

How to Make Charcoal out of Peanut Shells

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This manual will be translated into Haitian Creole.

This instruction manual is meant to teach Haitians how to make charcoal out of waste peanut shells. However, this method can be adapted to use any sort of plant waste, such as bagasse (sugar cane), newspaper, yard waste, etc. In addition, this technique can be scaled up to produce large batches of charcoal.

This method is based on a method for making charcoal developed at MIT by Amy Smith.

PEANUT SHELL CHARCOAL:

Charcoal is made by heating a woody material (such as wood, paper, and in our case, peanut shells) to a very high temperature and then smothering the material to keep air away from the material until it cools down. This burns off most of the impure, smoke-producing parts of the material but leaves relatively pure char that burns with little to no smoke.

Making charcoal out of peanut shells has many benefits. First, it replaces wood char as a cooking fuel. In a country that is highly deforested, this reduces the demand for the much-needed trees. Second, using raw peanut shells for fuel is not feasible because of the large amounts of smoke produced by the shells.. Turning peanut shells into charcoal utilizes a waste product. Lastly, this process can provide jobs to individuals. Since peanut shells are available around Haiti as waste, a person can create a charcoal-making business.

Making charcoal out of peanut shells requires three processes: burning the peanut shells to make char, mixing the char with a binding agent that holds the powdery char together, and compressing the char mixture into briquettes.

MATERIALS NEEDED:

For burning:

- Peanut shells (or other dry biomass, such as sugar cane bagasse or newspaper)
- Burn basket (This may be made from a variety of items such as a coffee can, charcoal chimney, or sheet metal. See Appendix A for instructions on how to make a burn basket)
- Burn basket cover (This is a heat-resistant container that completely covers the burn basket.)
- Newspaper (Several sheets)
- Matches/lighter
- Open patch of dirt or sand suitable for a fire and with loose dirt to pack around the burn basket cover
- Shovel (optional—used to pack dirt around the burn basket cover)

For the binding agent:

- 1 cup tapioca flour
- 5 cups water
- Stove or other means to boil water
- Medium pot
- Plastic bag
- Medium-sized bowl
- Sturdy spoon

For briquette-making:

- Briquette press (See Appendix B for briquette press description)
- Safe, dry, preferably sunny, area for the briquettes to dry for two days.

BURNING PEANUT SHELLS:

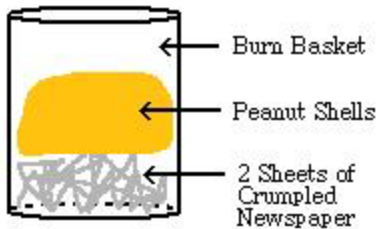
CAUTION: This process involves fire. Keep hair tied back and do not wear loose clothing. Do not touch the fire or the burn basket or cover until they have cooled substantially. It will take 30-45 minutes for the fire to cool down.

STEP 1:



Place the burn basket on a level patch of dirt or sand. Test putting the cover over the burn basket and make sure there is enough loose dirt around to pack around the bottom of the container to create an airtight seal.

STEP 2:



Place two crumpled sheets of newspaper in the bottom of the burn basket. Fill the burn basket 2/3 full with peanut shells.

STEP 3:



Light the newspaper underneath the peanut shells on fire. The peanut shells should catch fire as well.

STEP 4:



Let the fire burn until the smoke turns to mostly clear. For a small fire, this will take 2-4 minutes.

STEP 5:



STEP 5: Once the smoke is mostly clear, cover the burn basket by the cover: the larger, heat resistant container. Seal the bottom edges with dirt so that no smoke can escape.

STEP 6:

Wait for the burn basket and its cover to completely cool. For a small fire, this will take 30-45 minutes.

MIXING BINDING AGENT WITH CHAR:

STEP 7:



STEP 6: Mix one cup tapioca flour with one cup water. Bring four cups of water to a boil, then add the tapioca flour-water mixture to the boiling water. Allow the mixture to boil for 2-4 minutes until the mixture is a thick gooey consistency. This is the binding agent. It will be mixed with the char and formed into briquettes.

STEP 8:



After the burn basket and cover are completely cool, remove the cover . The charred peanut shells, called char, should be completely blackened, but often still retain their form.

STEP 9:



Pour the char into a plastic bag and crush the char into a fine powder so that there are no pieces greater than 1 mm wide.

STEP 10:

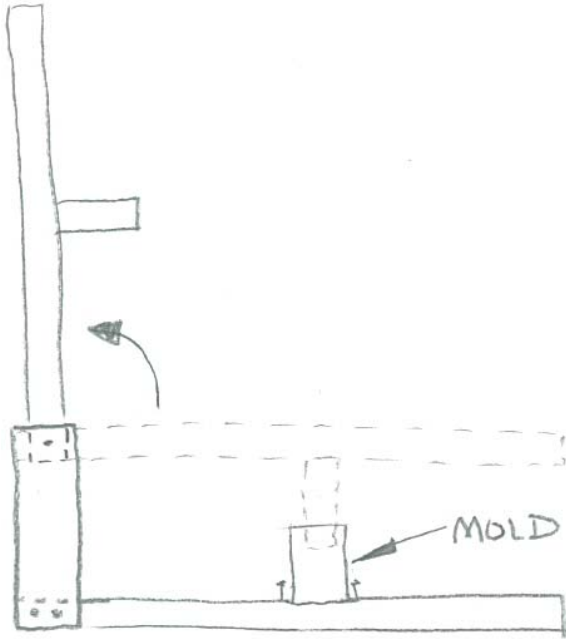


Mix 3 cups of the char mixture (do not compress the char) with $\frac{3}{8}$ cups of the binding agent made in STEP 7. This will make two briquettes.

