IMPROVED STOVES

What is this Action Sheet about?

If you are looking for ways to use less fuel and make less smoke when cooking, at home, at school or at the workplace, this Action Sheet is here to tell you about improved stoves, which aim to do just that.

What is an improved stove?

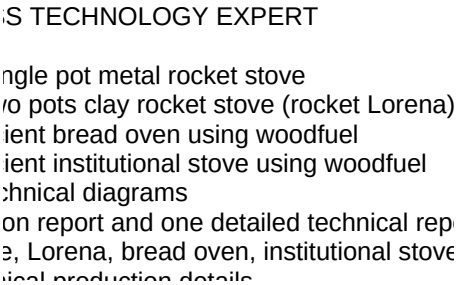
An improved stove is a cooking stove which has been especially/specifically designed to use less fuel, cook food more quickly, and produce less smoke. One example of an improved stove is the Upesi Stove found in East Africa. This stove uses half as much fuel and cooks food more quickly, but it still produces some smoke. The Rocket Stove is another amazing design that produces even less smoke. There may be no smoke without fire, but there can be fire with less smoke!

What are the benefits of cooking with an improved stove?

With an improved stove, your kitchen will be healthier, more comfortable and easier to keep clean. Using less fuel can save you time and money, and reduce impacts of fuel collection on the local environment. Switching from charcoal to wood from a sustainable source can reduce deforestation. A well-designed stove will also help cook food and boil water more quickly.

1.

2.



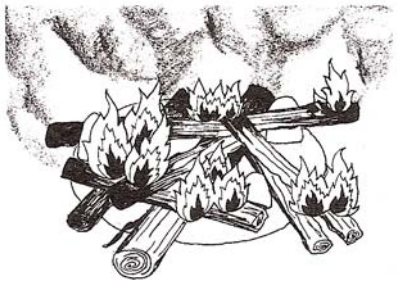
3.

1. A rocket stove in use in Uganda; 2. Amount of wood needed to cook a pot of unsoaked beans without a rocket stove; 3. Amount of wood needed to cook a pot of unsoaked beans with a rocket stove (Images: Peter Scott, GTZ-EAP project report

What are the principles behind improved stove design?

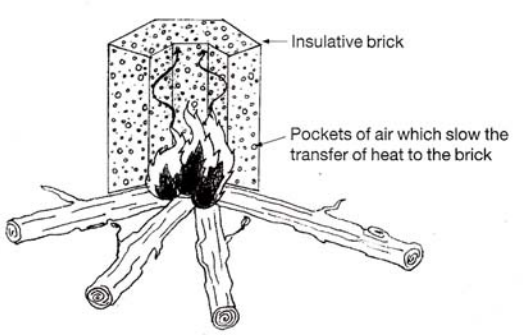
Stove designers learnt four important design principles from people who cook on traditional three-stone fires. Expert cooks know exactly how to set the fire to burn hot enough to avoid making a lot of smoke, how to feed wood to the fire to avoid using more fuel than necessary and how to place the pot to get the most heat from the fire. Stove designers use these lessons to design better stoves, creating easier, safer and faster ways to cook with fire.

LESSON 1. BURN FIERCE Inside a fire, pieces of wood get hot, and release gases. These gases catch fire and burn, releasing heat energy used to cook your food. Smoke is un-burnt gas and soot particles released from the wood. The hotter the fire is, the less smoke will be produced.



A smoky fire full of smouldering wood means that the fire is not hot enough to burn the gases being released from the wood.

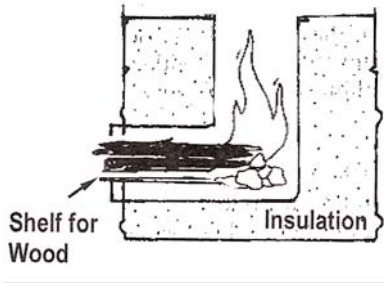
Insulation



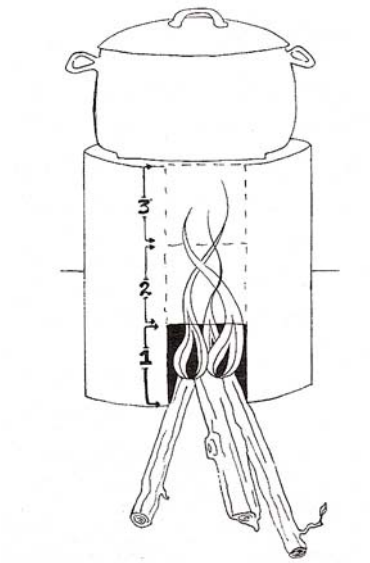
Light insulating material around the fire helps it to stay hot

Grate

Having a grate under the fire allows air to flow in underneath. Gaps between the pieces of wood help air to flow through. Air passing above the sticks is not as helpful because it cools the fire.

