



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.



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

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.

Pests and disease

Groundnuts are attacked by; the Bean leaf roller (*Lamprosema indicata*), Leafminer (*Stornopteryx subsecivella*), 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 flavus*) 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 from 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.
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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 monstearate (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

- *The Manual Screw Press for Small-scale Oil Extraction*, This book describes the Practical Action oil press manufacture and use,
- *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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Fax: +263 4 669 773
E-mail: zimbabwe@practicalaction.org.zw

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.

Gauthier
Parc Scientific Agropolis
34397 Montpellier
Cedex 5
France
Tel: + 33 (0) 467 61 1156
Fax: + 33 (0) 467 547390

Acufil Machines
SF. 120/2
Kalapatly
Coimbatore - 641 035
India
Tel: + 91 422 866108/866205
Fax: + 91 422 5752640
E-mail: gondalu@yahoo.com

Hand operated peanut shelling machines.

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

Mekins Agro Products (PVT)
Ltd
6-3-866/A Begumpet
Greenlands
Hayderabad 500-016
India
Tel: +91 842 36350
Fax: +91 842 842477

Zimplot Ltd
P.O. Box 1059
Bulawayo
Zimbabwe
Tel: +263 9 71363/4/5
Fax: +263 9 71365
E-mail: indsec@zimplot.co.zw
Website: <http://www.zimplot>

Sismar
(Société Sahélienne de Matériaux
Agricoles et de Représentations)
20 rue Dr.Theze
3214
Dakar
Senegal

Alvin Blanch Development Co. Ltd
 Chelworth
 Malmesbury
 Wiltshire, SN16 9SG
 United Kingdom
 Tel: +44 (0)1666 577333
 Fax: +44 (0)1666 577339
 E-mail: info@alvanblanch.co.uk
 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>
 Website: <http://www.groundnutsheller.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
 "Raj Buildings"
 Post Bag No. 250
 162, Linghi Chetty Street
 Chennai-600 001
 India
 Tel: +91 (0)44 2534 1711 / 25340731 / 25340751
 Fax: +91 (0)44 2534 2323
 E-mail: rajeximp@vsnl.com
 Website: <http://www.rajeximp.com/>
 AMUDA" Brand Ground Nut Decorticator are suitable to shell out the Groundnut Kernels from the shell. These decorticators are of Rotary type and equipped with a blower to separate the dust & husk. Available in Hand / Pedal / Power driven versions.

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

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Organisations and useful contacts

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Produced studies on crop improvement,
management of post harvest problems,
development of suitable cropping techniques, and
quality of groundnuts and its value added
products.

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Produces publications on tropical
agricultural products, and a series of
booklets on simple processing tools.

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E-mail: aalam@icar.delhi.nic.in
Website: <http://www.icar.org.in/>
Developed groundnut planter,
groundnut thresher,
groundnut/caster decorticator

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Practical Action is a development charity with a difference. We know the simplest ideas can have the most profound, life-changing effect on poor people across the world. For over 40 years, we have been working closely with some of the world's poorest people - using simple technology to fight poverty and transform their lives for the better. We currently work in 15 countries in Africa, South Asia and Latin America.

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