PEANUT PROCESSING

Introduction

Peanuts or groundnuts are a high value crop that can be marketed with little processing but are extremely versatile and can be used in a wide range of products. The oil can be used for cooking, they can be used as a shortening or as a base for confectioneries and they can be used to make peanut butter.

There are two types of groundnut, a bush and a runner. Hybrids of the two varieties have been developed and are commercially available. The pods of the bush variety contain one or two kernels in a thin shell. The runner variety has one to three kernels in a thicker shelled pod. Irrigation techniques consisting of regular watering up to ripening stage and then reduced to avoid wrinkling. Nitrogen fixing nodules are found on the roots although nitrogen and potassium fertilisers are often added to the soil to improve yields.

Harvesting

The groundnut plants are annually harvested by being pulled or dug up. This is usually called ‘lifting’. There are various designs of equipment available to assist in lifting groundnuts. The Industrial Development Centre (IDC) originally developed a groundnut lifter at Maidururi for the savannah area of Northern Nigeria and later adapted for local manufacture for the ITDG (now called Practical Action) project in Magoye in Zambia.

The IDC lifter is an attachment for an EMCOT plough. It is pulled by a draft animal, with two depth wheels and a plough-like bar for lifting up the groundnuts. The Practical Action groundnut lifter is a complete piece of equipment in itself. "A lightweight lifter suitable for groundnuts grown on 75 cm spaced ridges in sandy soils. Suitable for manufacture by village blacksmiths." The minimum equipment required would be a forge, anvil, hammer, tongs, chisel, and punch.

Stripping

This is the process of removing groundnuts in-shell from the haulm after lifting and, usually, drying. This is normally done by hand and is a tedious and time consuming operation. The pods are removed by picking or flailing.

Figure 1: Peanut butter production, Fadzavanhu Enterprises, Zimbabwe established by four housewives. One of them, Memory, is pictured here seen with samples of the final product. Credit: Practical Action
Pests and disease

Groundnuts are attacked by; the Bean leaf roller (Lamprosea indicata), Leafminern (Stornopteryx subsecicella), Long-horned grasshopper (Phaneroptera furcifera), Cotton leafhopper (Empoasca biguttula), Slant-fac grasshopper (Atractomorpha psittacina), June beetles (Leucopholis irrorala), and Tiger moth caterpillar (Dasychira mendosa) amongst others.

Mould (Aspergillus flavous) can attack groundnut, leading to aflatoxin contamination, if the nuts are not dried sufficiently. Aflatoxin in peanuts is a serious problem. The peanuts can become infected either before or after harvest. Once they are infected, there is no way that the aflatoxin can be removed and the peanut becomes dangerous for consumption. If the peanut is free from the disease at harvest, correct drying can prevent later infection. Some aflatoxin infection can be visible to the eye as mould, but in other cases it cannot be seen. Laboratory tests need to be carried out to confirm the presence of aflatoxin. The recommended moisture level should be less than 10 percent.

Blanching is a process that destroys enzymes (biological compounds that are responsible for deterioration and off-flavours in foods after harvest), while retaining the colour and most of the nutritional value. It is a very simple process and basically involves the immersion of the foodstuff in boiling water or steam for a very short time, followed by rapid cooling by plunging in very cold water. To carry out this process at the small scale all that is required is a large tank in which water can be boiled. At a slightly higher level, there is specific blanching equipment available- both water and steam blanchers.

Oil extraction

Oil contains high amounts of energy and fat-soluble vitamins (A, D, E, and K) and essential fatty acids. The oil content of the kernels is between 45% and 55%.

The peanuts are prepared for the oil extraction process by being shelled and cleaned. Oil production requires some type of press with which to extract the oil form the groundnuts and filtering equipment.

Practical Action has developed a simple manual screw press that would be suitable for extracting oil from peanuts, as well as many other agricultural crops. There are quite a number of presses of very similar design, they are simple to make, except for the screw which would have to be machined.

For more information see the Practical Action Technical Brief *Principles of Oil Extraction*.

Peanut butter

The peanuts are first shelled and cleaned. They are then roasted at 425°F (218°C) for 40-60 minutes either a) on trays in an oven, the nuts being turned by hand from time to time or b) in equipment similar to that used for roasting coffee. This small rotary roaster allows each nut to become uniformly roasted.

