

8. Making soap

Soap is important in preventing the spread of disease by helping people keep themselves, their clothes and their surroundings clean. In some places, soap is unavailable or expensive. This Technical Brief gives some practical guidelines on a cheap, easy way to make soap on a small scale, using ingredients which are available locally.

The principle

Making soap involves a chemical decomposition of fats and oils into their constituent parts, namely: fatty acids and glycerol. The fatty acids combine with an alkali, usually caustic soda, and the glycerol remains free. In the 'cold' process, which will be described in this Technical Brief, oil is treated with a definite amount of alkali. The aim is to complete the reaction, which generates its own heat, without any free alkali being left in the soap.

Basic, recipe

To make 4kg of soap:

- Oil or fat - 3 litres / 2.75kg /13 cups
- Alkali-370g of caustic soda crystals made up as directed on the container, or lye solution, made as described overleaf.
- Water - 1.2 litres / 5 cups

Choosing oils and fats

Different oils and fats bring their own specific properties to the soap, and the best mixture can only be arrived at by experimentation. Here are some guidelines, however.

*The only difference between an oil and a fat is that oils are liquid and fats are solid at normal temperatures.

The oils and fats used in soap-making fall into three categories as shown in the table below:

Category	Composition	Type of Soap	Ratio of caustic soda: oil
A: Lauric oils eg. Coconut oil Palm kernel oil	Lauric acid is the major fatty acid	Hard soap with a fast-forming lather	1:6
B: Liquid oils eg. olive oil, corn oil, sunflower seed oil, fish oil, groundnut oil, soya bean oil, cottonseed oil	Unsaturated fatty acids	Soap lathers freely with good detergent properties, but cannot make hard soap without being mixed with other categories	1:8
C: Semi-solid fats eg. palm oil, castor oil, animal tallow	Large quantities of palmitic and stearic acids	Soap is slow to lather, but lather is more stable than that from Category A oils	1:8



An example of a suitable blend is 24 parts Category A oil, 24 parts Category B oil, 38 parts Category C fat, plus 12 parts caustic soda dissolved in 32 parts water.

*All proportions are by weight.

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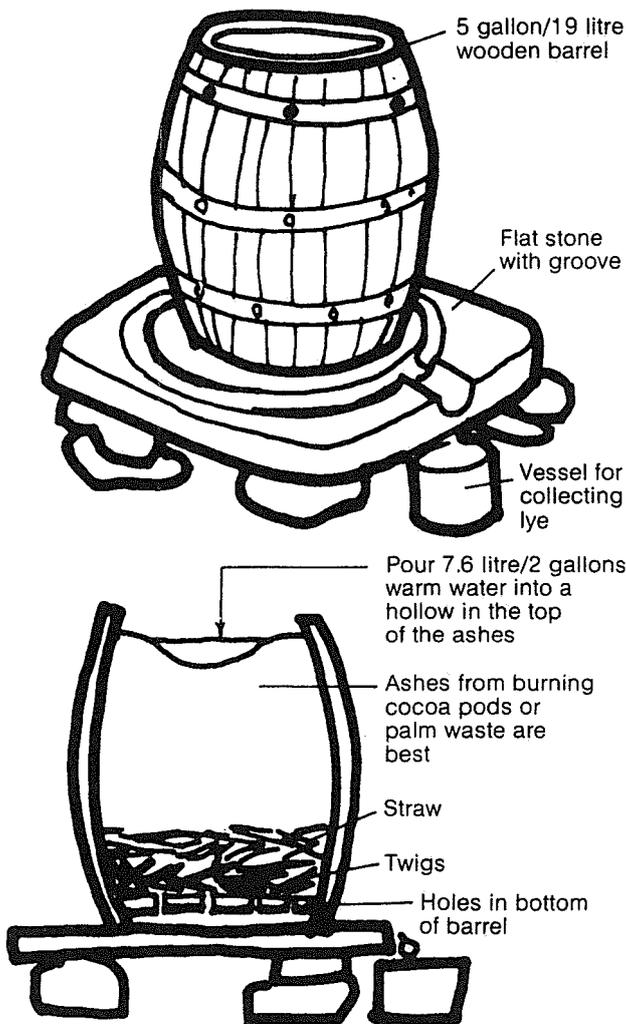
Alkalis

