SECIL
EMPLOYMENT & LIVELIHOODS

Sustainable Employment Creation and Improved Livelihoods for Vulnerable Urban Communities in Mogadishu

Charcoal Briquette Production

A Practical Training Manual

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CHARCOAL BRIQUETTE PRODUCTION - A Practical Training Manual

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A Practical Training Manual

July 2014

PREFACE

This manual has been developed as part of the EU funded project "Sustainable Employment Creation and Improved Livelihoods for Vulnerable Urban Communities in Mogadishu (SECIL), implemented by UN-Habitat in partnership with the Benadir Regional Administration (BRA), Cooperazione E Sviluppo (CESVI) and Human Relief Foundation (HRF) with the specific purpose of "Improvement of livelihoods of vulnerable households in urban and peri-urban areas of Mogadishu".

The 20 year civil war in Somalia has put immense pressure on the country's resources. In Mogadishu, where many communities cannot afford fuels such as liquid petroleum gas, kerosene or electricity, firewood and charcoal are the principal cooking fuels consumed by more than 70% of households. This has multiple negative impacts on the local, national and global level. There is a serious need to develop cheaper and cleaner alternatives to firewood and charcoal, especially in cities such as Mogadishu where the majority of users spend a considerable amount of time both collecting fuel and cooking in confined and badly ventilated buildings. Charcoal briquette production is a local innovation that can help to assuage such issues by providing a more affordable and cleaner source of cooking energy. Charcoal briquettes consist of charcoal dust mixed with water and a binder: often soil, composted organic waste or paper.

This manual has been developed for training community groups interested in starting up sustainable community level enterprises in Mogadishu; it can also be used by the community groups following the training as an operational manual and reference text, or to further train new members or other potential groups. Although formulated around the Mogadishu context this manual may also be relevant to other contexts. Community groups trained through this manual will produce two types of charcoal briquettes:

(i) Charcoal dust bonded with paper,
(ii) Charcoal dust bonded with composted organic waste or soil with high clay content (sticking capacity).

The manual provides background information on the need for charcoal briquettes in Mogadishu, discusses the socio-economic and environmental benefits of charcoal briquettes and describes step by step the procedures for charcoal briquette production, marketing and utilisation. It also offers advise on how community groups should govern themselves and develop charcoal briquette enterprises. In combination with other SECIL activities, this manual hopes to be able to contribute to the introduction of low-cost, energy-efficient fuel in Mogadishu; to reduce household expenditure on cooking fuel and reduce the negative impacts of these fuels on public health. By introducing this new and innovative livelihood option to Mogadishu, SECIL also hopes to contribute to reducing unemployment and, more broadly, to the building of peace in Somalia.

The SECIL team would like to express its gratitude to the EU for enabling this initiative to take place and wishes all users of this manual the best of luck in the development of their businesses.

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SECTION 1: INTRODUCTION

What are Charcoal Briquettes?

Charcoal briquettes are made by combining a binder (often soil, compost, or paper) with charcoal dust and water. The mixed materials are then compressed into a uniform solid unit (either by hand or in a mechanised press) and used like lump charcoal or firewood.

Charcoal briquette composition:

- *Charcoal dust*
- *Carbonized organic waste*
- *Carbonized branches*

+

Binders:
- *Paper*
- *Composted organic waste*

+ *Water* = ***Briquettes***

Benefits of charcoal briquettes

Economic

- Cheap
- Generates income and employment opportunities
- Easy to make

Social

- Similar to charcoal and firewood
- Reduces time and energy collecting firewood
- Compatible with daily chores
- Group work and team building

Environmental

- Efficient burning rate
- Low emissions
- Saves trees
- Mitigates climate change
- Contributes to managing solid waste

Health and Safety

- Reduced health risks
- Safe to use indoors
- Increased variety of food able to be cooked
- Increased safety of women and children

SECTION 2: BEFORE PRODUCTION

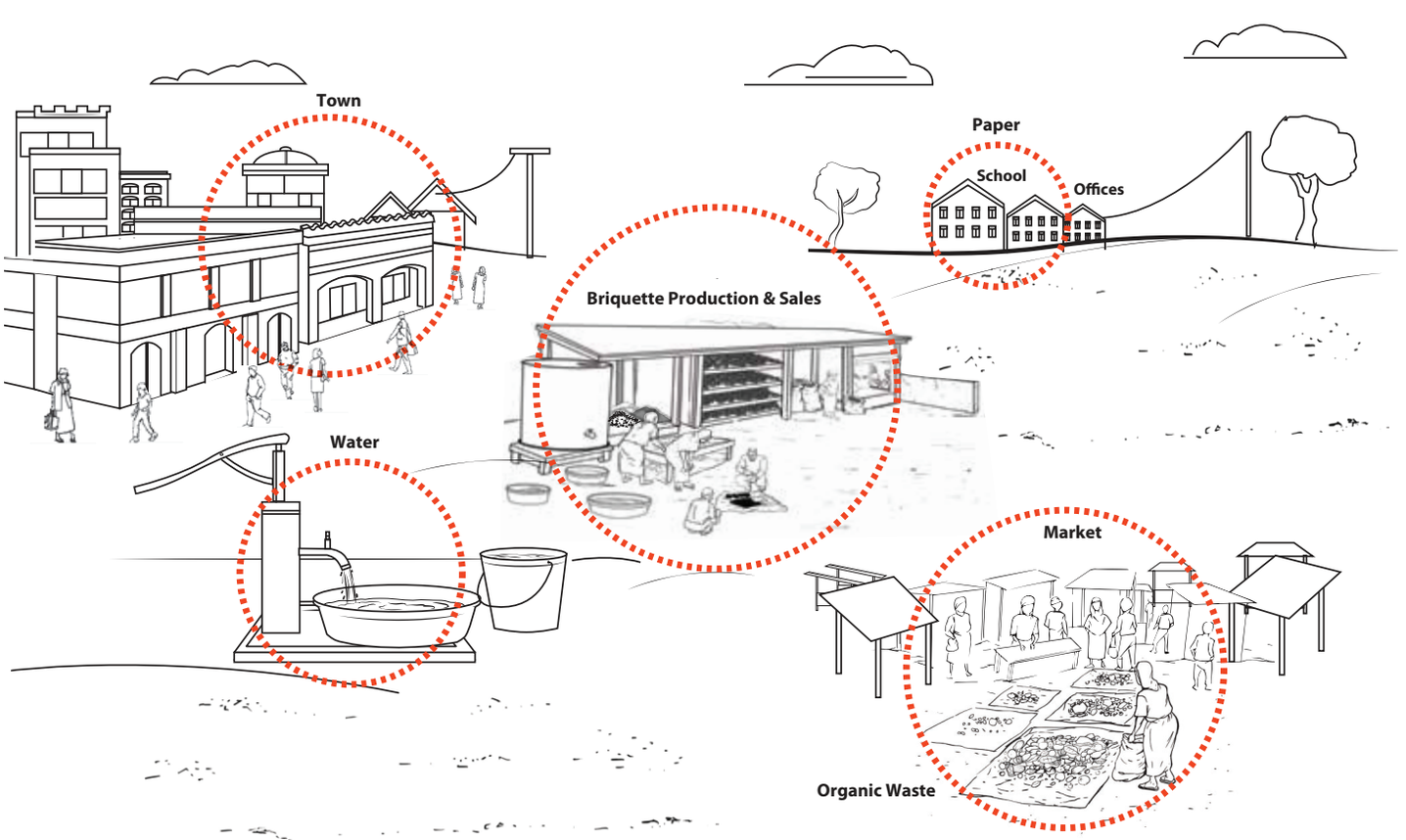
Before beginning the production process some important decisions and arrangements need to be made.

- Selection of a suitable site.
- Building of production and selling units.
- Sourcing of raw materials.

