



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.

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 irrorata*), and Tiger moth caterpillar (*Dasychira mendosa*) amongst others.



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

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

- *The Manual Screw Press for Small-scale Oil Extraction*, 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

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. ITDG Southern Africa has produced peanut butter making equipment.

Practical Action South Asia
5 Lionel Edirisinghe Mawatha
Kirulapone
Colombo 5,
Sri Lanka
Tel: +94 11 2829412
Fax: +94 11 2856188

Practical Action Southern Africa
P.O. Box 1744
Harare
Zimbabwe
Tel: +263 4 91 403896
Fax: +263 4 669 773

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

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

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.

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

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.

technical brief

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.

Organisations and useful contacts

Dr Winit Chinsuwan
 Vice-President, Research Affairs
 Khon Kaen University
 Khon Kaen 40002, Thailand
 Tel: +66 (0)43 237604
 Website: <http://www.kku.ac.th/>

National Research Centre for Groundnut
 P. O. Box 5
 Junagadh-362 001
 Gujarat
 India
 Tel: +91 (0)285 21550, 50382
 Fax: +91 (0)285 51550
 E-mail: director@nrcg.guj.nic.in
 Website: <http://nrcg.guj.nic.in>
 Produced studies on crop improvement, management of post harvest problems, development of suitable cropping techniques, and quality of groundnuts and its value added products.

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

Natural Resources Institute
 Central Avenue,
 Chatham Maritime,
 Chatham,
 Kent ME4 4TB,
 United Kingdom.
 Tel: +44 (0)1634 880088
 Fax: +44 (0)1634 880066/77
 E-mail: postmaster@nri.org
 Website: <http://www.nri.org/>
 Produces publications on tropical agricultural products, and a series of booklets on simple processing tools.

Indian Council of Agricultural Research
 Krishi Bhawan, New Delhi
 Pin - 110 001
 India
 Tel: +91 (0)11 2338 2358 / 2338 8991
 Fax: +91 (0)11 2338 7293 / 23382358
 E-mail: aalam@icar.delhi.nic.in
 Website: <http://www.icar.org.in/>
 Developed groundnut planter, groundnut thresher, groundnut/caster decorticator