

## Cashew Processing Guides

# Number 1

# Guidebook on the Cashew Processing Process



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# Guidebook on the Cashew Processing Process

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## A Competitive Cashew initiative publication in cooperation with



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## Cashew Processing Guides

# Number 1: Guidebook on the Cashew Processing Process

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# Preface

The Competitive Cashew initiative (GIZ/ComCashew) - formerly African Cashew initiative (GIZ/ACi) - conducted a comprehensive study on raw cashew nut processing equipment (GIZ/ACi, 2011), through consultation with cashew industry investors worldwide. The study revealed areas of concern related to raw cashew nut processing. The main questions posed by cashew processors and potential investors who wanted to set up businesses in Africa evolved around raw cashew nut processing, equipment types and food safety.

In response, GIZ/ComCashew has published a series of cashew processing guides to provide useful information and practical materials to the industry, notably to new processors and investors entering the raw cashew nut processing business in Africa and existing processors who plan to upgrade or expand their cashew processing factories.

The purpose of Cashew Processing Guide Number 1: *Guidebook on the Cashew Processing Process* is to provide information on the key steps involved in raw cashew nut processing to guide new investors and potential processors. This guidebook presents information on raw cashew nut processing models and the various steps to achieve successful raw cashew nut processing. The information in this guidebook will enable new processors to make informed decisions about good cashew processing practices, processing methods and models, factory size and good management systems to ensure viability and competitiveness of their processing business.

The guidebook also serves as a resource material and reference book for new investors in the raw cashew nut processing business.

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  - Association Nationale des Transformateurs d'Anacarde du Burkina Faso
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  - Cashew Industry Association and Processors in Ghana
  - Conseil du Coton et d'Anacarde de la Côte d'Ivoire
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# Contents

Preface.....	v
Acknowledgements .....	vi
1. Introduction .....	01
2. The Cashew Processing Process .....	02
3. Cashew Processing Scale.....	04
4. Cashew Processing Systems.....	06
5. Cashew Processing Models .....	08
6. Six Steps in Processing of Raw Cashew Nuts (RCN) .....	10
6.1 Drying of RCN.....	12
6.2 Pre-Treatment of RCN.....	13
6.3 De-Shelling .....	13
6.4 Peeling.....	15
6.5 Grading.....	15
6.5.1 Classification based on Colour .....	16
6.5.2 Classification based on Shape .....	17
6.5.3 Classification based on Size.....	18
6.5.4. Classification Order.....	18
6.6 Packaging of Processed Cashew Kernels .....	20
7. Quality Standards in Cashew Processing.....	21
8. Key Factors for Successful Cashew Processing .....	22
9. Guidelines for Management of a Raw Cashew Nut Factory .....	24
Recommended Reading .....	26
Glossary of Raw Cashew Nut Processing Terms .....	27
Acronyms and Abbreviations.....	29
The Competitive Cashew initiative (GLZ/ComCashew).....	33
Other Titles in this Series .....	34



# 1. Introduction

Africa produces 53 % of the world's cashew. Thus, the processing of raw cashew nuts at origin has become a promising business in Africa because international buyers prefer high quality kernels processed at source. Traceability, strong supply chain linkages and adherence to international food safety standards are important factors for establishing a competitive African raw cashew nut processing business.

Despite the wide range of experiences by many actors in the sector, technical and entrepreneurial information on raw cashew nut processing is strongly lacking. The Competitive Cashew initiative (GIZ/ComCashew), therefore, is publishing this series of Cashew Processing Guides to provide guidance for entrepreneurs and managers in cashew processing. These guidebooks provide essential and practical guidelines on the step-by-step approach to successful raw cashew nut processing.

The processing of raw cashew nuts involves a series of activities to transform the raw cashew nuts into high quality kernels for consumption. The process consists of many steps, is labour intensive and involves a critical choice of technology and methods at each step for efficient and competitive processing. The technology mix, methods and systems available at each step enable processors to select the the appropriate processing model for their business. In addition to describing the steps in raw cashew nut processing, this guidebook presents some of the commonly used methods, technologies and trends in cashew processing. This guidebook presents the primary processing processes of heat treatment, shelling and peeling, as well as grading of cashew kernels.

## 2. The Cashew Processing Process

The raw cashew nut processing process starts with properly drying and storing the raw cashew nuts for processing all year round. The next steps involve various activities to remove the cashew kernel from its shell. The final edible consumer product is the cashew kernel.