Site Selection

An ideal site should:

- Be within or near residential neighbourhoods
- Be near sources of
  - Water
  - Charcoal dust
  - Organic residues or biodegradable paper
- Have a suitable amount of production space
  - Small scale production = 5x3m
  - Large scale production = 13x7m (production and selling unit of 10x5m

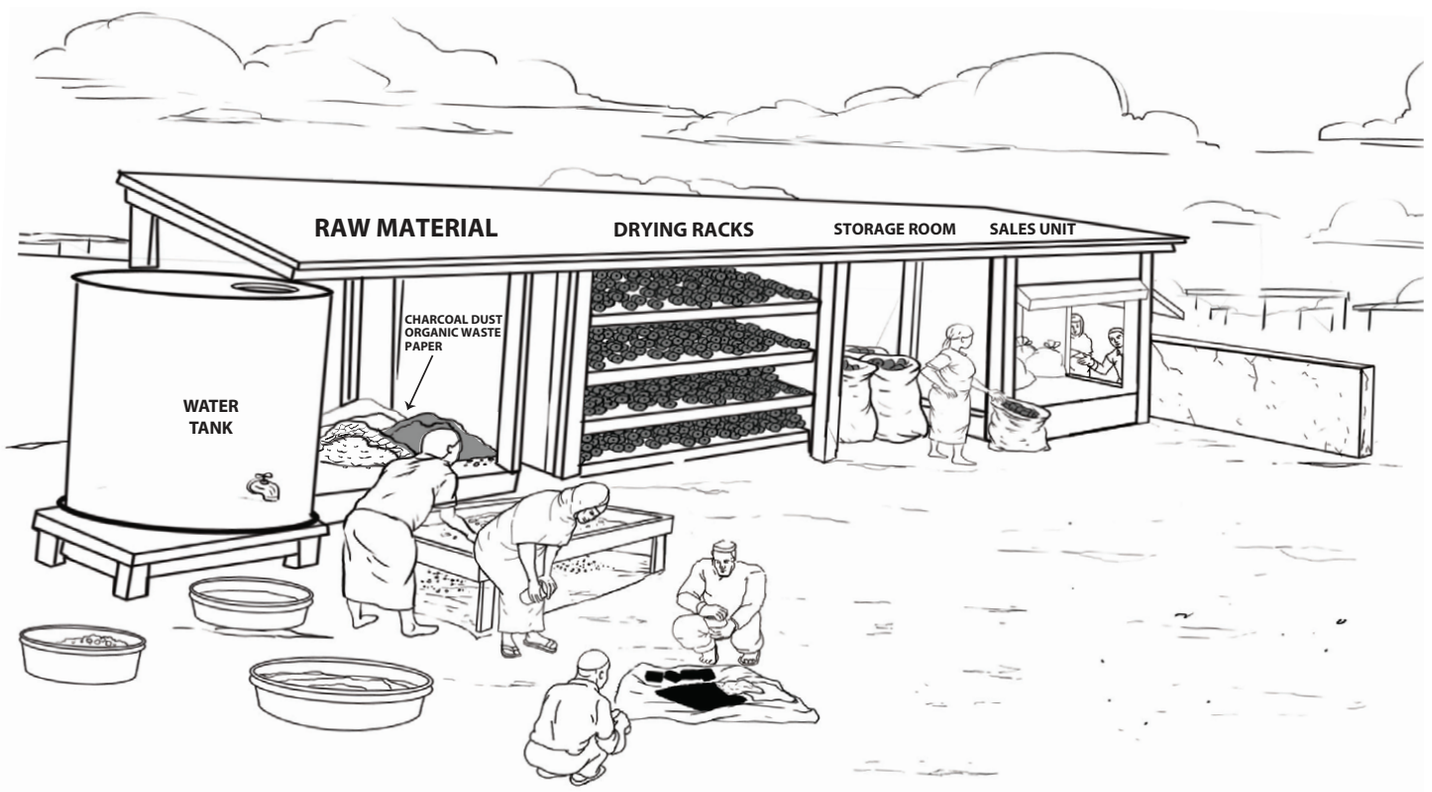


Ideal location for production site

Building of Structures

Some basic construction needs to be done on site before production can begin. This may include:

- Production unit including
  - Open production space
  - Drying racks
  - Secure storage for raw materials
  - Water source/storage
- Sales unit (if required and if land and resources are available)



Briquette production site

Sourcing Raw Materials

Charcoal dust

Charcoal dust can be sourced from existing charcoal traders or vendors or produced by carbonizing organic waste.

Before beginning production the community group must establish working relationships with local raw material producers and make suitable agreements for pricing, storage and transportation.

Paper

Paper is used as a binder and can be sourced from schools, universities, offices and other institutions.

Paper must be shredded as below before use.

DO use: ✓

- *Newspaper*
- *Printing paper*
- *Old exercise books*

DO NOT use: X

- *Cardboard or cartons*
- *Magazines*
- *Any coated, waterproofed or laminated paper*

Organic waste

Organic waste can be used as a binder and to produce charcoal dust on site.

Organic waste can be collected from markets, local traders, vendors, businesses, households, or branches from invasive trees collected from around the local area. If necessary, community group can raise awareness in the local area to sort waste at home into organic and non-organic waste. They can also arrange a fee system for collecting organic waste directly from markets, institutions or households.

DO use: ✓

- *Fruits*
- *Vegetables*
- *Roots and tubers such as potatoes*
- *Grains and legumes*
- *Other biodegradable materials*
- *Tree branches from the invasive plant Prosopis Juliflora*

DO NOT use: X

- *Plastic*
- *Metal*
- *Wood*
- *Glass*
- *Cloth*
- *Other non-biodegradable materials*
- *Indigenous plants without prior permission from authorities*

Water

Water is needed for the production of all types of briquettes. The community group should ensure measures are in place to be able to afford the ongoing costs of sourcing water.

DO use: ✓

Water from
- *Clean shallow wells*
- *Clean rivers*
- *Taps*
- *Vendors*
- *Boreholes*

DO NOT use: X

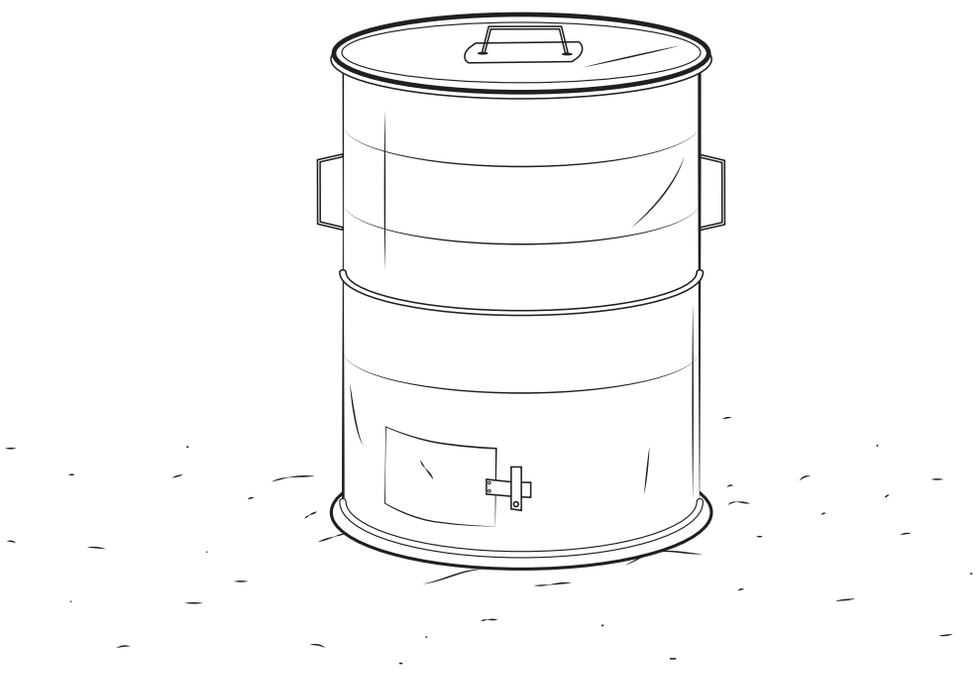
Water from
- *Dirty shallow wells*
- *Dirty rivers*
- *Contaminated ground water sources*

SECTION 3: PRODUCING RAW MATERIALS

Producing Charcoal Dust

If a community group does not have access to charcoal dust they can produce charcoal dust by burning organic waste, bones or trees branches through a process called carbonisation.

Before producing charcoal dust a drum kiln must be attained or made.