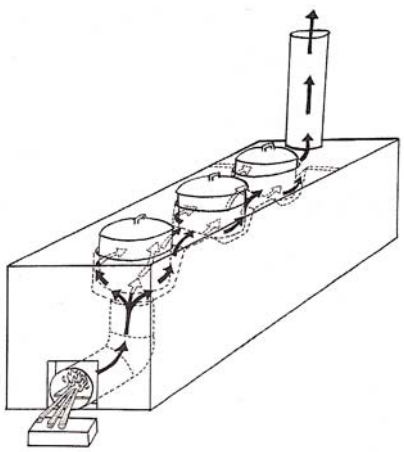


Chimney



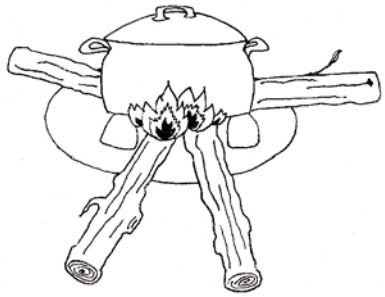
A short chimney above the fire forms a 'combustion chamber' where more gases can burn in the flames

Airflow through a multipot stove

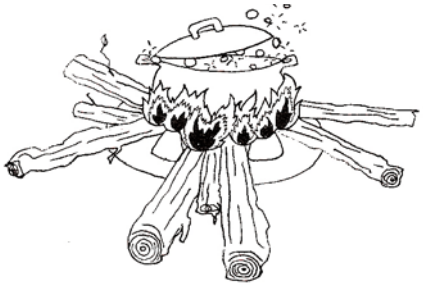


Just as blowing gently on a candle will make it burn brighter, but blowing too hard will put it out, a fire needs just the right amount of air flowing through to help it burn fiercely. The opening into the fire and the spaces in the stove through which hot air flows need to be sized to allow enough air through. It works best if all the airflow gaps have the same cross-sectional area.

LESSON 2. BURN WISE A fire that burns only the tips of wood will burn hotter and make less smoke. It will also use much less fuel. The temperature of the fire depends on how many tips of wood are burning. Well-designed stoves help users meter the amount of fuel they use, feeding in only as much as they need to cook their food.

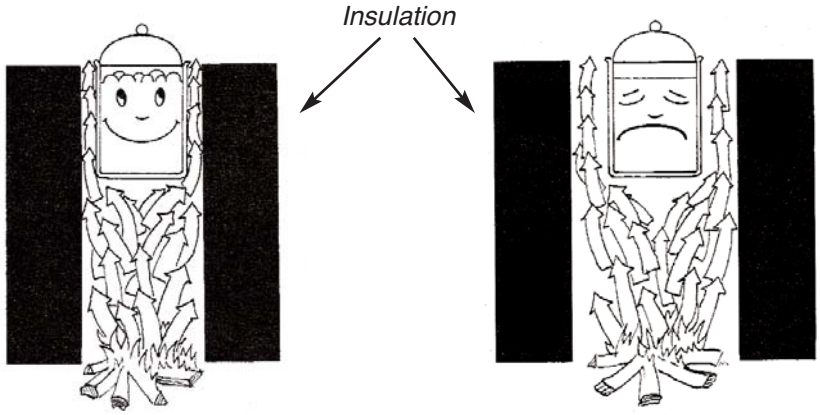


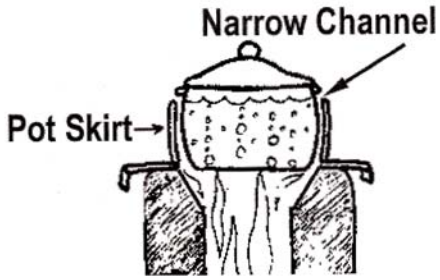
Burn a few tips for a low heat



Burn more tips for high heat

LESSON 3. COOK CLEVER Cooks want their fires to get to work quickly, and they don't want to waste fuel to produce energy that doesn't help cook the food. Stoves can be designed to deliver energy straight to the cooking pot. Insulating the path of heat flow to the pot and forcing hot flue gases to pass right by the pot gives maximum energy input where it is needed.



