Raw Cashew Nuts (RCN) Processing Process

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Summary

Introduction

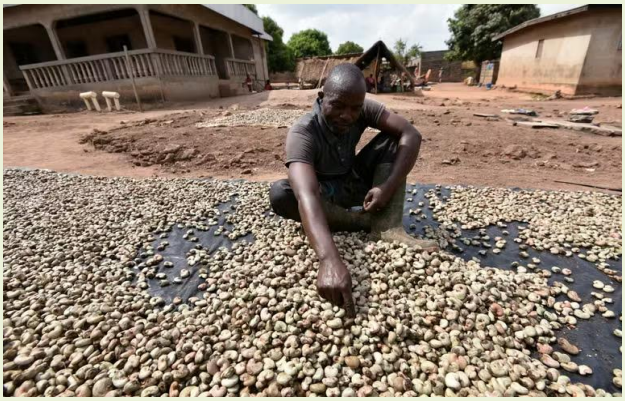
Cashew processing is a multi-phase procedure that aims to extract edible kernels from the shells. It integrates various phases to convert raw nuts into premium kernels. It is a labor-intensive process that requires the appropriate selection of technologies and methods at each phase to ensure its efficiency and competitiveness.

1. Identification of the stages of the NCB transformation process

The processing of raw cashew nuts involves six steps:

1.1. Drying raw cashew nuts

- **Process:** After sourcing, raw cashew nuts are dried to reduce their moisture content to a maximum of 9% w/w, which is ideal for storage.
- **Purpose:** Prevents deterioration during storage and prepares nuts for subsequent processing steps.
- **Method** : Drying on clean concrete floors or tarpaulins. Modern methods use drying machines. The well-dried nuts are then packed in jute bags for storage and use throughout the year.



1.2. Pretreatment of raw cashew nuts

Pretreatment covers all processes before shelling. It includes three steps:

- **Calibration**

Calibration is the process of grouping nuts into sizes based on their diameter. Commonly used sizes include **18mm** , **20mm** , **22mm** , **24mm** and larger than **24mm.**

Calibration is essential for mechanized shelling machines because it allows for precise adjustment of the cutting blades. Processing nuts of uniform size during **shelling reduces breakage and makes grading the kernels easier.**

The nuts are first calibrated and then stored in jute bags according to their size. Proper calibration ensures that the shelling process is more efficient and generates a higher yield of whole kernels.

- **Storage**

Warehousing involves storing raw cashew nuts purchased for processing throughout the year. Proper storage techniques are essential to maintain the quality of the nuts.

The dried and calibrated nuts are **packed in jute bags** with a standard net weight of **80 kg** per bag. These bags are stacked on pallets to avoid direct contact with the ground, which prevents the nuts from absorbing moisture.

Stacks should be placed **at a distance of one meter from the walls** and with **a space of two to five meters between the roof of the warehouse and the top of the stacks** to avoid excessive heating and burning of the nuts. Adequate ventilation is essential to minimize humidity. The warehouse should also be equipped with fire extinguishers for safety reasons. Proper storage helps prevent damage to nuts from insect pests and disease organisms, and ensures that nut quality is maintained throughout the year.

1.3. Thermal treatment

The commonly adopted processing models during the **heat treatment stage** in the cashew nut processing process are:

- **Steam and cut method**
  - **Process:** Raw cashew nuts are placed in a boiler where pressurized steam is introduced. This makes the shells brittle and easier to cut. After steam treatment, the nuts are spread evenly on a clean surface to air dry, which completes the cooling process.
  - **Benefits** : Produces high quality almonds, minimizes breakage and is widely used due to its effectiveness.
  - **Disadvantages** : Requires investment in steam boilers and proper steam handling to ensure safety.

- **Drum Roasting Method**
  - **Process** : Raw cashew nuts are constantly fed into an inclined, perforated drum where direct heat is applied. The drum rotates to burn the nut shells and make them brittle for shelling.
  - **Advantages** : Simple technology and relatively low cost.
  - **Disadvantages** : May result in lower quality almonds, less popular among modern processors due to inconsistent results.

- **Drum roasting method in an oil bath**
  - **Process** : Raw cashew nuts are immersed in a tank of hot cashew shell liquid (CNSL). This extracts the CNSL from the shells, making them brittle for easier peeling.
  - **Advantages** : Effective in making shells brittle, allows extraction of CNSL as a by-product.
  - **Disadvantages** : requires careful handling of hot oil, risk of reduced quality of almonds compared to steam cooking.

1.4. Shelling

Shelling is the process of separating the kernels from the shells of raw cashew nuts. This is a critical step in cashew processing as precision and accuracy are essential to prevent the kernels from breaking.

- **Removing the hull**

The shell is removed by cracking or cutting the raw cashew nuts to obtain the kernels. This is done using hand-held machines or fully mechanized shellers to open the shells. The kernels are separated from the shell in three different ways: by **hand** , using a small **pointed tool,** or using a **separating machine (see image)** .

- **Oven drying and humidification**

After shelling, the almonds undergo a process called **heat shock** to facilitate the removal of the **testa** (the thin skin covering the almond). This involves a combination of **oven drying and humidification** .

- First, the almonds are heated or dried to reduce their moisture content. This drying process causes the testa to contract.
- Next, the almonds undergo humidification, where the moisture content is increased, causing the testa to expand.
- The almonds are then heated once more to complete the thermal shock process. Through contraction and expansion, the strong adhesive force between the testa layer and the almond is broken.