Caustic soda is the most commonly-used alkali, but if it is too expensive or not available, caustic potash can be used. Caustic soda produces a hard soap, whereas caustic potash makes a softer soap which is more soluble in water.

To make caustic potash

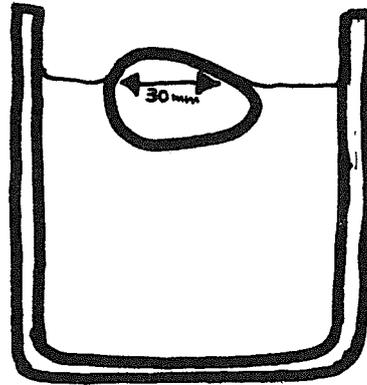
A solution of caustic potash (also known as 'lye water') can be leached with water from white plant, leaf or wood ashes. The best ashes to use are those from burning hard woods, and ashes from seaweed can also be used. Do not use ashes from burning paper, cloth or refuse.

Slowly add 7.6 litres of water to 19 litres of ashes in the apparatus shown below. After about an hour, brown lye water will start to drip from the bottom of the bucket and can be collected. When no more lye drips out, put the lye water through the ashes again to increase its strength. These quantities will make about 1.8 litres of lye.



You will need 4.53 litres of lye to react with your 2.75kg of fat. It will take 48 litres of ashes to make this, according to one source.

The lye is the right strength for soap-making when it will either support a fresh egg or when it will coat, but not eat away, a chicken feather dipped into it. Concentrate the lye by boiling it, if necessary.

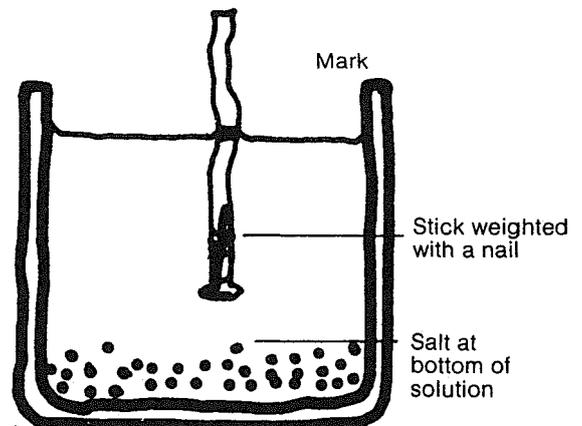


The lye is the right strength when it will lift part of the egg above its surface: an oval about 30mm long

Strength of alkali

Another way of making the alkali the right strength is to make sure it is the same density as a saturated salt solution, as follows. This is equivalent to 18 per cent of caustic soda by weight (relative density 1.37).

- Dissolve a fair amount of kitchen salt in water, stir well and let it stand until the next day
- If no salt is left at the bottom, add more, stirring, until there is some left at the bottom. The solution is now saturated.
- To make a measure for the density, take a small stick of solid wood, and weight the end (by tying on a pebble or a small piece of iron). Put the weighted stick into the salt solution. Adjust the weight so that it floats with a small part of the stick protruding from the salt solution. Mark the stick where it touches the surface



If you then put the stick in the alkali, it will float with the mark submerged if the lye is too weak. If it is too strong, the mark will be above the surface of the liquid. Adjust the strength by boiling to concentrate it or adding water, stirring well, until the mark is exactly at the surface.