To make a drum kiln the following steps must be taken:

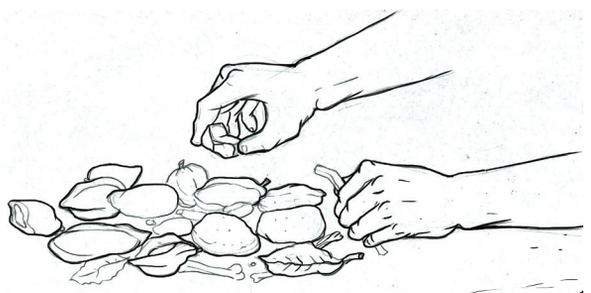
1) Acquire a drum with a lid at the top
2) Make a small window about 5cm by 5cm with a handle on the lid of the drum
3) Fix a handle on two sides of the drum.
4) Cut a door of about 5 cm by 5cm and 1 cm from the base of the drum
5) Fix metal stand inside the drum about 15 cm from the base of the drum
6) Fix a mesh with 5mm holes on the stands inside the drum
7) Make three stands about 30 cm from the ground

Option 1: Producing charcoal dust from organic waste

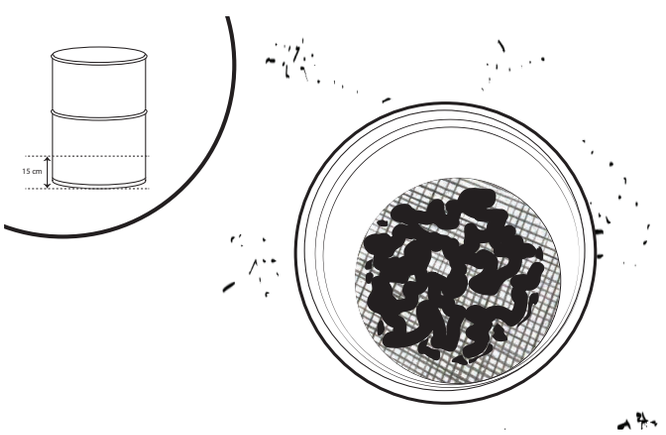
1 Dry organic waste is in the sun.

2 Sort organic waste to remove impurities such as:

- pieces of wood
- stones
- metal
- plastic
- glass



3 Place organic waste on a wire mesh and place inside the drum.



4 Ignite material through the window at the bottom and then close window and lid.

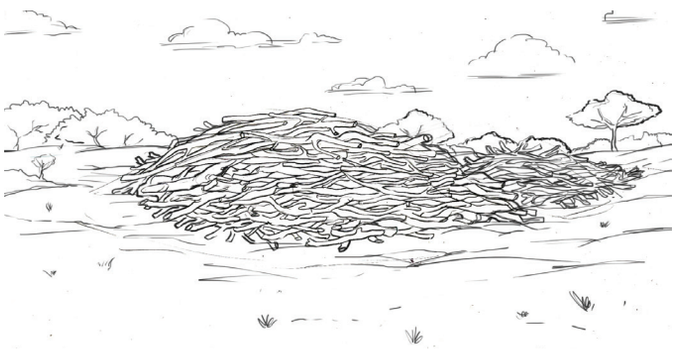
5 Burn organic waste for about 10 minutes *bones may take longer.

6 Remove charcoal from drum. Charcoal is now ready to be turned into charcoal dust.

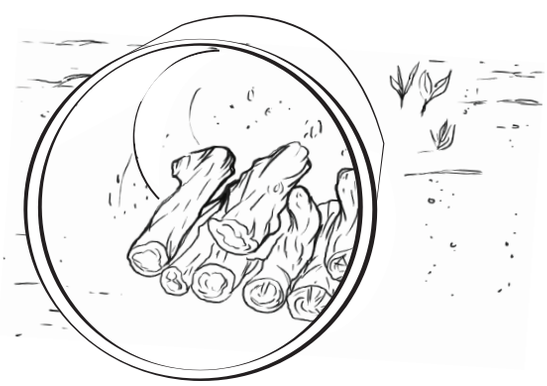
Option 2: Producing charcoal dust from *Prosopis Juliflora (Ali Garoob)*

1 Harvest branches of Prosopis juliflora (Ali Garoob) and remove leaves.

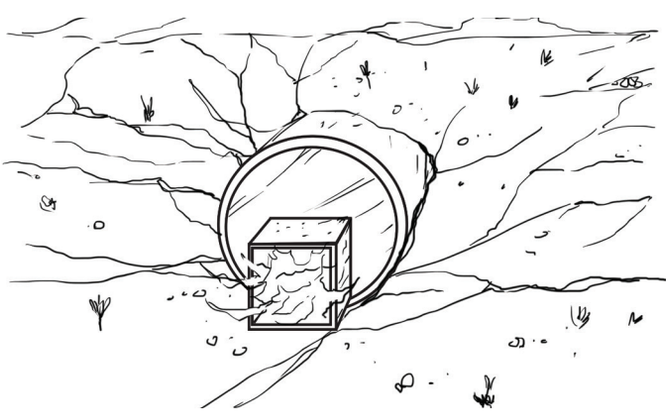
2 Dry tree branches in the sun.



3 Arrange wood carefully in the drum



4 Bury the drum under soil or sand, ignite wood and close door to drum

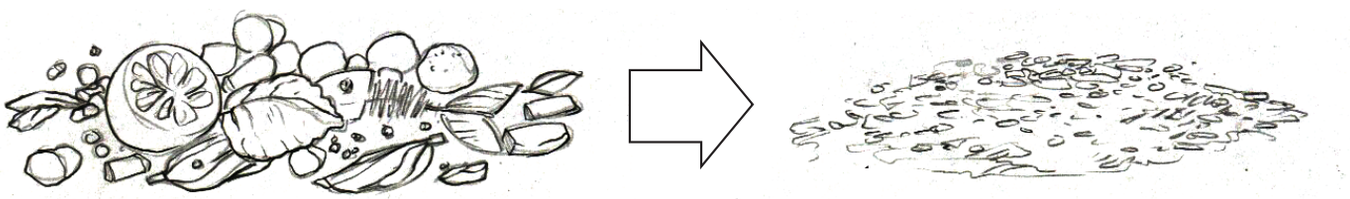


5 Burn branches for 6–12 hours

6 Remove charcoal from drum. Charcoal is now ready to be turned into charcoal dust.

Producing Compost

Organic waste can be composted to make a binder which is then mixed with charcoal dust and water to make briquettes. Composted organic waste is used as a binder where soil is lacking.