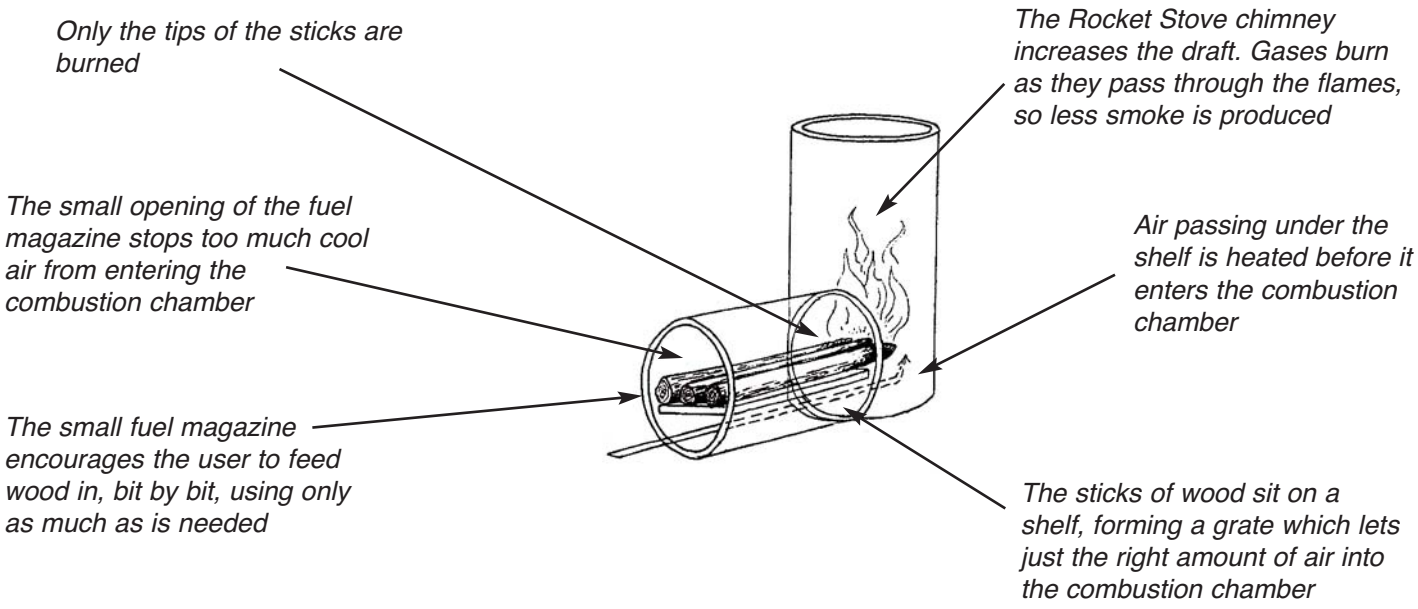


Upesi stove liners made of clay (Image: Sarah Watson, PACE)

LESSON 4 GO LOCAL Stove designers work with cooks to make sure stoves work well with local cooking methods. Local manufacturers help stove designers find ways to use easily available materials, so that improved stoves can be sold as cheaply as possible. For example, the Kenyan Upesi stove is made of locally available clay.

How does the Rocket Stove use these design principles?

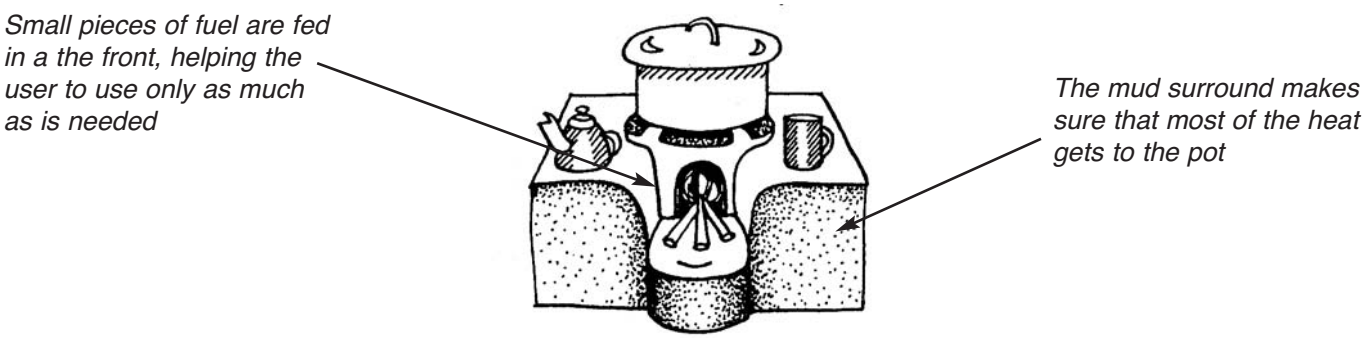
The household Rocket Stove is a small stove made of metal and ceramics that burns small pieces of wood or other plant material at a very high temperature. This diagram shows how a rocket stove works, and how it burns wood efficiently without producing smoke.



