Information about Cashew Processing in India

Keywords: cashew processing in India, Indian cashew production, cashew nut processing, cashew nut roasting, cashew nut shelling machine, cashew nut grading, cashew kernel peeling process, cashew kernel weighing and packing, cashew nut shell carbonization, cashew nut shell briquetting, cashew oil extraction, cashew apple processing

Abstract: Cashew is one of the important commercial crops in India, and India is the largest grower, processor and exporter of cashew in the world.

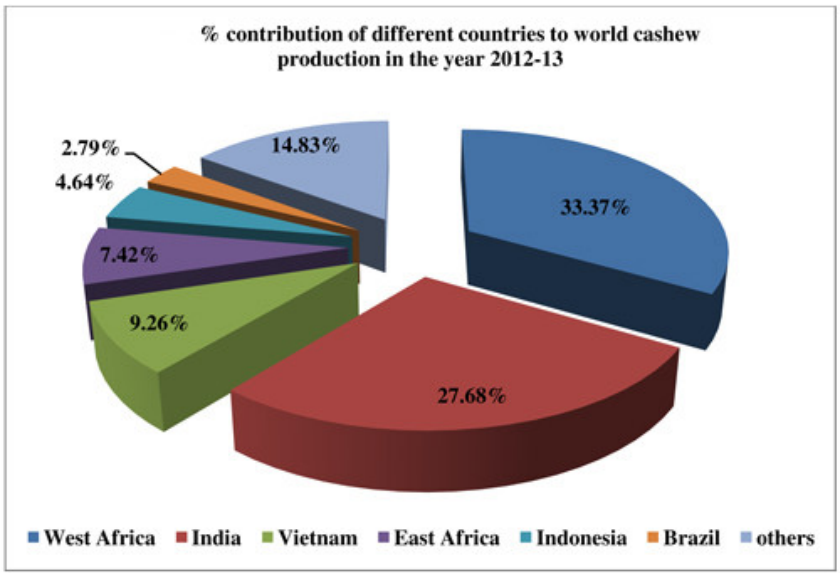
Indian Cashew Production

Four centuries ago, when the adventurous Portuguese landed on the Indian coasts, they brought with them the valuable tree nut, cashew. Cashew came, conquered and took deep roots in the entire coastal region of India. It found that the Indian soil more suitable for cashew growth than its homeland-Brazil. Later it soon spread as a popular cash crop to other parts of India.

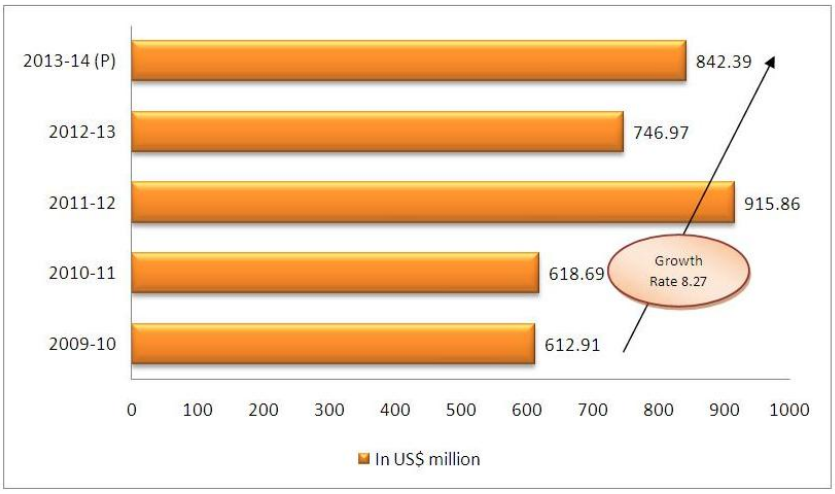
Cashew is one of the important commercial crops in India, and India has over 700,000 ha. cashew plantation and has annual output of over 400,000 tons of raw cashew nuts. Cashew is grown in the western and eastern coastal areas and further island, and the major production states are Kerala, Andbra, Orissa, Maharashtra, Karnataka, Goa and Tamil Nadu; Meghalaya, Madhya Pradesh also have a small amount of production.