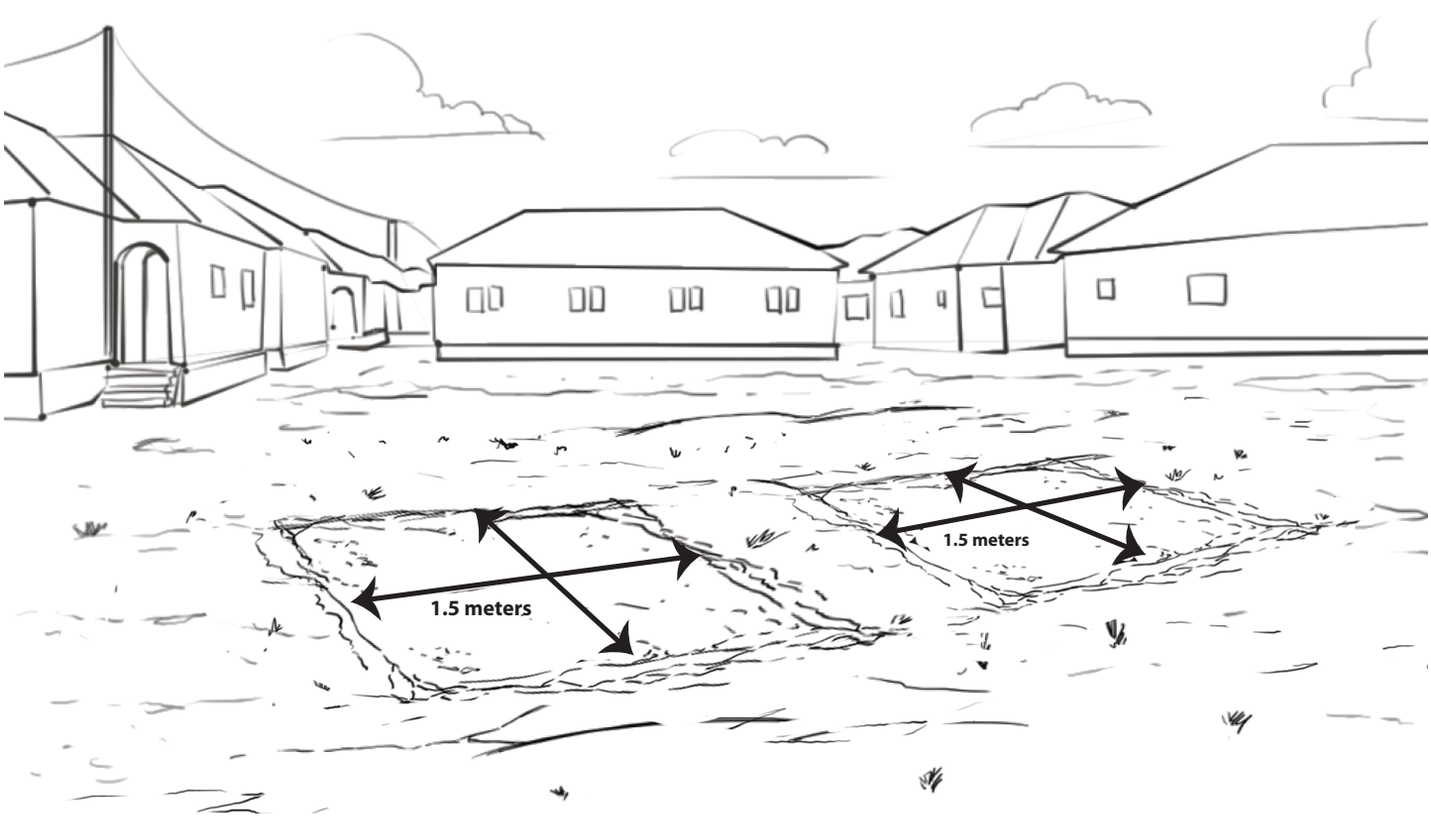


1 Sort organic waste to remove impurities.

By hand

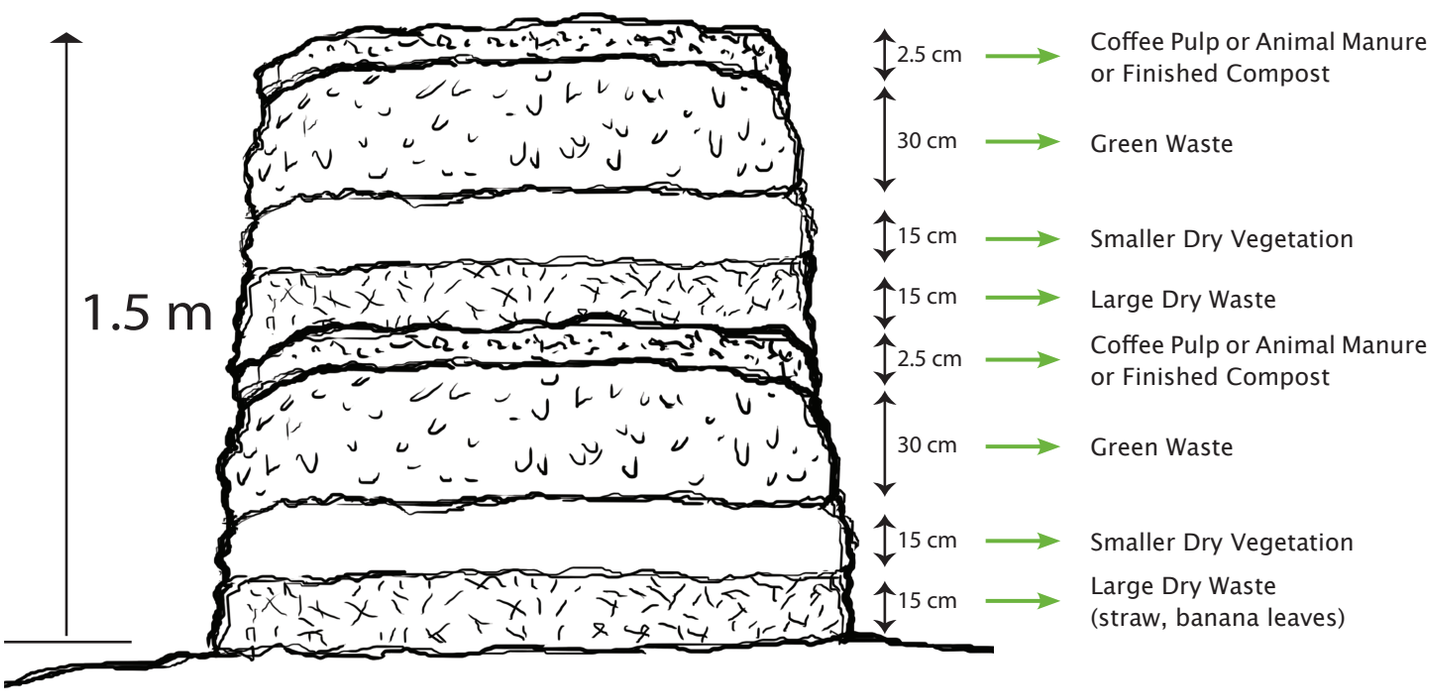
Sieving

2 Clear land of 1.5x1.5m. Set aside similar sized space for turning of organic material.

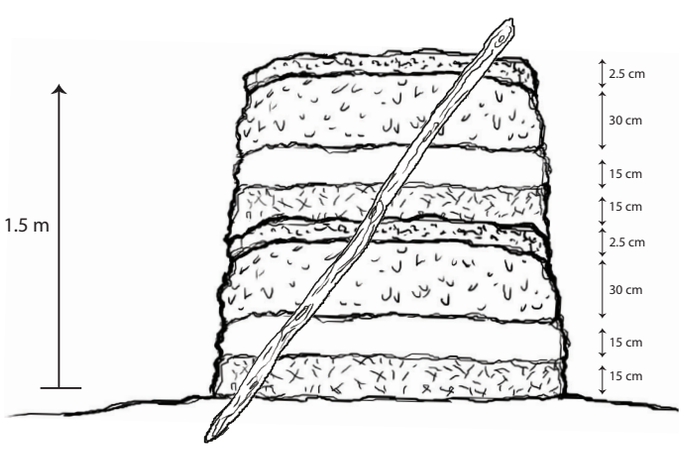


3 Make layers of organic waste as follows:

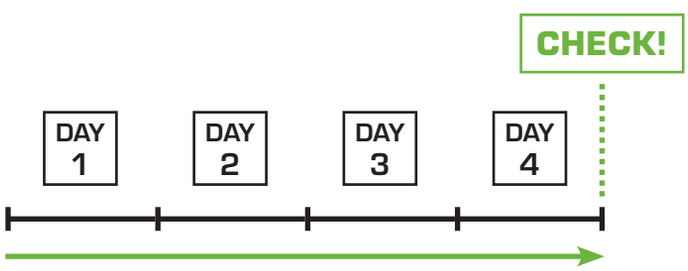
i. Spread larger dry waste up to a thickness of 15cm.
ii. Sprinkle water to moisten the material.
iii. Add another 15cm layer of smaller dry vegetation (chop/shred if necessary).
iv. Sprinkle water to moisten the material.
v. Add layer of 30cm of green waste.
vi. Sprinkle water to moisten material.
vii. Repeat whole layering process until the pile is about 1.5m high.



4 Insert long sharpened stick diagonally to the centre of pile and leave the process to start.



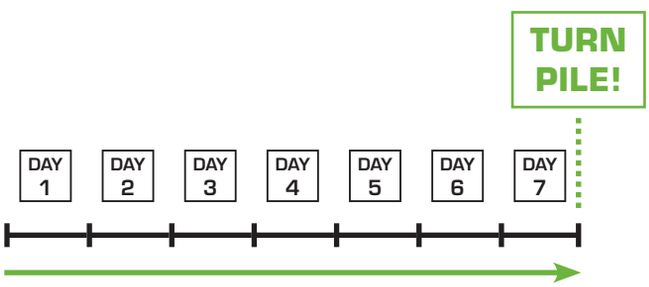
5 Check pile every 3-4 days.

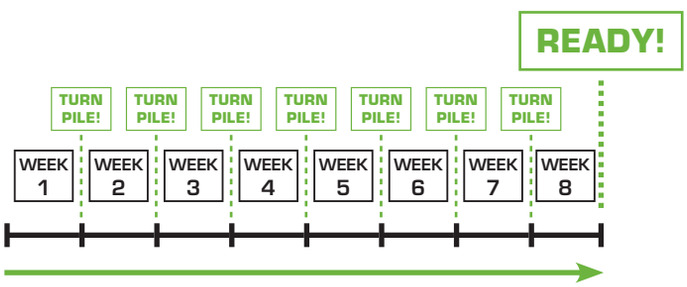


*if the stick is hot, the process is going well. If the stick is not hot, water and air flow should be altered. If the stick shows signs of a white substance, add more water.