This complex process results in high value addition to the raw cashew nut. The objectives of raw cashew nut processing are:

- Removing the highest possible weight of kernels from the raw cashew nut
- Avoiding breakage of the kernels
- Ensuring that the distinctive light ivory cashew colour is maintained
- Maintaining the natural taste of the kernels. Note that naturally tasting cashew kernels are free from chlorophenol off flavours.
- Ensuring kernels uphold international food safety standards for consumption

The achievement of these objectives results in obtaining high quality cashew kernels at competitive prices.

Unlike almonds or hazel nuts, where the nut is enclosed in an otherwise hollow shell, the cashew kernel is cushioned in a hard shell by a honeycomb layer called the testa. Thus, processing the raw cashew nut involves more complex steps to obtain the half-moon shaped, light ivory and naturally tasting kernel.

Raw Cashew Nut processing involves three (3) key stages:

- a) *Heat treatment*: The application of direct heat, hot oil or steam, prepares the raw cashew nuts for shelling and facilitates removal of the shell.
- b) *Shelling and peeling*: The hard shell is either cracked or cut to expose the kernel with testa for separation from the shell. The testa of the cashew kernel has to be removed after shelling. The white kernels are obtained after removing the shell and the testa. The shells contain the corrosive Cashew Nut Shell Liquid (CNSL) which can burn or blister the hands of workers. It can also cause damage to cashew processing machinery.
- c) *Grading*: The final stage of the primary processing process is the classification of kernels and packaging for distribution and sale.

These three basic (3) stages of raw cashew nut processing involve different methods of heating, shelling and peeling. The application of any method depends on available technologies and resources such as access to electricity, water and labour as well as the knowledge of local customs.

In the planning stage of establishing a raw cashew nut processing factory, the investor and potential processor must take decisions on processing scale, systems and models of cashew processing, which are described and discussed in the subsequent sections.

### 3. Cashew Processing Scale

The scale of a cashew processing factory is its annual processing capacity, which is the quantity of raw cashew nuts that a factory processes each year. The investor determines the processing scale by making decisions about the installed machinery, and the number of employees in the factory, available funds, and the proper management of resources.

Cashew processing scale is classified as small, medium or large. The criteria for these groupings vary from one location to another as shown in Table 1 for small-scale processing capacity.

Region	Small Capacity Classification
Benin	Less than 1000
Côte d'Ivoire	Less than 3000
Ghana	Less than 1000
Brazil	Below 5,000 MT/year
India	Below 10,000 MT/year

*Sources: Ministère de l'Agriculture, de l'Élevage et de la Pêche ; Stratégie nationale de développement de Filière Anacarde au Bénin, Décembre 2015 ; Ministère de l'Agriculture, Projet d'Accélération de la Transformation de la noix de cajou brute en Côte d'Ivoire. Projet document, Janvier 2014; Ministère de l'Agriculture. Transformation d'anacarde Termes de Reference juillet 2013; Ministry of Food and Agriculture, African Cashew initiative & DANIDA Background Information for Stakeholder Workshop on Cashew Master Plan Development, June 2015*

In Africa, there are differences in the classification of processing scale. For example, 1,000 MT/year is considered a small-scale unit in Ghana, whereas in Côte d'Ivoire 3,000 MT/year is considered small scale. The classification of cashew processing scale is not yet standardized.

Moreover, raw cashew nut processing capacity ranges from small-scale processing, which is below 1000 MT/year to large-scale processing of about 30,000 MT/year.

The choice of processing scale to be set up by an investor depends on the following:

- Financial resources
- Choice of location
- Availability of raw materials
- Choice of machinery
- Management skills
- Relevant expertise and experience in cashew processing
- Availability and cost of labour

Before deciding on the processing scale, it is important to conduct a detailed investigation on existing factories and to verify manufacturers' claims of performance of the machinery. This information will then feed into a business plan. The choice of processing scale and technology determines the cashew processing system, which may be manual, semi-mechanised or fully mechanised.

## 4. Cashew Processing Systems

The choice of technology mix, availability of labour and technical expertise for raw cashew nut processing in several countries has resulted in different cashew processing systems. The three widely-used systems are (1) Manual, (2) Semi-Mechanised and (3) Mechanised Systems. The availability and costs of labour played a key role in the evolution of these cashew processing systems. Table 2 presents an overview of the three systems and their labour intensity.