India is the largest grower, processor and exporter in the world. It is also interesting to understand, that the new statistics of consumer interests done during 2009 has proved India is also the number one consumer of cashew kernels in the world overtaking USA.

Cashew kernels is consumed all over the world as a premium snack and nowadays more used as a preferred ingredient due to its excellent flavor and unique texture in large array of foods like sweets, dates, ice-creams and so on. It can be dried or oil roasted, salted, coated with chocolate, spices, honey, etc.



Cashew Kernel Exports from India (2009-10 to 2013-14)



Overview of the Cashew Processing in India

The products of cashew fruit are cashew apple and cashew nuts/kernels. In India, cashew apple is extensively used only in Goa to prepare cashew liquor called feni.

The cashew kernel is covered by a thin membrane called testa, which contains the non-edible substance tannin and protects the tasty kernel from the ravages of nature until it is processed. So, processing of cashew kernel is indispensable. The kernel yield is around 22%-24% of in-shell cashew. The major by-product of processing is cashew nut shell liquid (cashew shell oil), which is an important raw material in the manufacture of resin. In India, cashew processing began during the first half of the 20th century, and the processing is manual then.

Indian cashew process industry started with family workshops of small scale, and as time goes on, it gradually developed into labor-intensive industry of high organization. Due to the steady growth of world demand for cashew nuts, cashew process industry has become a high-profit industry. The cashew nut processing industries are typically located in the rural and backward areas.

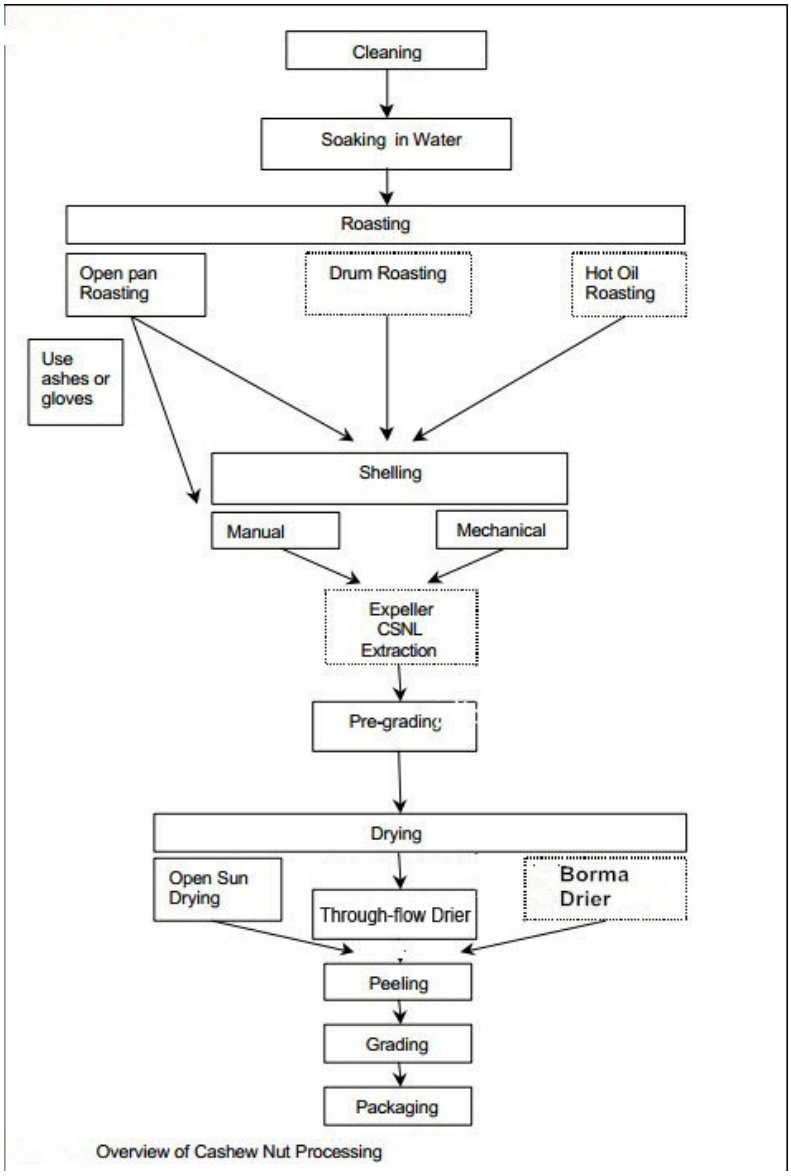
The number of cashew processing units in India increased rapidly from 170 in 1959 to as many as 3,650 in 2005-2006, which scattered in many states of the country provided employment to over 0.5 million people, 95% of these are women, and India processed about 1.18 million MT of raw cashew seeds at that time. Probably, the country may have around 4,000 cashew processing units.