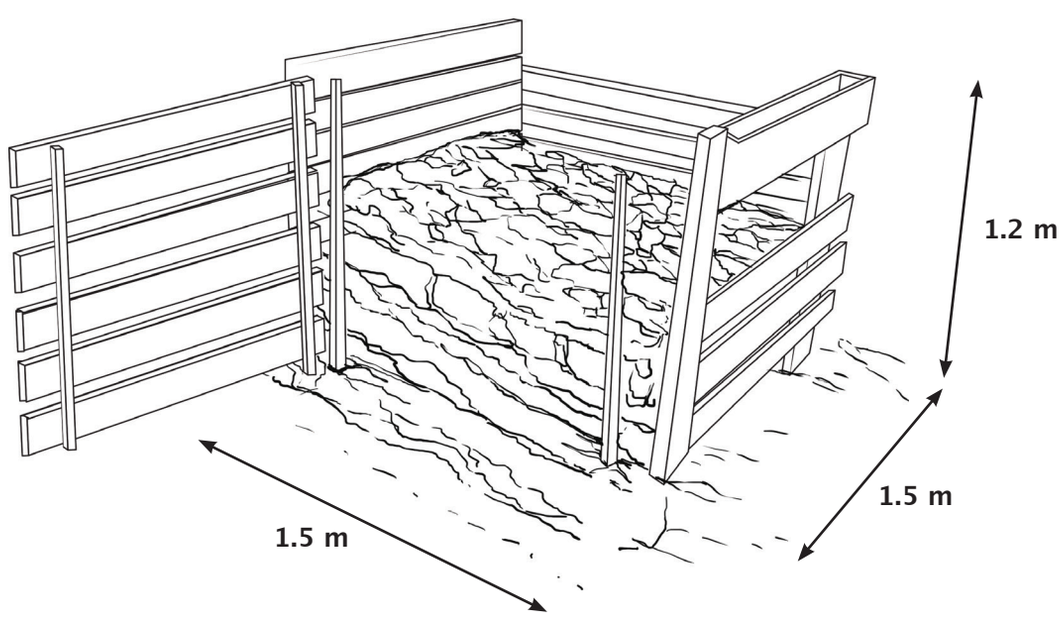
6 Turn pile on weekly basis to increase air and improve quality of compost.

7 In 6-8 weeks impurities are removed and the compost is ready for briquette production.





This whole process can also be conducted in a plastic or wooden box of 1.5x1.5m (height of 1.2m). An additional box of similar dimensions would then be required for turning the material. Compost boxes must be properly constructed with sturdy walls. They must be well maintained and covered to stop the spread of disease and vermin.



Composting box

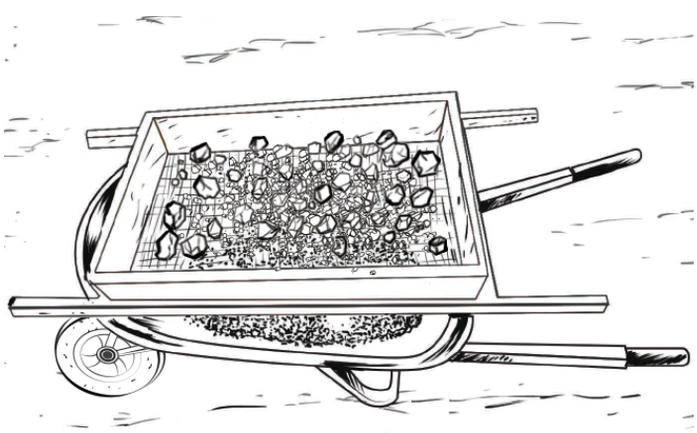
SECTION 4: PRODUCING BRIQUETTES

Sorting, Sieving, and Grinding Charcoal Dust and Compost

Impurities must be removed from raw materials to prevent briquettes smoking too much. This can be done by hand for larger particles or by sieving.

Option 1: Sieve made from a sack

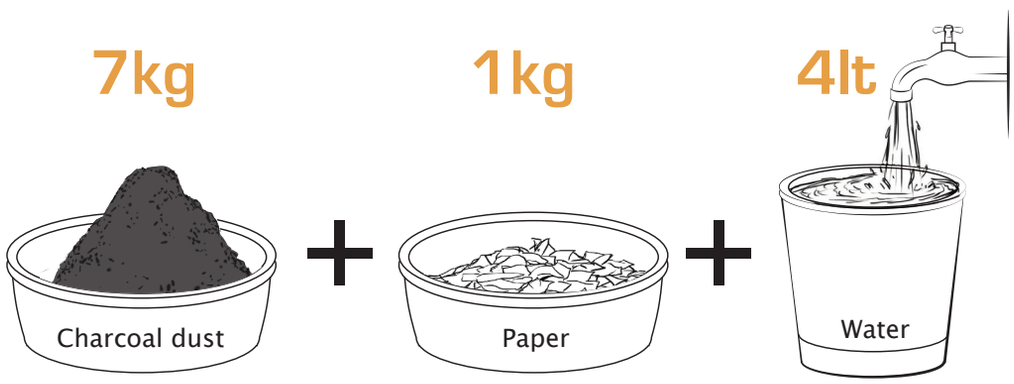
Option 2: Sieve made from wood and wire mesh



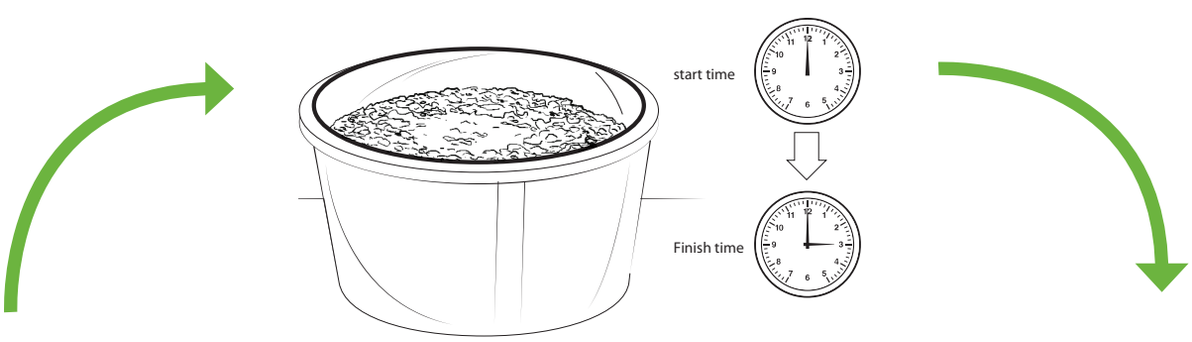
Coarse particles can also be used for cooking or ground into finer dust.

Briquette Production Process

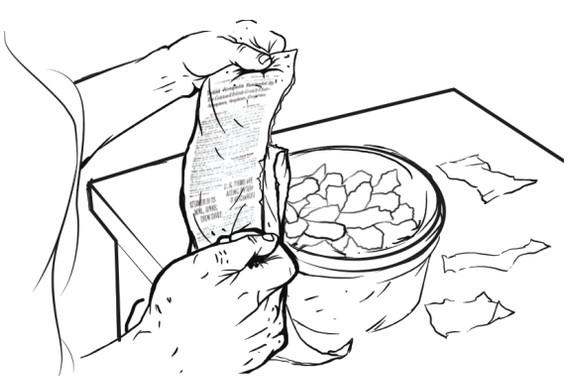
Charcoal dust + paper + water



2 Soak shredded paper in water for three hours. Rub paper and water mixture between hands so that it becomes sticky.

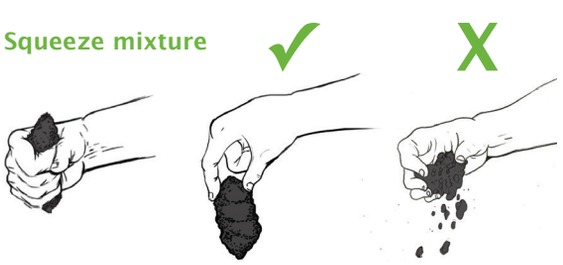


1 Shred paper.

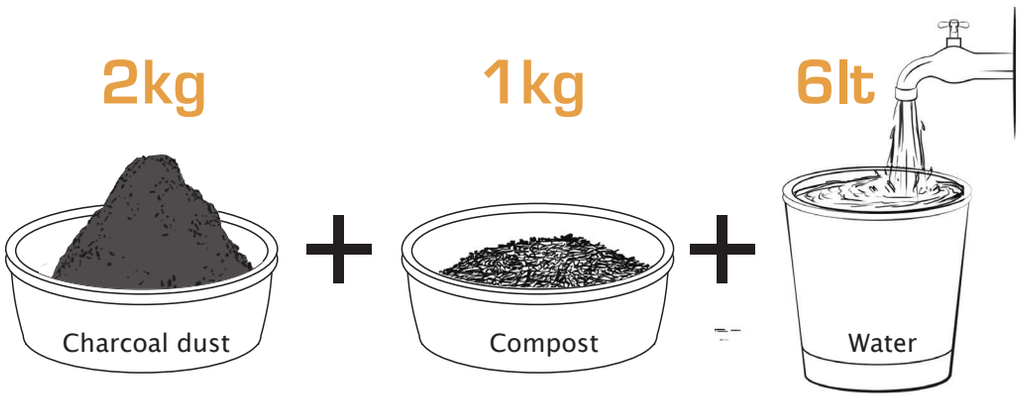


3 Add charcoal dust to bucket of soaked paper and mix well. Add water as required.

4 Check mixture.



Charcoal dust + compost + water



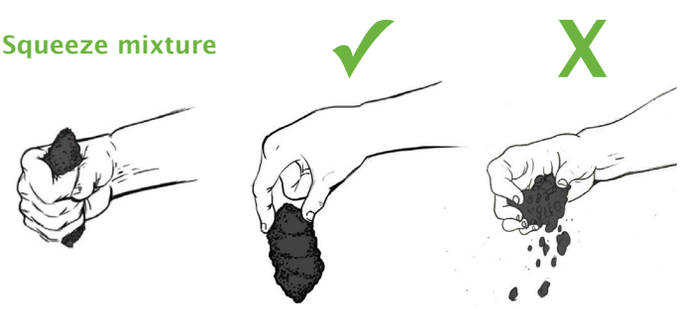
1 Mix charcoal dust, water and compost.

