.