

# OILSEEDS





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### **1.- Oilseeds and nuts:general information**

Oil is contained within a range of oilseeds, fruits, nuts and seed kernels. However, not all oil-bearing seeds and nuts contain edible oil. Some contain poisons or unpleasant flavours and are only used for paints. Castor oil needs very careful processing to make it safe and is not really suitable for small-scale processing. There is a universal demand for vegetable oils for household cooking, as an ingredient for other food products such as baked goods and snack foods and as a raw material for the manufacture of soap, detergents and body oils.

Oil from crops such as maize is extracted using solvents that dissolve the oil. This method of extraction is not suitable for small-scale processors due to the high costs of equipment and the need for solvents which might not be readily available.

Oil is contained in plant cells and is released when the cells are ruptured. The method of extracting the oil depends on the composition of the raw material. Some seeds are processed dry while palm fruits are processed wet.

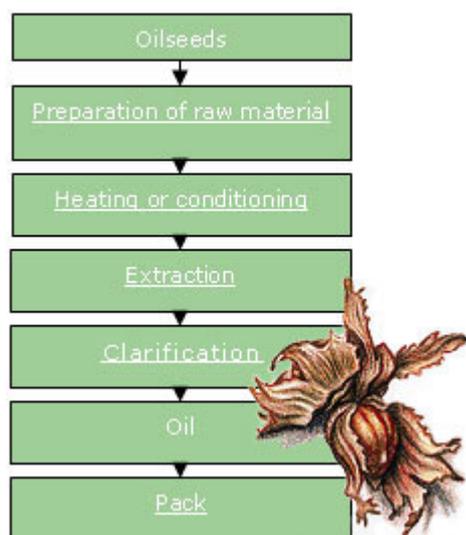
The process of oil extraction produces a by-product known as oilcake. This is very nutritious and can be used for animal feed or as an ingredient in other food products.

During oil processing, the raw material (oil seeds or nuts) is heated to destroy any enzymes and micro-organisms that may cause rancidity. The oil may also be heated after extraction to remove as much water as possible which helps to increase the quality of the oil and the potential shelf life.

Oils should be stored in a cool place away from direct sunlight and heat to prevent chemical changes that can lead to rancidity.

## 2.-Processing oilseeds

### - Processing oilseeds -



### Suitability for small-scale production

There is universal demand for vegetable oil for home use and for use in other food processing operations.

Decentralised, small-scale oil processing can bring many benefits to the processor and the local community. Extracted oil is a relatively 'safe' product in terms of the likelihood to cause food poisoning.

If properly processed, oils have a shelf life of up to 6 months.

### Constraints to production

Solvent extraction of oils is not suitable for small-scale processing as it requires the use of solvent which might not be available. It is a complex method which should only be carried out by well trained personnel.

The high value of oilseeds compared to other crops means that processors have to take higher financial risks from losses.

The equipment required for oil extraction can be expensive and might not be available locally. Expellers need to be maintained regularly to ensure they extract oil efficiently.

For year-round production, processors need a large working capital to buy and store seasonal crops. There is stiff competition from large-scale processors who benefit from the economies of scale and can market oils at a lower price.

Small-scale extraction produces crude oil which has a different appearance and flavour to commercially refined oils. It is necessary to test-market the oil for acceptability before embarking on an enterprise.

## **2.1.-Oilseeds and nuts:general information**

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## **2.2.-Preparation of raw material**

Oilseeds and nuts should be properly dried before storage and cleaned to remove sand, dirt and other contaminants.

Fruits should be harvested when fully ripe and cleaned and handled carefully to reduce bruising and splitting.

All raw materials should be sorted to remove stones and debris. Any mouldy nuts should be discarded as these can cause aflatoxin poisoning.

Cleaned oil seeds should be stored in cool, dry, ventilated rooms away from birds, insects and rodents. Some raw materials (eg sunflower, groundnut) require dehulling (also known as dehusking or decorticating) prior to oil extraction.

A range of dehulling machines (both manual and powered) are available.

After dehulling, the seed is winnowed to remove the husk or seed coat from the kernel. Traditionally, winnowing is carried out by throwing the seeds in the air and letting the husks blow away. For higher rates of production, winnowing machines (manual and powered) are available.

Dehulling is important to give high yields of oil and to reduce the bulk of material that is processed. When pressing groundnuts, some of the husk is added back to the groundnut cake during pressing (10% by weight) to make it easier to press the oil.