In a bucket or basin

On the floor

2 Check mixture.

Squeeze mixture

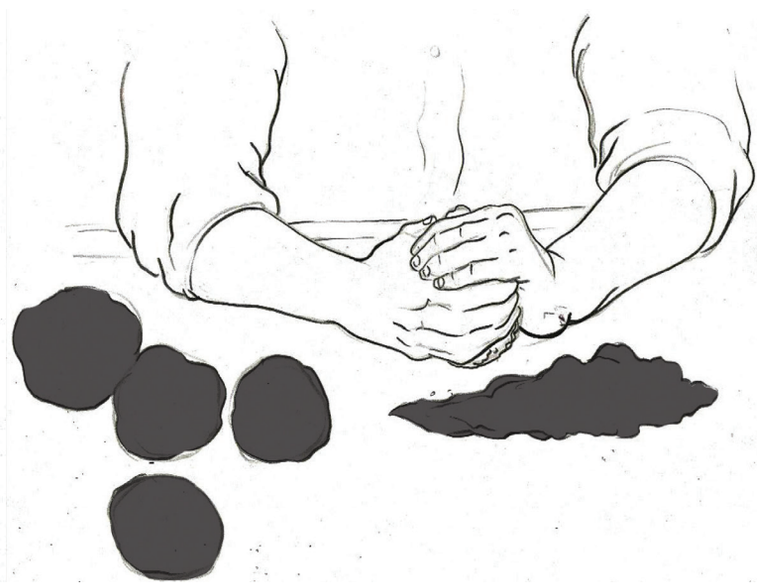


Add more compost!

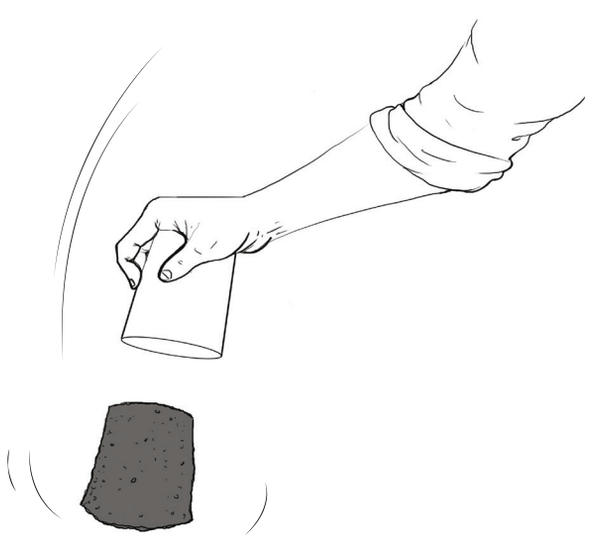
Pressing Briquettes

Briquettes can be pressed by hand or using recycled cans/plastic pots.

Pressing by hand:

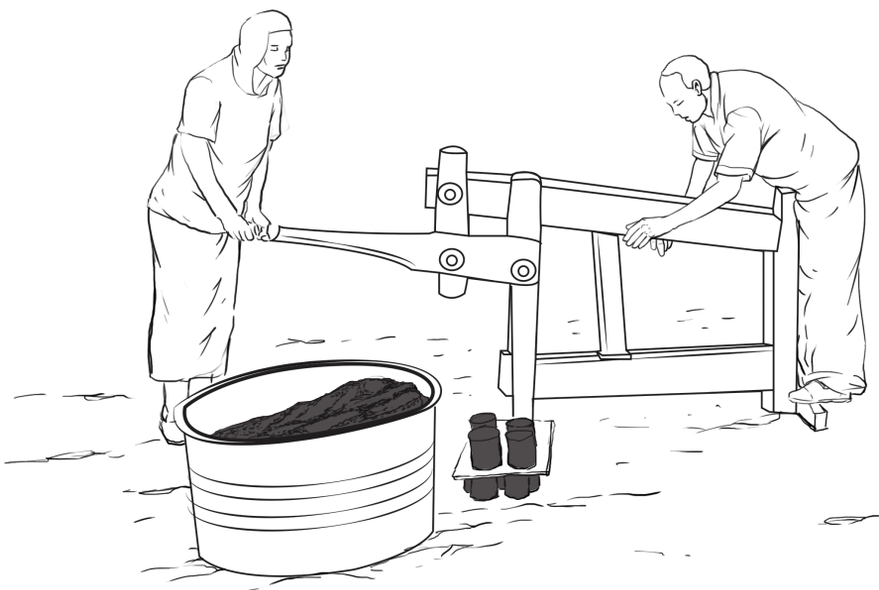


Pressing by using recycled cans/plastic pots:

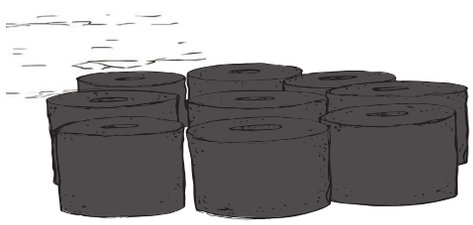


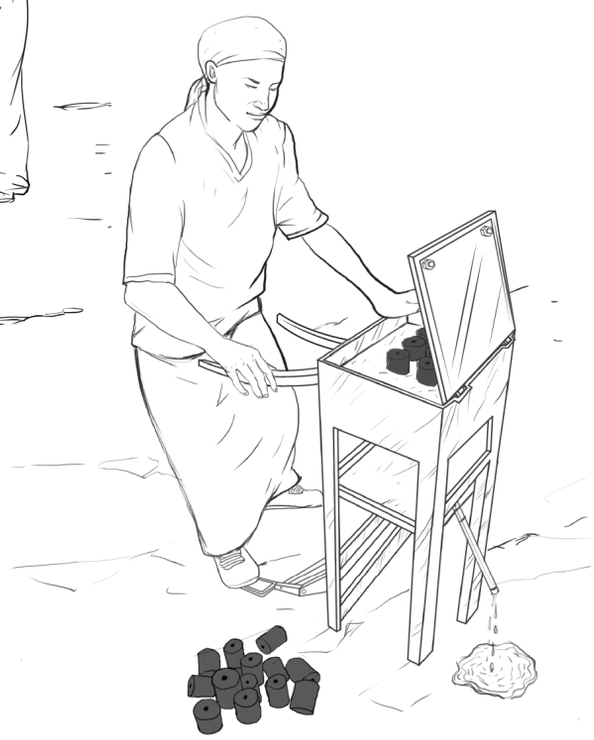
2 hours = 100-300 pieces

A mechanised press can also be used if available.



Wooden press



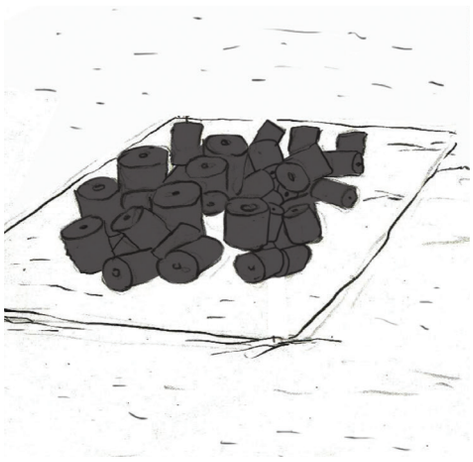


Metal press

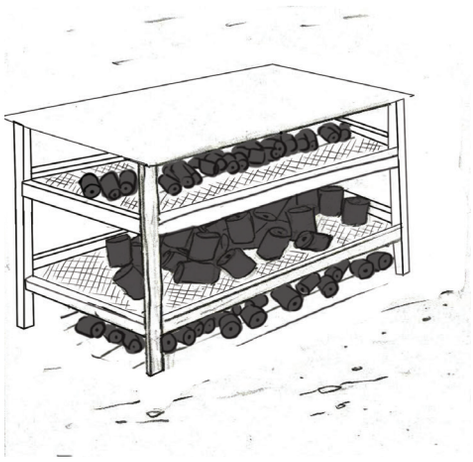
2 hours = 100 pieces

Drying Briquettes

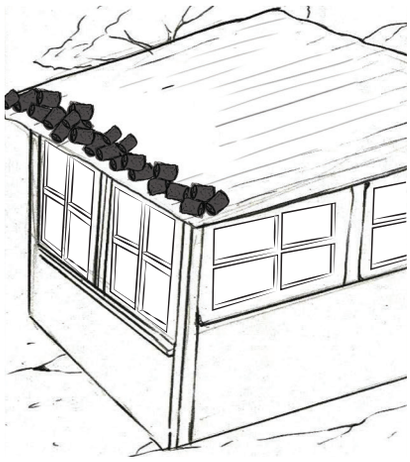
After pressing briquettes must be moved to the drying area.