**Table 2:** Comparison of Raw Cashew Nut Processing Systems

Manual Systems	Semi-Mechanized Systems	Mechanized Systems
Complete use of manually-operated machines	A mix of manually-operated and automated machines	Complete use of automated machines
Labour intensive	Less labour intensive than manual systems	Minimal labour force with high productivity per worker
Mostly small-scale processing	Mostly medium-scale processing	Mostly large-scale processing
Low technology mix	Higher technology mix than manual systems	High technology mix
Low production* capacity	Higher production* capacity than manual systems	High production* capacity
Low electricity usage	Higher usage of electricity than manual systems	Heavily dependent on the use of electricity
High percentage of whole kernels in packing	Relatively lower percentage of whole kernels in packing than manual systems	Relatively lower percentage of wholes in packing than manual and semi-mechanised systems

\*Production Capacity: Volume produced over time

Source: African Cashew initiative 2011, Cashew Nut Processing Equipment Study

The choice of equipment, machinery and processing method is linked to each of the following factors:

*Cost factors:*

- Cost and availability of labour
- Cost of energy, shipping and packaging
- Cost and efficiency of processing machinery
- Volatility of prices
- Prices for broken kernels relative to wholes
- Price for by-products such as CNSL

*Customer-driven factors:*

- Food security and safety
- Traceability requirements
- Labelling and packaging demands from customers
- Changing market structures: few customers with high demand for kernel volumes

*Other enabling factors for successful processing operations:*

- Good quality and well-dried raw cashew nuts
- Detailed investigation into existing cashew processing factories
- Working capital at a competitive interest rate
- Technical understanding of the process and equipment
- A process which gives an outturn of whole kernels at a minimum of 80 %
- Attention to food safety standards
- A market for the less valuable and broken grades
- Availability of labour
- Business climate and government policies in the cashew sector
- Market information on raw cashew nuts and on cashew nut processing

Making early and timely decisions on the above factors is important for the success of the cashew processing factory.

## 5. Cashew Processing Models

When setting up a processing factory, the investor may adopt a range of methods or models. The commonly adopted processing models at the heat treatment stage of the cashew processing process are *steam & cut*, *drum roasting* and *oil bath roasting* (see table 3).

The *steam & cut* method is commonly referred to as steam cooking or simply steaming of raw cashew nuts. A boiler is filled with raw cashew nuts and pressurized water vapour is generated and introduced into the boiler for the steaming process over a period of time.

The *drum roasting* method involves application of direct heat below a tilted perforated drum in which the nuts are continually fed and discharged. The drum is continuously rotated to burn the nut shells and make them brittle for shelling. This method is no longer popular among cashew nut processors because lower quality cashew kernels are obtained from this method.

The *oil bath roasting* method was introduced in the 1930s. This method involves filling raw cashew nuts into a tank of hot CNSL. In this process, CNSL is extracted from the raw cashew nut shell, thus making them brittle for shelling.

Today, the *steam & cut* model is the most dominant method used in raw cashew nut processing. The model adopted at each stage is influenced by factors such as availability and quality of raw materials, labour, and factory location.

**Table 3:** Heat Treatment Models for Cashew Processing

Steam & Cut	Drum Roasting	Oil Bath Roasting
Most commonly used method	Traditional method, still in use for small-scale processing and in few set-ups	Developed from demand for CNSL and improvement on drum roast
Employs steam cooking	Employs direct heating of nuts in a drum	Employs hot CNSL bath to extract CNSL of nuts and to make them brittle
Gives a whiter colour of kernels than other methods	Gives many scorched kernels	Gives whiter colour of kernels than drum roast

Steam & Cut	Drum Roasting	Oil Bath Roasting
Widely endorsed for food safety practices	Not easy to comply with food safety practices; process is unclean	Relatively food safe, more compliant than drum roast
Concentrates CNSL in shells leading to burning/ blistering of hands during shelling, if not properly handled	Liberates CNSL in fire, hence little or no effect on hands	Liberates CNSL in process, hence no effect on hands
Nuts most suitable for cutting* <sup>1</sup>	Nuts most suitable for cracking* <sup>2</sup>	Nuts suitable for cutting and cracking
Relatively high cost of equipment and operations	Very low cost	Relatively higher cost of equipment than drum roast
Shells can be used for CNSL extraction for extra revenue	Loss of CNSL, no extra revenue	Extracts CNSL as by-product of process, extra revenue