Water

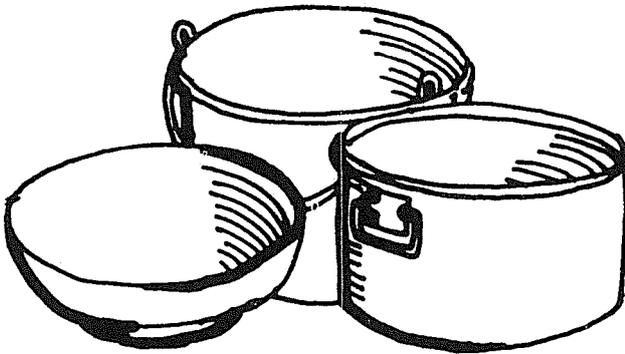
Water needs to be 'soft' to make good soap, so rainwater is a good source. 'Hard' water contains dissolved mineral salts which prevent soap lathering and hinder cleansing.

To make water soft, add 15ml (1 teaspoonful) of lye to each 3.8 litres (1 gallon). Stir and leave to stand for several days, to allow the sediment which has been precipitated to sink to the bottom. Then pour off the softened water.

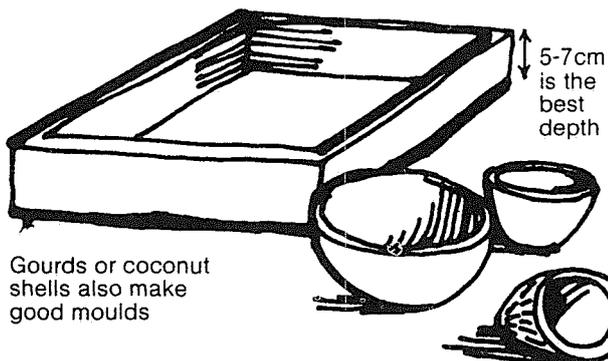
Equipment

To make soap, you will need:

- Two large bowls or buckets. Soap-making equipment should never be made from aluminium, as the alkali will corrode it

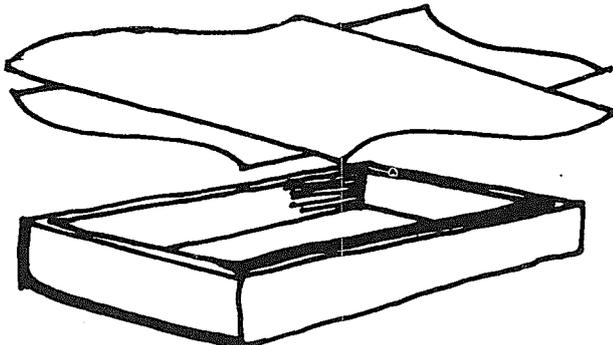


- Measuring cups
- Wooden or enamel spoons or smooth sticks for stirring
- Moulds: water-tight containers which can be made from wood, plastic, cardboard or waxed paper



Gourds or coconut shells also make good moulds

- Cloth or waxed paper to line the moulds, so that the soap can be removed easily



Make the lining of two strips: one longer than the mould, and the other wider

WARNING: Caustic soda will burn skin and eyes, so try and wear protective gloves while making soap. If you get burnt, wash the skin immediately with cold water and then put citrus juice or vinegar on it to neutralize the alkali.

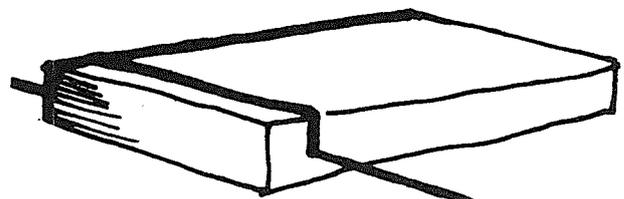
Method

- Add alkali to water, never the other way round. The alkali solution should be at body temperature (37°C). Never put your finger in the solution to test the temperature, or it will burn you, but feel the outside of the container