1.5. Peeling

- Process: Removing the testa from cashew kernels is done using peeling machines or manually. Most factories use peeling machines combined with manual peeling to completely remove the testa.
- Objective: To obtain clean, white cashew nuts, ready for grading.
- Method: Friction and air pressure in machines; **manual peeling** for complete removal of testa. **Mechanized peeling** often results in a **higher percentage of broken kernels** .

1.6. Ranking

Grading involves classifying almonds according to **color** , **shape** and **size** .

- **Classification based on color**

The color classification also takes into account the size of the almonds, distinguishing between whole pieces and broken pieces. In the table below you can see the grades and their corresponding color characteristics**.**

Grade	Color characteristics
First quality "Extra"	Uniformly white, pale ivory or light yellow.
Second quality scorched	Yellow, light brown, light ivory, light ash gray or dark ivory.
Third special scorched quality	Dark yellow, brown, amber, and light to dark blue. They may be slightly shriveled, immature, and slightly speckled, blotched, or discolored.
Fourth quality	They have the same color characteristics as the first or second grade, but have pitted spots.
Lightly Blemished Whole Almonds (LBW)	Light brown, light ivory, light ash gray or dark ivory. The beans may have light brown speckles or spots on the surface, provided that this does not affect more than 40% of the beans.
Lightly stained parts (LP)	They may be light brown, light ivory, light ash gray, or dark ivory. Pieces may have light brown speckles or spots on the surface, provided that no more than 20% of the pieces are affected.
Whole stained almonds (BW)	Dark yellow, brown, amber or light to dark blue. The kernels may be slightly shriveled, immature or perhaps speckled with brown or spotted on the surface, provided that no more than 60% of the kernels are affected.
Desert (D)	Cashew kernels may be scratched, deeply burned, shrivelled, spotted dark brown, spotted black, blotched, or otherwise discolored.

- **Classification based on shape**

Depending on their shape, cashew nuts are classified into two categories: **whole nuts** and **broken nuts** , which are bits, cracks, or pieces.

- **Whole (W)** : A cashew kernel is graded as whole if it has the characteristic pippin shape of a cashew kernel and no more than 1/8 of the kernel has been broken. This grade is called a **W grade** .
- **Tip (B)** : Tips are almonds that have been broken widthwise. They represent less than 7/8 but not less than 3/8 of a whole almond, and the cotyledons are still naturally attached. This grade is labeled as Grade **B.**
- **Split** : Split almonds are almonds that have been split lengthwise and have not more than 1/8 of the cotyledon broken. This grade is labeled **S** .
- Chunks are smaller sized broken almonds. They are classified into the following categories in descending order of size: large chunks (LWP, SP, SPS, etc.), small chunks

(SWP, SSP, DSP, etc.), chips (CHIPS, SSP1, SSP2, SSP3), mini-chunks (BB, G1, G2, G3), fine grains (X), fines (FE), mixed chunks (P1M, P2M, P3M) **.**

- **Classification based on size**

Size is an estimate of the number of kernels per **kilogram** or **pound . Size** grading is **required** for premium **cashew kernels** , but is optional for other grades of whole kernels.

Cashew nut sizes are classified into two broad categories: The sizing of whole almonds includes the " **sizes** " of **180** , **210** , **240** , **320** , **450** and, more rarely, **500** .

Size is the number of cashew kernels in a pound of a sample. For example, for size **180** , there should ideally be **180 kernels** per **pound** , with a margin slightly lower than **180.** For size **210 , the** number of kernels ranges from **181** to **210** per **pound** .

2. Transformation scale

Scale refers to the amount of raw cashew nuts your plant can process in a year. This can have a significant impact on the efficiency, profitability, and success of your business. Let's look at the different cashew processing scales and the factors that influence your choice.

The grading system for cashew processing is not yet standardized. Furthermore, the processing capacity of unprocessed cashew nuts can fluctuate from small-scale processing of less than **1,000 tonnes** per year to large-scale processing of up to **30,000 tonnes or more** annually.

3. Transformation systems

The main cashew processing systems are:

3.1. Manual systems

- Rely heavily on manual labor for most stages of processing.
- Suitable for small scale operations with limited access to advanced machinery.
- **Advantages** : Low initial investment, adaptable to different production scales.
- **Disadvantages** : High labor intensity, lower efficiency, increased risk of quality inconsistencies.

3.2. Semi-mechanized systems

- Combine manual labor with the use of machines for certain stages of processing.
- Ideal for medium-scale operations that want to increase efficiency without fully mechanizing the process.
- **Benefits** : Improved efficiency, better consistency in product quality, reduced labor costs.
- **Disadvantage** : High initial investment, complex maintenance of machines, need for qualified technical personnel.

3.3. Mechanized systems

- Use advanced machinery for most or all processing steps.
- They are best suited for large-scale operations with significant investment capacity.
- Advantage: High efficiency, consistent quality, reduced dependence on labor.

- Disadvantage: High initial investment, complex maintenance of machines, need for qualified technical personnel.

Conclusion

Raw cashew processing is a meticulous and essential process that transforms the harvested fruits into high-quality edible kernels. This complex process involves several steps, from harvesting and drying, to roasting and shelling, to heat pre-treatment, shelling, final drying, grading and packaging. Each step plays a crucial role in ensuring that cashew kernels reach the consumer in optimum conditions of freshness and quality. Cashew processing requires specialized skills and constant attention to detail to preserve the organoleptic and nutritional characteristics of the kernels. By mastering each phase of this process, producers can offer a delicious and nutritious product, ready to be enjoyed by cashew lovers around the world.

Sources : Documentary synthesis and information from practitioners