\*<sup>1</sup> The cashew shell is split open longitudinally

\*<sup>2</sup> The cashew shell is split into many parts

Source: African Cashew initiative 2011, Cashew Nut Processing Equipment Study

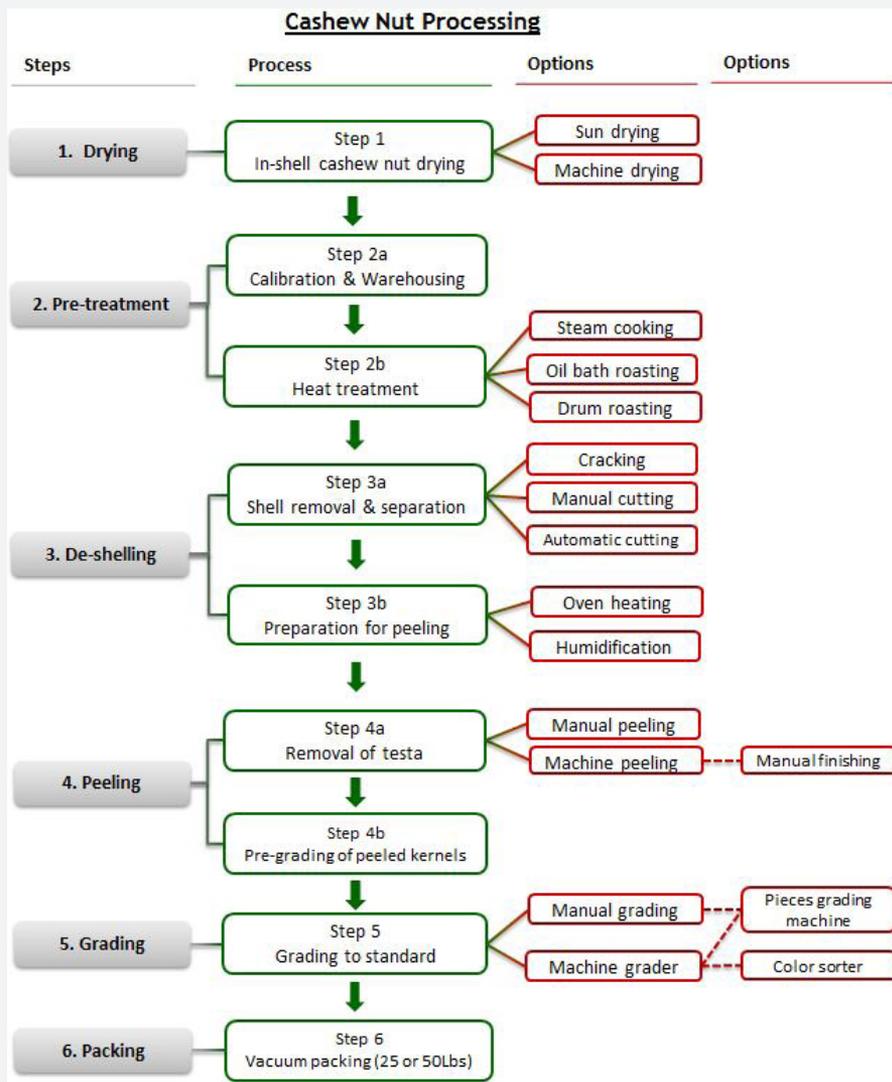
## 6. Six Steps in Processing of Raw Cashew Nuts (RCN)

The six (6) commonly adopted steps in raw cashew nut processing are:

1. Drying of RCN
2. Pre-treatment of RCN (warehousing, calibration and heat treatment)
3. De-shelling (removal & separation, oven drying and humidification of kernels)
4. Peeling (removal of the testa from the kernel)
5. Grading of the kernels (classification of kernels into different quality grades)
6. Packaging the kernels for storage and shipment