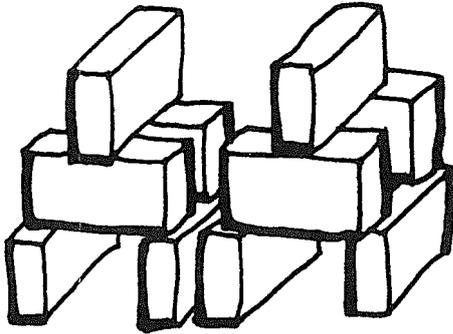
- Melt any solid fat in the oil/fat mixture
- Pour the alkali slowly into the oil/fat mixture, stirring it continuously in one direction only. The mixture needs to be stirred for at least half an hour after all the alkali has been added. The mixture should become thicker, and lines of white particles should follow the spoon as you stir
- Pour the mixture into lined moulds and leave it to set undisturbed for two days in a dry place. If it has obviously not set after two days or grease is visible on the top, leave it a little longer
- When the soap has set, remove it from the moulds and cut into bars

Cut the soap with a knife or wire

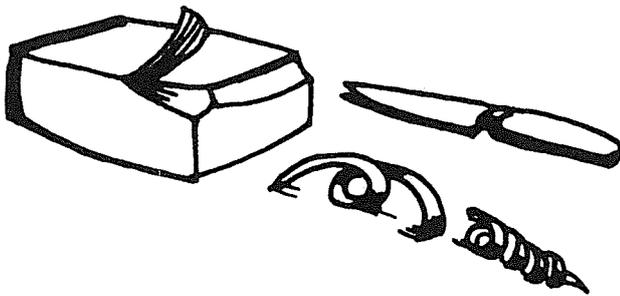


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- Stack the bars on trays and leave them for four to six weeks to allow the chemical reaction to finish completely



- When the soap is finished, it will shave from the bar in curls. Cover the bars of soap to prevent further loss of moisture



Perfume

Perfume can be added at the same stage as the alkali. As well as giving the soap an attractive smell, it can act as a preservative. Perfumes must be resistant to alkali, however. For 4kg of soap, one of the following could be used:

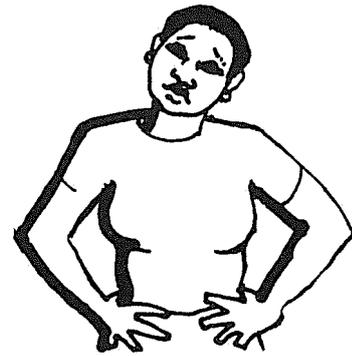
- 4 teaspoons oil of sassafras
- 2 teaspoons of oil of wintergreen or citron ella or lavender
- 1 teaspoon of oil of cloves or lemon

For more information

- Donkor, Peter. *Small-scale soap-making: a handbook*, Intermediate Technology Publications.
- Bertram, S. P. *The preparation of soap*, TOOL, Entrepotdok 68-69a, 1018 AD Amsterdam, The Netherlands. 1976.
- Tropical Development and Research Institute. *Soap manufacture by the cold process*, TDRI, 56-62 Gray's Inn Road, London WC1 X 8LU, UK.
- German Adult Education Association. *Make your own soap: an aid to extension and village workers in Ghana*, African Bureau of the German Adult Education Institute, PO Box 9298, 36 Patrice Lumumba Road, Accra, Ghana.
- VITA *Village Technology Handbook*, 1815 North Lynn Street, Rosslyn, Virginia 22209, USA.

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Illustrations by Frances Stuart



Problems?

If the soap you made was not successful, it may have been because:

- You used the wrong materials
- The fat or oil was rancid or salty
- The alkali was too hot or cold
- The mixture was stirred too fast or not for long enough

Using dirty or rancid fat

Dirty or rancid fat must be cleaned before it can be used for making soap. This can be done by melting it and straining it through a finely woven cloth or by boiling it up with water, leaving it to cool and separating it when set.