Cashew Nut Processing

The cashew industries in India employ different unit operations/ methodology for processing. Traditionally, the raw nuts are processed manually by the experienced semi-skilled workers. Since the 1960s, the processes came to be mechanized for roasting, shelling, and CNSL extraction. Nevertheless, for the most part, cleaning of raw materials and kernel grading by sizes have still remained manual operation.

Cashew nut processing is generally done on a home scale and factory scale in India. In the home scale process, the dried nuts are burnt in an open fire and hand shelled, in which maximum over-burnt and charred kernels are recovered and the valuable cashew nut shell liquid is wasted completely. The nut is graded into three or more groups and is conditioned to about 16% moisture by soaking or spraying water, and then the nut is roasted either by drum, or oil bath or steam roasting methods.

Cashew nuts factory-scale processing



Overview of Cashew Nut Processing

Raw cashew nut cleaning:

Raw cashew nuts carry foreign matter of sand, stones, dried apples, etc. by cleaning the raw nuts, the foreign matter is removed to help high-quality roasting operation.

Nut soaking:

This stage is soaking cashew nuts in water to avoid scorching them during the roasting operation. And this process of covering the nuts with water, standing and draining should be repeated with the same nuts about three times until a moisture content of 9% is reached.

Nut roasting:

It is designed to make the shell brittle, which facilities the extraction of the kernel when breaking the shell open. And in this process, the nut shell liquid will also be released. There are several methods of roasting: open pan roasting, drum roasting, oil bath method and steam roasting.

1. The earliest roasting process is the open pan roasting, in which the nuts are heated and stirred constantly in a metal pan over a basic earth fireplace. Due to the heat and slight charring, the shells become brittle. However, the pan roasting is not followed in organized sectors of the cashew processing industry.

2. Drum roasting is developed from the pan method, completed by feeding the nuts into a rotating drum over a fire

with high temperature. The rate of shelling and the output of whole kernels are very high in this method, but there is a loss of CNSL that has high export potential.

3. In oil bath roasting, the nuts get roasted by means of screw or belt conveyor in a bath of cashew shell liquid in a tank heated by a furnace which uses spent cashew nut shells as fuel, and also the separated cashew nut shell liquid released from the nuts is extracted and recovered by continuous overflow arrangement.

4. Steam roasting is a kind of improved method adopted in cashew processing. The nuts are steam cooked in a specially built steam cooker so as to make the shell soft an then cut open to get the kernel. In this process, the cashew nut shell liquid comes out and gets collected in the cooker, separately removed.

Nut cooling:

Once the raw nuts are roasted, they are taken to a separate place and spread on the floor. There they are kept two or three days so that they are cooled, and then they are transferred to the next process.