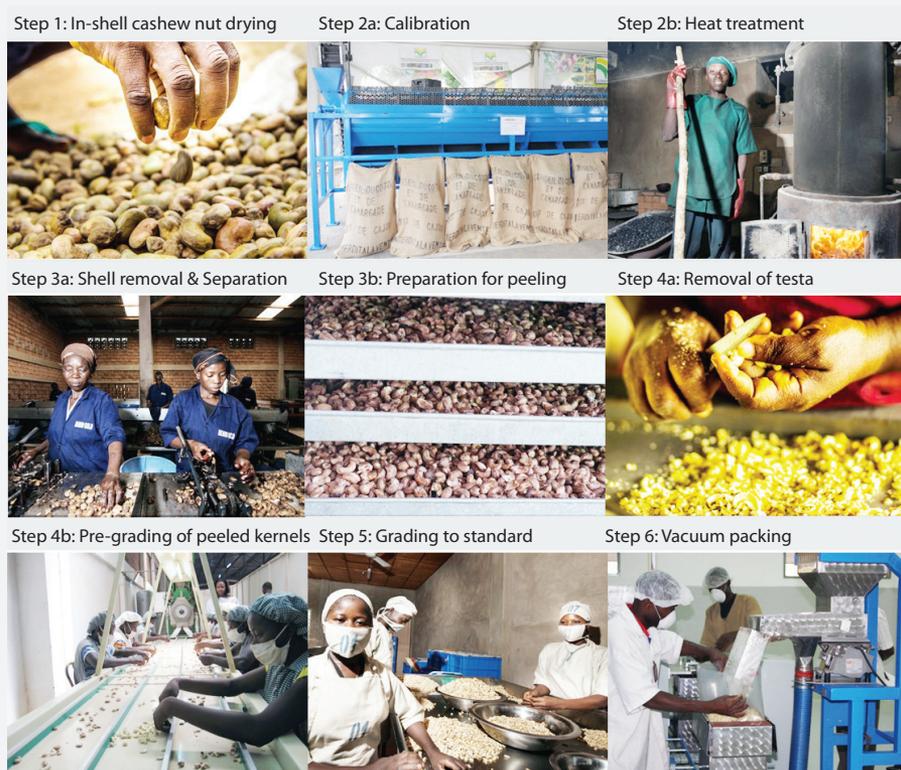
These steps are illustrated below in Figure 1.

**Figure 1: Basic Steps in Cashew Processing**



Source: African Cashew initiative 2011, Cashew Nut Processing Equipment Study

**Figure 2:** Pictorial View of Cashew Processing Steps



The six (6) steps are now described in detail.

Source: *Competitive Cashew initiative 2016*

## 6.1 Drying of RCN

Drying is the first processing step after procuring raw cashew nuts. The raw cashew nuts are dried to reduce the moisture content to a maximum 9 % w/w ideal for warehousing. This moisture content slows down or completely prevents deterioration of the raw cashew nuts during storage. Drying is done either on a clean concrete floor or on tarpaulins spread on a flat surface. Modern drying methods involve the use of drying machines that run on electricity.

Well-dried nuts are bagged in jute sack for warehousing and use throughout the year.

## 6.2 Pre-Treatment of RCN

Pre-treatment covers all processes before shelling. It involves three (3) steps: calibration, warehousing and heat treatment of the dried nuts.

- a) *Calibration of nuts*: Calibration is the process of grouping the nuts into various sizes according to the diameter of raw cashew nuts. Commonly used sizes are: 18 mm, 20 mm, 22 mm, 24 mm and more than 24 mm. The nuts are first calibrated and then stored in jute sacks according to size. The calibration of nuts is especially important with mechanised shelling machines for the accurate adjustment of cutting blades. The processing of same sized nuts during the shelling process reduces breakage and facilitates grading of kernels.
- b) *Warehousing*: This is storing the procured raw cashew nuts for processing throughout the year. Processors must secure their raw cashew nuts during the cashew season which lasts three to four months every year. Proper warehousing prevents damage to the nuts by insect pests and pathogenic organisms. It maintains the quality of the nuts throughout the year.

The dried, calibrated nuts are packaged in jute bags with standard net weight of 80 kg per bag and arranged in stacks on pallets to avoid contact with the floor and thus prevent the dried cashew nuts from absorbing moisture. The stacks are placed in one-metre distance to the walls and with two to five metres' space between the roof of the warehouse and the top of stacks to avoid excessive heating and scorching of the raw cashew nuts. Properly arranged stacks enable visible counting of the bags, which facilitates control of the stock throughout the year. The warehouse should be well ventilated to minimise humidity and be equipped with fire extinguishers.

- c) *Heat treatment of RCN*: Heat treatment eases the separation of the kernel from the shell. There are three methods of heat treatment: steaming, drum roasting and oil bath roasting. Steaming is the dominant method for heat treatment of raw cashew nuts. The steaming of raw cashew nuts is done in a boiler to make shells brittle and easy to cut. Once the steaming process is complete, the nuts are spread evenly on a clean surface to facilitate complete cooling, which is referred to as air drying.