A shady area on the ground



A drying rack

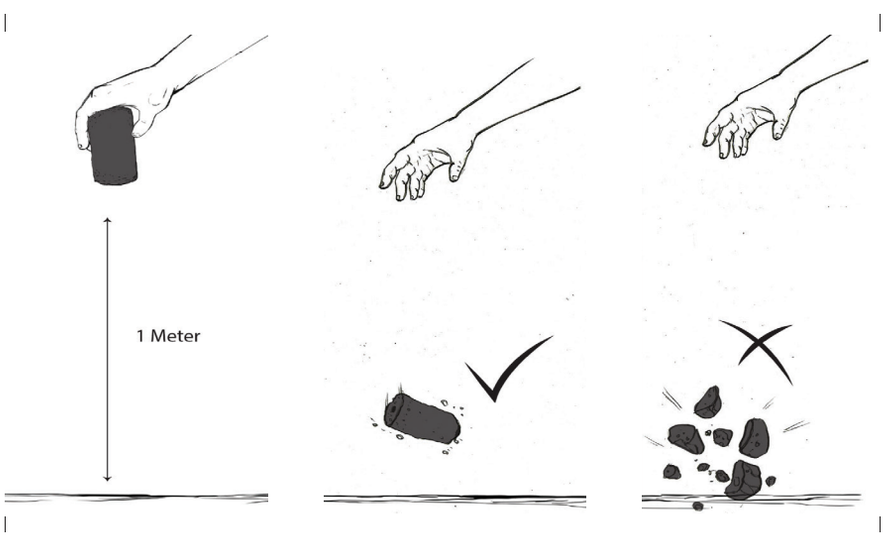


A shady rooftop

> ! *Drying takes between 1 to 4 days depending on weather, size of briquette and raw materials.*

> ! *• Well dried charcoal briquettes feel dry to the hand.*
> *• Briquettes must be dried in the shade to avoid cracking.*
> *• If no shade is available briquettes can be covered with a plastic sheet.*

Testing Durability of Briquettes

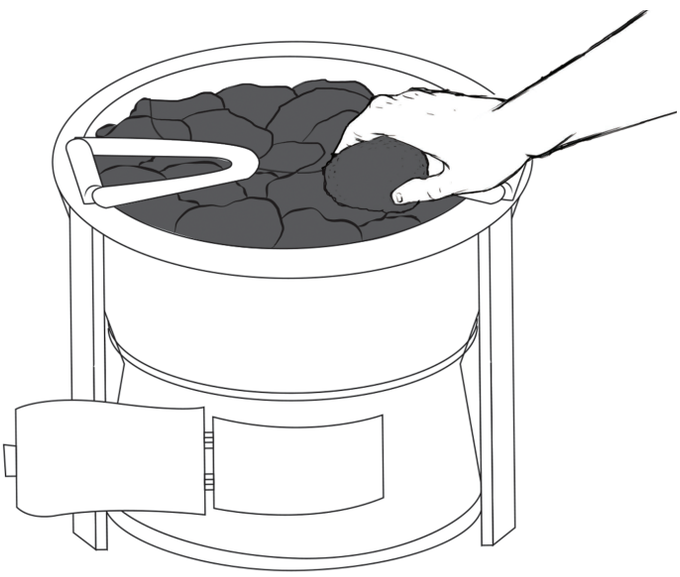


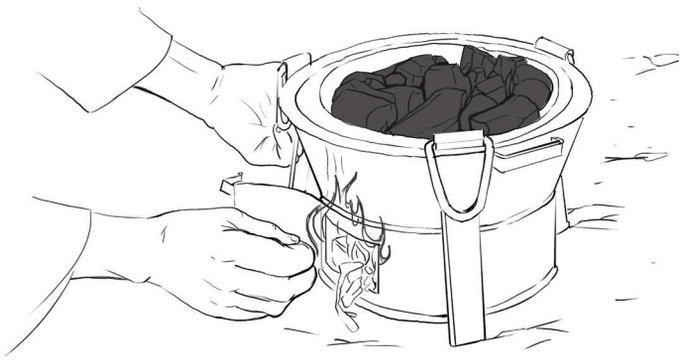
SECTION 5: USING BRIQUETTES FOR COOKING

Use of Charcoal Briquettes for Cooking

Charcoal briquettes are used in cook stoves. They can be used whole or broken into smaller pieces but must fit well into the cookstove available.

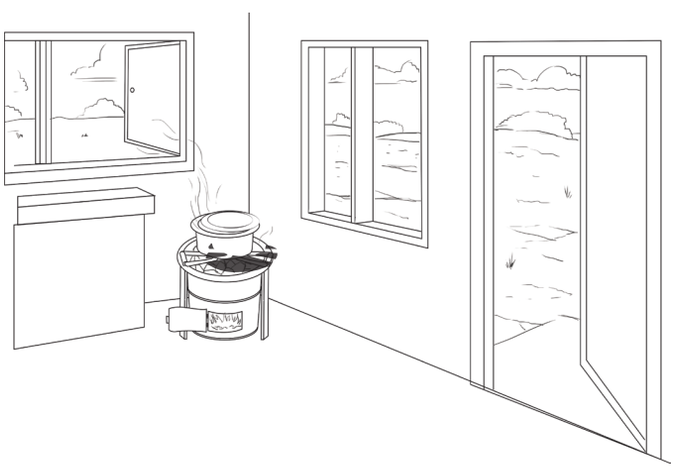
Note: Breaking briquettes into small pieces reduces their burning period.





DO:

- *Leave stove for 10 minutes to catch fire and stop smoking before moving stove inside.*
- *Use in a well ventilated space.*



DO NOT use:

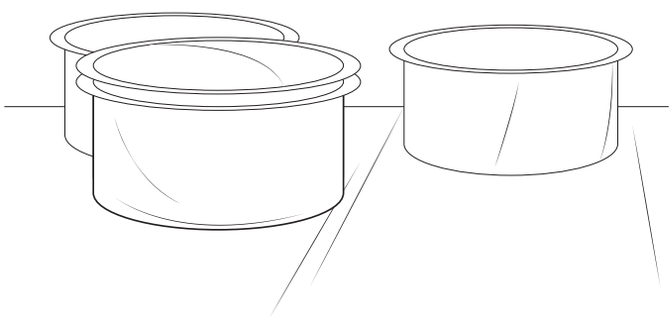
- *Wet briquettes'*
- *Kerosene to light a cook stove*
- *Un-carbonized organic waste*
- *Wet compost*

Group members use briquettes at home for 2 weeks to be familiar with the way they perform.

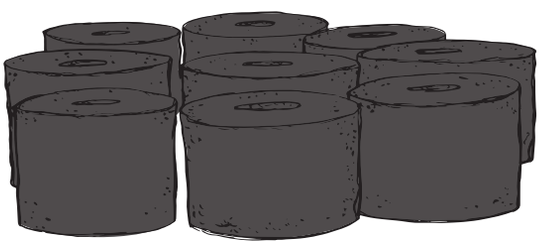
Participatory Cooking Demonstration

Items needed for the cooking efficiency demonstration:

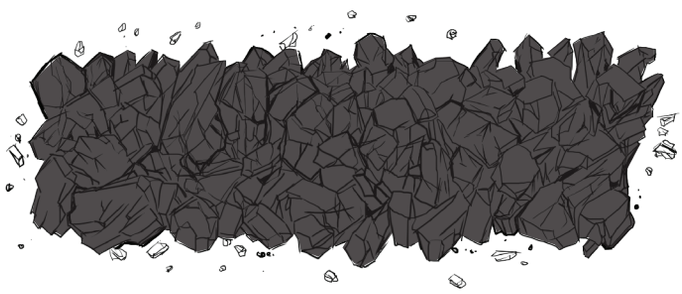
Pre-prepared ingredients for cooking local meal