You may find it better to use more or less binding agent.

PRESSING BRIQUETTES:

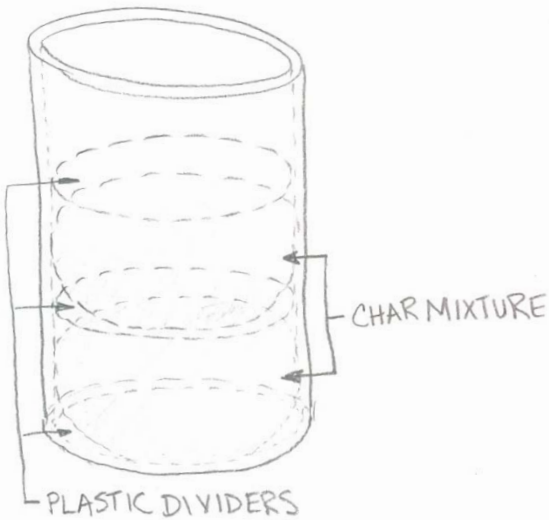
STEP 11:



Rotate the arm of the briquette press up to load the mold.

Place the mold on the base of the press on the area surrounded by nails.

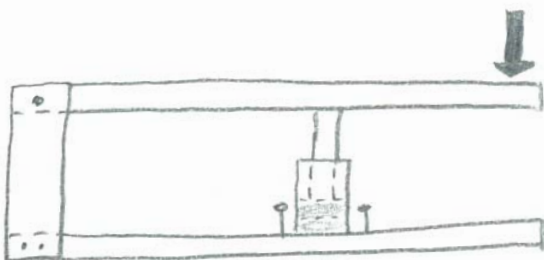
STEP 12:



Load the mold in the following order:

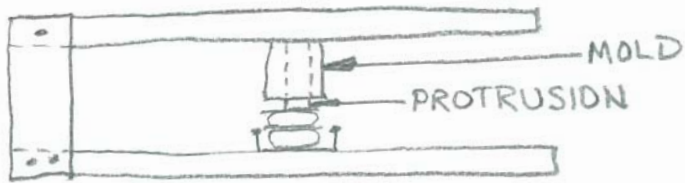
1. plastic divider
2. half the char mixture
3. plastic divider
4. remaining char mixture
5. plastic divider

STEP 13:



Rotate the arm down and push or sit on the long end of the arm to compact the briquettes

STEP 14:



While holding the arm in place, lift the mold up so that it touches the lever arm. Then remove the briquettes.

STEP 15:



Peel the plastic dividers off of the briquettes and set the briquettes in a dry, preferably sunny, area. After two days the briquettes will be completely dry and ready for use.

Appendix A: Burn Basket

The burn basket allows users to easily burn the peanut shells. A burn basket can be made out of a variety of objects. The instructions were made using a gallon size coffee can with holes punched in the sides. A charcoal chimney and a custom-made burn basket made from sheet metal can also be used as burn baskets..

COFFEE CAN:

CAUTION: The following steps involve punching holes in metal, which creates sharp edges. Be careful to keep your hands away from the sharp edges of the burn basket.

Use a gallon-size coffee can with the top cut out.

Punch about 15 holes ($\frac{1}{4}$ inch wide) in the bottom and about 50 holes ($\frac{1}{2}$ inch wide) in the sides of the can (with extra toward the bottom).

When burning, place the can on three rocks or bricks so that air can flow through the bottom holes.



CHARCOAL CHIMNEY:

An alternative to using a coffee can as a burn basket is a charcoal chimney (shown below). A charcoal chimney is a metal cylinder used to start charcoal fires. The chimney, however, is very effective at lighting peanut shells on fire.

If the chimney has large holes in the bottom, place a thick foil pan with holes punched in it into the bottom to keep the peanut shells and char from falling through the bottom.

If you use a charcoal chimney, use the following instructions for Step 4: To light the peanut shells on fire, place the crumpled newspaper underneath the bottom of the charcoal chimney and fill the chimney 2/3 full of peanut shells. Then, light the newspaper on fire and continue Step 5.



A Weber Charcoal Chimney loaded with charcoal. You can also use this chimney as a burn basket to light peanut shells on fire.
http://store.weber.com/img/ecom/product/307416_lg.jpg



Top-down view of the charcoal chimney with a thick foil pan with holes punched in it laying over the bottom of the chimney.

CUSTOM BURN BASKET:

To create a larger burn basket, make one out of sheet metal according to the following designs.

The peanut shells will sit on a circle of wire mesh supported by two rods threaded through holes in the cylinder. Place two 1/4 inch steel rods through the small holes at the bottom, each one through holes on opposite sides of the basket to form an X across the bottom. Then place a 17 inch diameter circle of mesh on top of the rods.

To light, follow the instructions for the charcoal chimney above.