Nut shelling:

The purpose of shelling is to produce clean, whole kernels free of cracks. In India, this operation has always been done manually, which is still relevant to the small-scale processor, although the mechanical process is an advisable option in all cases.

1. Manual shelling: in the manual process, the nuts are cracked with a wooden mallet or a light hammer. Wood ash for covering the shells or gloves are required because of the residue CNSL during roasting. The skilled and experienced workers can release the kernels form the shells with no damage and breakage, with a quality of 90% whole kernels.

2. Mechanical shelling:

---the semi-mechanized process is using a pair of knives which are shaped in the contour of half a nut. By means of a foot operated lever, the knives cut through the shell all around the nut, leaving the kernel untouched.

---Oltremare shelling machine is a manually chain-fed shelling system that is also based on two nut-shaped knives. The nuts are pushed between the knives and cut, separating the shell halves by the knives' twisting movement to get the kernels.

---the Cashco system shelling machine is also a chain-fed one, but the nuts can be placed in the right position automatically, having two knives that cut the sides of the nut and a pin that is wedged into the stalk end of the nut to separate the shell halves.

---centrifugal sheller employs the continuous flow. A rotary paddle projects the shells against the solid casing and the impact cracks open the shell without breaking the kernel. All sizes of nuts can be processed by this sheller. However, the nuts should be graded in advance, because different rotary speed is used for various sizes.

Shell and kernel separation:

It is done after shelling to separate the shell pieces and kernels. Usually blowers and shakers are used to separate the lighter shell pieces, at the same time, the unshelled nuts are returned to the shelling process. The recover of small pieces of kernel sticking to the shell is usually done manually.

Kernel pre-grading:

It can be done before or after drying the kernels and may greatly reduce the final grading work. For large-scale processors pre-grading can be done mechanically, separating mainly the whole from the broken kernels and sometimes separating the different size groups of whole kernels.

Kernel drying:

The kernel coming from the shelling is covered with a brown cover, known as testa, and to remove the testa is for blanched kernels and protecting the kernel from pest and fungus attack, so the kernel needs drying process. The moisture content is about 6% before drying and 3% after.

1. Sun drying: the shelled kernels are spread out in thin layers under strong sunshine to complete drying.

2. Borma drier: it is the most commonly used one and necessary for medium and large-scale producers. Its chamber is heated directly by flue gases from a furnace at the bottom. Cashew shells can be burnt to produce heat. There are mesh-wire trays in the chamber, and air vents are provided at the top and sides for the moisture to escape. In order to get uniform drying, the position of trays is changed at a interval of 10-30 minutes.

3. Through-flow drier: to minimize the losses, this drier which totally avoids the cashew kernel scorching and reduce drying time, is designed.

Kernel Peeling:

It is an operation of removing the kernel coat (testa) which is already loosen by drying.

1. Manual peeling: it is done by gentle rubbing with fingers, and the parts still attached to the kernel are removed by the use of a bamboo knife.

2. Mechanical peeling: this process differs widely, including air-blasting, suction, a freezing operation and a system of rubber roller.

Kernel Grading:

1. The common grading standard is based on cashew kernel sizes. The peeled kernel usually graded manually, with the exception of a few grading aids. The grading standards developed in India refer to white whole (undamaged) kernels and indicate the number of kernels per lb of weight. The largest kernel comes in the grade of W210 (440-460/kg) and the smallest of the seven grades is W500 (1000-1100/kg). For large operations looking towards export markets, it is necessary to grade the kernel to an international level.

2. Power-driven rotary sieves are one mechanical method, another being two outwardly rotating rubber rollers aligned at a diverging angle.

3. Cashew kernel color sorting machine is an advanced equipment with a special attention to preservation of brittle and an aim of highest purity and quality from products, and this system allows the separation among scorched and unpeeled kernels without handling the product, thus avoiding costly breakage.