How a Rocket Stove works (Image: Aprovecho)

What about Upesi stove design?

The Upesi stove is made of a pottery cylinder (known as the stove liner), built into a mud surround in the kitchen. It can be used to burn wood or farm waste such as maize stalks and animal dung. Upesi means 'fast' in Swahili, because the stove not only cuts fuel use, it also cooks food faster.



The Upesi Stove was developed in the mid-1980s by the Kenyan Ministry of Energy, the German government agency GTZ and the Kenyan national women's organisation Maendeleo ya Wanawake, and has been growing in popularity ever since.

In Western Kenya, Practical Action (formerly known as ITDG) trained 13 women's groups to manufacture and market the stoves. Women potters now produce more than 10,000 stoves every year, earning extra money. With training in business management, the women's groups developed a network of installers and retailers to sell the stoves to households.

How can we get an improved stove?

Find out locally whether there are any improved stoves for sale, and whether there are any credit schemes being developed to help people buy them. Working with stove design engineers, schools and businesses can also use the design principles to invent larger improved stoves to save fuel and improve the health of their workers.

Is there good clay where you live? Is there a tradition of pottery? If so, ceramic stoves, adapted to local needs, could have potential in your area. Seek out local knowledge and expertise. If you plan to develop, build and/or sell improved stoves, contacts listed in the directory may help you to find stove engineers and business management training.

What else can we do to save fuel and make kitchen air healthier?

Using an improved stove to bring your cooking pot to the boil, and then placing it in a **fireless haybox cooker** to finish cooking can save enormous amounts of fuel! (See Action Sheet 59).

Even though improved stoves produce less smoke, they should include a flue leading out through the roof wherever possible. If not, then it is a good idea to put in a smoke hood, and vents in the eaves space (see Action Sheet 63), or use the stove outside. More ways to reduce indoor air pollution can be found on Action Sheet 57.

ACKNOWLEDGEMENTS: This Action Sheet was written by Nancy Gladstone and reviewed by Dean Still at the Aprovecho Research Centre. It is based on information from the following documents: Design Principles for Wood-burning Cook Stoves by Aprovecho Research Centre, Shell Foundation, Partnership for Clean Indoor Air www.repp.org/discussiongroups/resources/stoves/#Dean_Still; Introduction of Rocket Stove Cooking Devices in Uganda by Peter Scott, Aprovecho/GTZ EAP Consultant; How to make an Upesi Stove – Guidelines for small businesses by Vivienne Abbott, Clare Heyting, Rose Akinyi ISBN (9966-9606-0-0); Illustrations were reproduced with permission from the above.

FOR MORE INFORMATION

Contacts

Practical Action (formerly known as ITDG) www.practicalaction.org
GTZ Household Energy Projects PRO-BEC www.probec.org Marlis.Kees@gtz.de
HEDON Household Energy Network http://hedon.info
SPARKNET Knowledge Network on Energy for Low Income Households in Southern and Eastern Africa - http://sparknet.info
Aprovecho - The original rocket stove was designed by Larry Winiarski at Aprovecho in Mexico - www.aprovecho.net/

ROCKET STOVE BUILDERS

In Tanzania:

Afaksad Ndilanha National Coordinator of Probec TZ: gtz-tanzania@gtz.de
Leo Rwey: leo_rwey@yahoo.com

In Uganda

GTZEAP: jkute@yahoo.com; lmugerwa@yahoo.com
Kawere Muhammad: ucodea@yahoo.co.uk

BOOKS

Appropriate Mud Stoves in East Africa by Stephen Gitonga, 1997, IT Kenya (Available from www.developmentbookshop.com)

The Kenya Ceramic Jiko - A manual for stovemakers by Hugh Allen, ITDG Publishing, 1991
(Available from www.developmentbookshop.com)