The process of steaming concentrates the CNSL into a jelly-like fluid to reduce the corrosive effect of CNSL on workers' hands during manual shelling.

## 6.3 De-Shelling

De-shelling is the process of separating the kernels from the raw cashew nut shells. The objective of de-shelling is to obtain the highest percentage of whole/complete kernels and to prepare them for easy peeling. De-shelling is the most critical step

of processing raw cashew nuts. Precision and accuracy are most important to avoid kernel breakage. The de-shelling process consists of two (2) steps:

- a) *Removal of the shell:* The shell is removed by cracking or cutting the raw cashew nuts to obtain the kernels. This is done by the use of manually-operated machines or fully-mechanised shelling machines to cut open the shells. The kernels are separated from the shell in three different ways: by hand, with a small pointed tool, or with a separation machine. Existing machines are unable to fully separate the kernels from the shells. Consequently, manual separation of the kernel and the shell is required.

The corrosive effect of CNSL in the raw cashew nut shells that cause blisters or burning of the skin can be prevented by rubbing vegetable oils (coconut oil, castor seed oil, linseed oil, flax seed oil) or ashes on workers' hands. Another protective measure is wearing rubber gloves during the shelling process.

After separation, kernels are grouped into three categories: 1) whole kernels 2) broken kernels and 3) rejects. The whole and broken kernels undergo further processing to obtain the final cashew kernel. The rejects undergo a revision process to obtain kernels that can be further processed into high quality kernels.

The shells are used as fuel for machines in the cashew processing factory. Other uses of the shell are biofuel and extraction of CNSL. The residual mass from the CNSL extraction may be used as fuel briquettes. These by-products of the shell are marketed for increased competitiveness (for more information, see [www.comcashew.org](http://www.comcashew.org))

- b) *Oven drying and humidification:* Oven drying and humidification, also called thermal shock, facilitates the removal of the testa without breaking the kernels. Kernels are heated (dried), humidified and heated again to complete the thermal shock process. Contraction and expansion through the thermal shock process breaks the strong adhesive force between the testa layer and the kernel. While drying reduces the moisture content of the kernels and results in the contraction of the testa, humidification increases the moisture content and causes expansion of the testa.

Specially-designed ovens called Borma are used for oven drying. The humidification is done in a humidifier or thermal shock chamber. Modern thermal shock systems combine drying and humidification in the same chamber. A detailed overview of available machines can be found in Cashew Processing Guide Number 3: Guide to Raw Cashew Nut Processing Equipment.

## 6.4 Peeling

Peeling is the process of removing the testa from the kernel. Most factories use peeling machines combined with manual peeling. Peeling machines use friction and air pressure to remove the testa from the kernel. However, mechanised peeling does not remove all testa from the kernels. Thus, mechanised peeling is often combined with manual peeling to fully remove the testa. The success of mechanised peelers largely depends on the inherent peelability of the kernels and efficiency of the thermal shock treatment. In the fully manual peeling method, small knives are used to remove the testa.

Mechanised peeling results in higher percentage of broken kernels than manual peeling. Thus, equipment manufacturers are continuously improving peeling machines to minimise the occurrence of broken kernels.

## 6.5 Grading

Grading involves the classification of the kernels based on colour, shape and size. Grading can be done manually, using highly-trained skilled labour or with cashew grading machines which can be obtained from different suppliers. See Guidebook no 3: Guide to Raw Cashew Nut Processing Equipment.

Cashew kernels are graded into white (W), scorched (S) and desert (D) for colour and either whole (W) kernels or broken kernels for shape. Broken kernels are further graded by shape into splits (S), butts (B), pieces (P) and baby bits (BB). This is the classification scheme of the Association of Food Industries (AFI).

**Table 4:** Grading of cashew kernels

Grading parameter	Grading designation
Colour	White (W); Scorched (S); Dessert (D)
Shape	Whole (W); Broken kernels
Size	Whole: 140 – 500 Broken kernels: e.g. splits (S), butts (B), pieces (P) and baby bits (BB)

Source: Association of Food Industries: [www.afius.org](http://www.afius.org)

### 6.5.1 Classification based on Colour

Cashew kernels are also classified according to colour which is white (W), scorched (S) or dessert (D). However, the colour classification also takes into account kernel sizes which are whole or broken pieces. Table 5 shows the grades and corresponding colour characteristics.