Coconut is dehulled and split by skilled operators as this is faster than using a small-scale machine. Most nuts need grinding before oil extraction to increase the yield of oil. Small mills are available for grinding copra, palm kernels and groundnuts.

Groundnuts are ground to a coarse flour either by pounding in a mortar and pestle or using a roller mill. Sunflower seeds are broken using flakers.

Hammer mills are used to break palm kernels.

Coconut flesh is grated using manual or powered graters.

### Operation:dehulling

Prices Codes	Cost (\$US)
1	0-170
2	171-850
3	851-1700
4	>1700

#### °Suppliers of dehullers

Equipment category	Scale	Name of the equipment	Technical description	Price code	Ref.	Images
Palm nuts	S-M	Palm Nut Cracker: standard	An electric powered dehuller used to crack the shells of palm nut kernels. A centrifugal thrower rotates within a heavy gauge steel case. The machine is fitted with an input hopper and discharge chute. Throughput capacity 500kg/hour.	4	3	
	S-M	Palm Nut Cracker	A diesel or electric powered dehuller used for nuts. Throughput capacity 750kg/hour.	3		
Groundnuts	S,M,L	Decar 300 Shelling Machine	Designed to shell groundnuts on an industrial scale. They also sort out the unshelled elements and remove shells and dust by vacuum extraction. Capacity 150-2000kg/hour.		3	
	S-M	High Capacity Groundnut Decorticator	Electric powered equipment for shelling groundnut pods for edible and seed purpose. Breakage limited up to 2%. Suitable for medium scale commercial units. Capacity 300-350kg/hour.		3	
	S	Groundnut Decorticator	A manual dehuller suitable for small-scale farmers to shell groundnut pods for seed and other purposes. Easily relocated. By using sieves of a smaller slot size it can be used for shelling castor as well. Capacity 50-60kg/hour.		3	
	S-M	Groundnut (Peanut) Decorticator	Electric dehuller used for shelling peanuts. Fitted with a blower to remove the broken shell. Capacity 100-750kg/hour.		3	
	S-M	Groundnut Decorticator	An electric powered machine for shelling groundnut. Fitted with a blower to remove husks and a shaking screen to separate out good whole kernels and split kernels. Capacity 300kg/hour.	2	3	

	S	Decorticators	A manual machine for removing the skin from groundnuts etc. Capacity 50kg/hour.		3	
	M-L	Groundnut Shellers	Electric and manual shellers used for removing groundnuts from outer shells efficiently and with minimum nut breakage. Capacity from 50-12,000kg/hour.	2,3	3	
	S	Decorticator	Small-scale manual sheller used for the decortication of groundnuts. Capacity 10kg/hour.		3	
	S-M	Peanut Sheller	This shelling machine has 3-4 kw electric motor. Capacity of 250kg/hour.		3	
	S	Rubber Tyre Groundnut Sheller	Manual sheller with a capacity of 40-60kg/hour.		3	
	S	Paddy Type Groundnut Stripper	Manual sheller with a capacity of 10-15kg/hour.		3	
Sunflowers	S-M	Sunflower/Palm Nut Cracker	This electric machine shells seeds by centrifugal force. Capacity of 300kg/hour.	2	3	
	S	Sunflower Decorticator	Manual sheller used for the removal of husk of sunflower seed. Capacity of 10kg/hour.		3	
	S-M	Seed Decorticator Machine	Electric sheller with a capacity of 500kg/hour.	3	3	

## Operation:milling

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1	0-170
2	171-850
3	851-1700
4	>1700