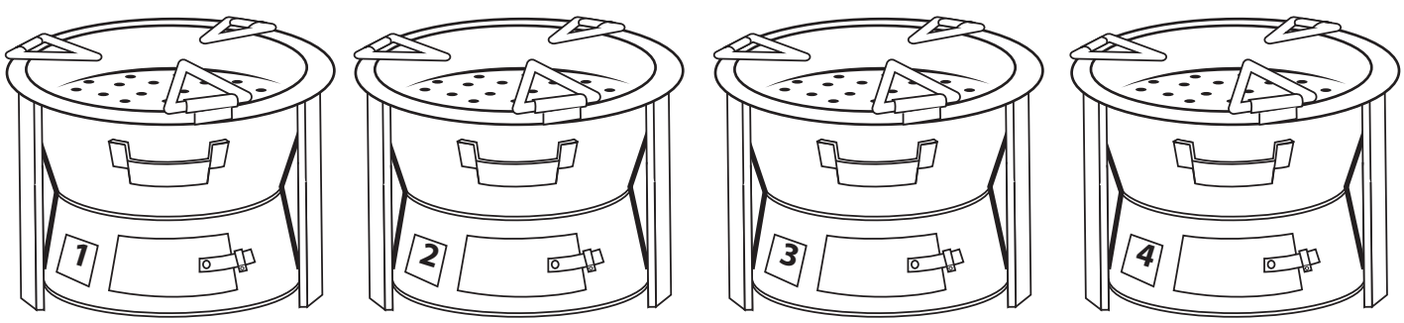
4 clean cooking pots



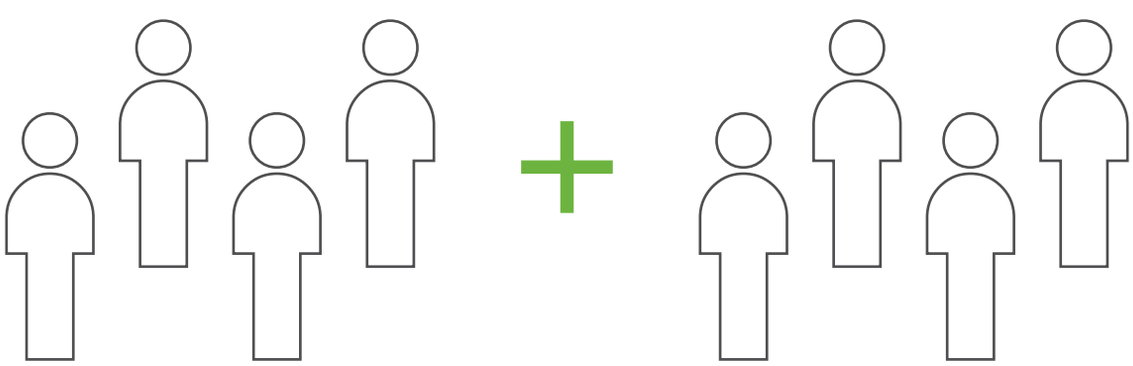
Well dried charcoal briquettes



Lump charcoal



4 cook stoves

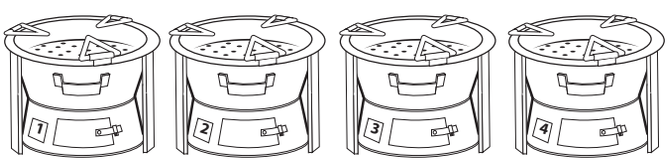


4 community members to light 4 stoves and 4 community members to monitor cooking process

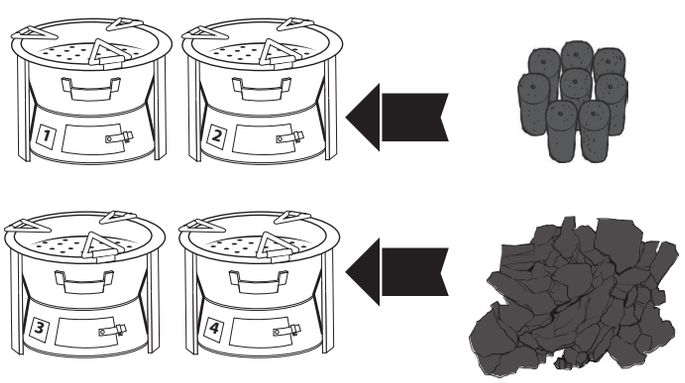
Conducting a cooking demonstration:

1 Select 4 community members to oversee cooking and another 4 to ignite cook stoves.

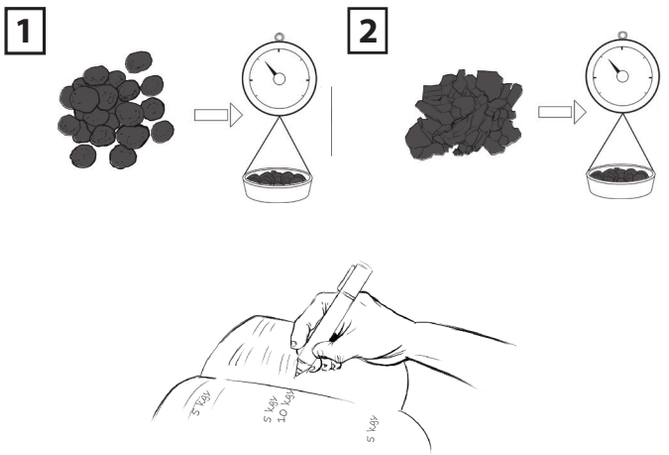
2 Label cook stoves 1–4.



3 Fill cook stoves 1 and 2 with briquettes and cook stoves 3 and 4 with charcoal.



4 Weigh fuel in each stove and record amount.



5 4 community members light 1 cook stove each and record 1) start time, 2) igniting time, 3) cooking time.

6 Community group serves food to local communities and advertise cooking times of each stove. Show soot at bottom of pot.

SECTION 6: BUSINESS DEVELOPMENT

Packaging and Pricing

Price of charcoal briquettes is normally low and is based on local costs and target customer group.

Briquettes can be packaged in the following ways:

Costumers bring their own bags or containers

Individual pieces

In tins,metal buckets

In sacks or bags

Business Plan

During the training of community groups a charcoal briquette business plan with the following contents should be drawn:

- Objectives,
- Types of briquettes to be produced,
- Sources of raw materials,
- Potential customers,
- Location for production and for sale and exposure,
- How the business will be run describing production procedures, packaging, pricing depending on market and location, selling points, types of cook stoves,
- A strategy for awareness raising campaigns such as through cooking demonstration described earlier and media targeting different customer types,
- A budget on costs and targeted profit and time period.

Group Governance and Leadership

Before forming a proper working group certain decisions need to be made:

- What is our group's name, address and other contacts?
- What are our mission, vision, goal and objectives for the charcoal briquette project?
- What are our group values?
- What by-laws (rules and regulations) should govern our relationships as members, our work as a group including sharing roles and benefit and how to deal with members who fail to honour their obligations?
- How to conduct meetings?
- Leadership election criteria for each office e.g. education, experience.

Group by-laws, roles and responsibilities of group members, should be discussed and put into writing during training. Some possible roles of group management committee are indicated in the box below.

- ***Chairperson and vice:*** *Chair all meetings, ensure secretary gives notice for meetings, offer guidance on direction on working of the committee, ensure groups goals are met and ensure group adheres to set bylaws. Ensure group maintain tools and equipment. Vice chairperson acts as chairperson during the absence of chairperson*
- ***Secretary and vice:*** *Issue notice of meetings, identify physical and venue for meetings, take minutes/notes and prepare report of meetings, avail meeting reports to members, ensure group members keep records which she/he safe guards. Vice secretary acts as secretary during the absence of secretary*
- ***Treasurer, financial manager, accountant:*** *Keep records of account, plans and control finance, safekeeping of group funds*
- ***Coordinator:*** *Coordinates group activities*

It is important for members to carry out their own role diligently and understand each other's role in the group. Group members should sign an agreement to adhere to by-laws and conduct their role to the best ability.

Leaders should be decided by all group members in an inclusive and transparent manner. The selection criteria and methods should be decided by all members and put into writing in the group's bylaws.

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CHARCOAL BRIQUETTE PRODUCTION

A Practical Training Manual

This manual is part of the EU funded project 'Sustainable Employment Creation and Improved Livelihoods for Vulnerable Urban Communities in Mogadishu' (SECIL) implemented by UN-Habitat in partnership with the Benadir Regional Administration (BRA), CESVI and Human Relief Foundation (HRF). It serves as a practical guide to entrepreneurs and community groups interested in the local production of charcoal briquettes in Mogadishu. It provides the relevant information to be able to produce this low-cost fuel for household and commercial use.

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