**Table 5:** Cashew grades and characteristics

Grade	Colour characteristic
First quality fancy	Uniformly white, pale ivory or light yellow.
Second quality scorched	Yellow, light brown, light ivory, light ash-grey or deep ivory.
Third quality special scorched	Deep yellow, brown, amber, and light to deep blue. They may be slightly shrivelled, immature, and light-brown speckled, blemished or otherwise discoloured.
Fourth quality	They have the same colour characteristics as the first or second quality but have pitted spots.
Lightly blemished wholes (LBW)	Light brown, light ivory, light ash-grey or deep ivory. Kernels may show light brown speckles or blemishes on the surface, provided that not more than 40 % of the kernels are affected.
Lightly blemished pieces (LP)	They may be light brown, light ivory, light ash-grey or deep ivory. Pieces may show light brown speckles or blemishes on the surface, provided that not more than 20 % of the pieces are affected.
Blemished wholes (BW)	Deep yellow, brown, amber or light to deep blue. Kernels may be slightly shrivelled, immature or may be brown speckled or blemished on the surface, provided that not more than 60 % of the kernels are affected.
Dessert (D)	Cashew kernels may be scraped, deeply scorched, shrivelled, deep-brown-speckled, black-speckled, blemished or otherwise discoloured.

Source: AFI specification for cashew kernels; [www.afius.org](http://www.afius.org)

## 6.5.2 Classification based on Shape

Depending on their shape, cashew kernels are classified<sup>1</sup> into whole and broken grades which are butts, splits or pieces as follows:

**Figure 3:** Classification of shapes of cashew nuts according to the AFI criteria.



### Whole (W)

A cashew kernel is classified as whole if it has the characteristic kidney shape of a cashew kernel and not more than 1/8 of the kernel has been broken off. This grade is labelled as grade W.



### Butts (B)

Butts are kernels which have been broken crosswise. They are less than 7/8 but not less than 3/8 of a whole kernel and the cotyledons are still naturally attached. This grade is labelled as grade B.



### Splits (S)

Splits are kernels that have been split lengthwise and not more than 1/8 of its cotyledon has been broken off. This grade is labelled as S.



### Pieces

Pieces are smaller size broken kernels. They are categorized into the following grades in a decreasing size order:

- large pieces (LWP, SP, SPS, etc.)
- small pieces (SWP, SSP, DSP, etc.)
- chips (CHIPS, SSP1, SSP2, SSP3)
- baby bits (BB, G1, G2, G3)
- fine grains (X)
- fines (FE)
- mixed pieces (P1M, P2M, P3M)



Source: Association of Food Industries; [www.afius.org](http://www.afius.org); Photo source: GIZ/ComCashew 2016

1 Definitions are based on AFI descriptions retrieved from [www.afius.org](http://www.afius.org)

### 6.5.3 Classification based on Size

Size is an estimation of the amount of kernel per kilogramme or pound. Classification by size is compulsory for first quality/fancy cashew kernels but is optional for other whole grades (see table 5).

**Table 6:** Size designation of cashew kernels

Size Designation	Count per Kilo	Pound
180	266 - 395	140-180
210	395 - 465	180-210
240	485 - 530	220-240
320	660 - 706	300-320
450	880 - 990	400-450

Source: Association of Food Industries; [www.afius.org](http://www.afius.org)

Cashew kernel sizes are classified in two broad categories:

1. Sizing of whole kernels includes 'size count' of 180, 210, 240, 320, 450 and less frequently 500. Note: the size count is the number of cashew kernels in 1 lb of cashew sample being considered. For the size grade 180, for example, the number of kernels should ideally be 180 with an allowable range of below 180. That for size grade 210 is 181 to 210.
2. Sizing of broken kernels includes large and small kernels.

A combination of these sizing characteristics results in 27 conventional international grades. However, there can be more than 27 grades depending on the country of origin and market demand.

### 6.5.4. Classification Order

Grading cashew kernels is done in the order of colour, shape and size.

A white coloured whole kernel in the size 180 will be referred to as WW180, meaning White, Whole, size 180. Another example of a grade is SW240, meaning Scorched, Wholes, size 240.

However, few exceptions exist in the classification of broken kernels:

A white coloured butt is referred to as FB (fancy butts). Similarly, FS is referred to as fancy splits. Other exceptions are LWP (Large White Pieces) and SWP (Small White Pieces).

Table 7 presents the conventional grades and their full descriptions based on AFI Standards that are commonly used in the cashew industry.