°Suppliers of equipment for milling

Equipment category	Scale	Name of the equipment	Technical description	Price code	Ref.	Images
Mills	M	No.2 Hand Grist Mill	Manual grinder that can be adjusted for coarse to fine grinding with counter balanced handle crank. Holds 5 cups of grain. Cone shaped burrs are made of special alloy for longer life. Suitable for cereals, legumes and oilseeds. Throughput 5kg/hour.	1	3	
	S-M	No.60 Power Grist Mill	Electric or manual mill that is suitable for use on large and small farms. Adjustable for grinding texture. Includes hopper, feed regulator slide, coarse and fine grinding burrs and 12 inch diameter pulley. Suitable for cereals, oilseeds and herbs and spices. Capacity of 150kg/hour.	2	3	
	S-M	Stone Grinding Mills	Stone grinding mills suitable for fine or coarse grinding of cereals, oilseeds and herbs and spices. In a range of sizes (from 15 to 1000kg/hour).		3	
	S-M	Oil Mill	Tiny oil mills in 3 models for multipurpose grains - sunflower, rapeseed, groundnut, cotton, shea tree, sesame and cocoa etc. Oil cake production from 7 - 12%. Throughput capacity 175-450kg/hour.		3	
	S-M	Milling Machine	This electric or manual mill can be used for crushing palm kernels, groundnuts and moringa seeds to extract oil.	3	3	
	S	Oil Mill Machinery	Used for the extraction and filtration of all kinds of oil bearing seeds. Throughput 10kg/hour.		3	
Grinders	S-M	Grindmaster Model 3000	Electrical, commercial peanut grinding equipment designed for use in a shop. Can grind 0.5kg peanuts in 30 seconds.	3	3	
	S	Peanut Butter Grinder	Hand powered food grinder to make peanut butter.	1,2	3	
	S	Palm Nut Crusher	Battery or electric powered food grinder to crush palm nuts.		3	
	S	Grinder for Groundnut Paste	Battery or electric powered grinder for peanuts.		3	
	S-M	Groundnut Coarse Grinding Machine	Electric powered mill to grind peanuts. Capacity 275kg/hour	3	3	
	S-M	Wet Soybean Grinding Machine	Electric soybean grinding machine. Capacity of 80kg/hour.	2	3	
	S-M	Coconut Jelly Disintegrating Machine	Electric grinder for nuts and oilseeds. Capacity of 250kg/hour.	2	3	
	S-M	Shea Nut Crushing Machine	Electric grinder for nuts and oilseeds.		3	
	S-M	Fine Grinder	This electric mill can be used to separate creamed dessicated coconut into virgin coconut oil and a fine aromatic dessicated coconut.		3	

### **2.3.- Heating or conditioning**

Wet raw materials such as palm fruit or coconut are heated to break the oil/water emulsion and allow the oil to be separated.

Groundnuts and sunflower seeds are conditioned by heating with a small amount of water before oil extraction. This assists in rupturing the oil bearing cells and decreases the viscosity of the oil which allows it to flow more freely.

The required temperature and moisture content vary according to the raw material.

Groundnut flour needs 10% added water and is heated to 90°C in a seed scorcher. Heating is complete when the mixture stops sticking together and forms a free flowing flour.

### **2.4.-Extraction**

There are three main types of oil extraction: Motorised or animal powered ghanis; oil presses; oil expellers.

A ghani consists of a wooden mortar fixed to the ground and a rotating pestle. The raw material is crushed against the side of the mortar as the pestle is rotated. Oil is pressed out of the oil seed and runs through a hole at the bottom of the mortar where it is collected.

There are many types of oil press, but all work on a similar principle. Raw materials are placed in a heavy perforated or slotted cage and a metal plunger is used to press out the oil. The main difference in the design is the method used to move the plunger, which can either be a screw thread or a hydraulic jack.

Oil expellers have a horizontally rotating screw which feeds raw material into a barrel-shaped outer casing with perforated walls. The expeller grinds, crushes and presses out the oil as the oil-seed passes through the machine.

Oil flows through the perforations in the casing and is collected underneath. The residue or oilcake is pushed out of the end of the unit.

For maximum efficiency, the screw should fit tightly within the casing and therefore requires repair or replacement at frequent intervals since it gets abrasion from the seeds.

### **2.5.-Clarification and filtration**

Crude extracted oil contains a range of contaminants including fine pulp and fibre from the plant material, small quantities of water, resins, colours and bacteria which make it dark in colour.

The contaminants can be removed by clarifying the oil.

A clarifier can be used. If this is not available, the crude oil can be left to stand for a few days and then the upper layer is removed.

If further clarification is needed, the oil can be filtered through a fine filter cloth.

After filtering, the oil is heated to boil off traces of water and destroy bacteria.

When all impurities are removed, the shelf life of the oil can be extended from a few days to several months, provided it is stored properly.

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## **3.-Aflatoxins**

Aflatoxins are a poisonous group of compounds that are produced by moulds that grow on seeds and nuts. They are poisonous to humans and animals if consumed over a prolonged period.

Aflatoxins are not destroyed by heating or processing. However, the mould can be prevented from growing by drying and storing the crop correctly.

Contaminated seeds can be easily identified if there are visible signs of mould growth, discoloration or a shrivelled appearance.

These seeds should be destroyed.