After roasting the nuts will be well browned and the skins loose. After cooling, it is necessary to remove the skins by gentle brushing, an inspection will allow the manual removal of discoloured and other rejected material.

*Figure 2: Peanut grinding machine. Example of equipment produced in the Practical Action light engineering workshop. ©Practical Action*
A simple winnower to remove the skin from the nuts can be made by allowing the nuts to fall in a gentle stream in front of an electric fan. The heavy nuts will fall straight down while the lighter skin will be blown away.

Traditionally women pounded the nuts between stones, a very time-consuming activity. Now nuts are often ground in a mill that may be powered by hand or with a motor. The type of mill used will depend on the scale of production. The most commonly used mill is an adjustable plate mill. The tighter the distance between the plates the finer the texture of the butter. The milling process may have to be repeated to obtain the desired texture.

Salt may be added at this stage; about 2% by weight. A special anti-oxidant chemical may be added to prevent rancidity, which will develop after a few months. However, to start with the product will probably be sold very soon after manufacture. The peanut butter is then packed in jars.

The type of peanut butter produced by this process is of the 'crunchy' variety, and adjustments on the mill can produce varying textures. For the very smooth paste a more sophisticated milling process is required, with the high levels of heat being produced during milling causing difficulties.

To avoid separation of the oil and the settling out of the solids within the peanut butter after few days of storing, the stabiliser called glyceryl monostearate (GMS) can be added to the at 2-3% by weight (see Food Chain Journal number 30). It is suggested that all of the GMS is added to a small amount of the peanut butter to form a premix and then this is mixed into the main batch. This results in more even distribution of the small amount of GMS in the batch.

References and Further Reading

- Oil Processing: Food Cycle Technology Source Book by UNIFEM. This book has a broader coverage.
- Small-scale Peanut Butter Processing in Tanzania Food Chain Journal Number 30 June 2002, ITDG.
- Principles of Oil Extraction Technical Brief, Practical Action.
- Peanut Roaster Technical Brief Practical Action South Asia (details shown below).
- Engineering drawings of the Practical Action screw press are available from Practical Action Head Office, E-mail: infoserv@practicalaction.org.uk.

Practical Action South Asia has been involved in the design and development of a peanut roaster for small-scale production, and should be able to supply names and addresses of local equipment suppliers. Practical Action Southern Africa has produced peanut butter making equipment.

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Equipment manufacturers and suppliers
Note: This is a selective list of suppliers and does not imply endorsement by Practical Action.

Penagos Hermanos & CIA LTDA
Apartado Aereo
Bucaramanga
Colombia
A powered mill for ‘crunchy’ peanut butter, with adjustable milling thickness.

Small-scale nut grading equipment suppliers.

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Parc Scientific Agropolis
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Cedex 5
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Fax: + 33 (0) 467 547390

Acufil Machines
SF. 120/2
Kalapathy
Coimbatore - 641 035
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Tel: + 91 422 866108/866205
Fax: + 91 422 5752640
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Hand operated peanut shelling machines.

G. North (PVT) Ltd
P.O. Box 111
Southerton
Harare
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Tel: +263 4 63717/9

Mekins Agro Products (PVT)
Ltd
6-3-866/A Begumpet
Greenlands
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Website: http://www.alvanblanch.co.uk
Manufactures of a wide range of small scale processing equipment including peanut shellers.

Jock Brandis
1317 Princess Street
Wilmington NC
28401 USA
E-mail: jockatsouthland@aol.com
Website: http://www.peanutsheller.org
Developer of the low cost Malian sheller made from cement. The organisations can provide assistance in the manufacture of these machines.

Rajan Universal Exports (MFRS) PVT. Ltd
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Kunasin Manufacturing
107-108 Sri-Satchanalai Road,
Sawankalok
Sukhothai
Thailand
Tel: +66 (0)55 642119
Manufactures of a rubber tyre groundnut sheller

Tonnet Enterprises
Gayaza Road
just after Kalerwe market
P.O. Box 3136, Kampala
Uganda
Tel: +256 (0)77 413754
Manufacturer of a hand cranked rotary groundnut sheller. It can shell 3-5 bags of unshelled groundnuts depending on skills of the operator.
Information provided by:

Post-Harvest Handling & Storage Project,
P.O. Box 7856 Kampala,
Uganda.
Tel: +256 41 234531
Organisations and useful contacts

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