Kernel rehumidification (optional):

Before the kernels are packed, it is necessary to ensure that their moisture content rises from 3% up to around 5%. This is to make the kernels less fragile, thus lessening the risk of breakage during transport. In humid climate, the kernels may absorb enough moisture during peeling and grading, making a further rehumidification process unnecessary.

Weighing and Packing:

weighing is done for the purpose of packing, and here the nuts are filled in containers, bags, and pouches as per the requirement. Once it is done, the containers are taken to the packing process.

The normal package of export of kernels is in air-tight tins of 25lbs in weight. The packing needs to be impermeable as cashew kernels are subject to rancidity and go stale very quickly.

After filling and weighing, the cap should be soldered on in preparation for the ‘vita pack’ process. This consists of removing all air from the tin and substituting this with carbon dioxide (CO_2). The advantages of packing cashew kernels in carbon dioxide are twofold. Firstly, carbon dioxide is an inert gas and will not support life. Any infestation that may have been present is therefore arrested. Secondly, carbon dioxide is soluble in cashew oil and goes into solution as soon as the seals are made.

Some processors do not have vacuum pumps and displace the air in the tin by feeding in carbon dioxide through a small hole in the bottom of a side of the tin. The carbon dioxide valve is turned off when all the air has been replaced, the holes in the tin are then sealed, with the hole at the bottom of the side of the tin being done first, and the one on the top last.

Cashew Oil Production

Cashew oil is an edible cooking oil made from cashew nuts. Extracting cashew oil is a long process, since most of it is done by hand. Before making cashew oil, the shells and skins must be first be removed. The nuts are collected from the bottom of the fruit. They can then be roasted or dried in an oven. This process helps remove some of the volatile shell oil, and it makes the shells brittle and easy to break open. The skins are then removed after the shelled nuts are roasted a second time. Cashew oil can then be extracted from the cashew nuts after the skin is removed. The oil is obtained by crushing the cashew nuts. This can be done with a hydraulic or mechanical press.

Cashew Nut Shell Liquid---Byproduct of Cashew Nut Process

Cashew nut shell liquid (CNSL) or cashew shell oil is a versatile byproduct of cashew nut processing. The nut has a shell about 1/8 inch thickness inside which is a soft honey comb structure containing a dark reddish brown viscous liquid. It is called CNSL, which is the pericarp fluid of the cashew nut. It is often considered as the better and cheaper material for unsaturated phenols.

CNSL has innumerable applications, including friction linings, paints, laminating resins, rubber compounding resins, cashew cements, polyurethane based polymers, surfactants, epoxy resins, foundry chemicals, and intermediates for chemical industry. It offers much scope and varied opportunities for the development for other tailor-made polymers.

Process Used Cashew Nut Shell as Biomass Fuel

When CNSL is removed, the deoiled shells are abundantly available as biomass waste. The cashew nut shell has

calorific value of 4252kcal/kg. The shell waste generated in cashew processing is utilized as a substitute to wood fuel by making charcoal with carbonization process.

1. Carbonization: the carbonization of cashew nut shell is carried out in developed small capacity single drum kiln by means of direct heating method and indirect heating method achieve carbonization.

2. Briquetting: the carbonized cashew nut shell is mixed with binder, and then it can be made into briquettes either manually or using machines. For the mechanical briquetting, load the mixture directly into the briquetting mould/machine to form uniform-sized cashew nut shell briquettes.

Cashew Apple Processing

The cashew apple is a kind of soft fruit, rich in nutrients, and contains so much vitamin C. It can be eaten fresh, cooked in curries or fermented into vinegar, as well as an alcoholic drink. It is also used to make preserves, chutneys, and jams in India.

In Goa, the cashew apple is mashed, the juice is extracted and kept for fermentation for a few days. Fermented juice the undergoes a double distillation process. The resulting beverage is called feni or fenny. Feni is about 40%-42% alcohol. The single-distilled version is called urrac, which is about 15% alcohol.