**Table 7:** Conventional grades of cashew kernels

No.	Grade	Description
<b>White kernels</b>		
1	WW180	White Wholes 180
2	WW210	White Wholes 210
3	WW240	White Wholes 240
4	WW320	White Wholes 320
5	WW450	White Wholes 450
6	WW500	White Wholes 500
7	FB / WB	Fancy Butts (White Butts)
8	FS / WS	Fancy Splits (White Splits)
9	LWP	Large White Pieces
10	SWP	Small White Pieces
11	BB	Baby Bits
<b>Scorched kernels</b>		
12	SW180	Scorched Wholes 180
13	SW210	Scorched Wholes 210
14	SW240	Scorched Wholes 240
15	SW320	Scorched Wholes 320
16	SW450	Scorched Wholes 450
17	SW500	Scorched Wholes 500
18	SB	Scorched Butts
19	SS	Scorched Splits
20	SP	Scorched Pieces
21	SSP	Scorched Small Pieces
<b>Dessert kernels</b>		
22	DW	Dessert Wholes
23	SSW	Scorched Second Wholes
24	DB	Dessert Butts

No.	Grade	Description
25	DS	Dessert Splits
26	DP	Dessert Pieces
27	SPS	Scorched Pieces Second

Source: AFI; [www.afius.org](http://www.afius.org)

## 6.6 Packaging of Processed Cashew Kernels

After grading, the kernels are stored in containers according to grades and labelled for identification. The kernels are then conditioned for packing by maintaining moisture contents of 3.5 % – 4 % ,which is ideal for packaging. The maintenance of the ideal moisture content is achieved by either drying or humidification to reach the required moisture content. Low moisture levels result in breakages after packaging, whereas high levels of moisture induce blockage or clamping of kernels after packaging.

Kernels are fumigated before final packaging to prevent infestation by arthropod pests and pathogenic organisms.

To buyers, vacuum packing is the most acceptable method for packaging cashew kernels. This packaging method involves back flushing the kernels with a mixture of carbon dioxide and nitrogen to prolong the shelf life. Recent developments in cashew kernel vacuum packing technologies have increased efficiency and compliance with international food safety requirements.

Plastic bags of two sizes, specifically designed for cashew, are demanded by most buyers for packing the 25 lbs and 50 lbs bags. Gulf countries, however, prefer tin packaging. Most Indian kernel exporters, therefore, use two different packaging methods.

The packaging facility should be designed in compliance with international food safety standards and to meet the buyer requirements. It is the responsibility of management to ensure full compliance with international food safety requirements for cashew.

## 7. Quality Standards in Cashew Processing

Quality standards are established for cashew kernel marketing and processors are required to meet kernel buyer specifications.

In the international market, stringent quality specifications are assigned to cashew kernels. Processors and buyers operate in the context of the international quality standards. Beyond the international quality standards, kernel buyers make specific requests in relation to packaging, kernel grades and consistency of supply. Current quality specifications for cashew are as follows:

- a) The Association of Food Industries (AFI) standards were developed for the American market, but are widely used by kernel buyers globally. The AFI standards for cashew kernels are based on the quality and finishing of kernels (consistency in size, shape, colour and final packaging). It is widely used in the cashew industry as a benchmark for cashew kernels. The specifications focus on the quality of the product, which includes grading, moisture levels, blocking, and food safety. It also provides guidelines for packaging, labelling, and inspection of the product as well as the documentation of export. To access the US market, a cashew processor must meet the AFI standards in addition to other local and international requirements. For detailed and comprehensive information about the AFI and its standards for cashew kernels, visit [www.afius.org](http://www.afius.org).
- b) The Cashew Export Promotion Council of India (CEPCI) - <http://cashewindia.org/> has developed quality standards specific to the Indian market. Currently, the cashew environment in India is not favourable for kernel export from Africa.
- c) The United Nations Economic Commission for Europe (UNECE) has developed a set of quality specifications for the European market. The UNECE standards for cashew kernels focus on the description of the product, the quality and sizing, as well as presentation and marketing of the product. The standards encourage high-quality production, improved profitability and protected consumer interests. Though it is developed for the European markets, it is rarely used. The reason is that AFI standards were developed earlier and have since been used by US and European buyers. For more information on the UNECE standards for cashew kernels, visit [www.unece.org/trade/agr/](http://www.unece.org/trade/agr/).

Processors should confirm the preferred quality standard with prospective kernel buyers before supplying the products. Failure to comply with a buyer's quality standard results in rejection of the consignment or reduced price of the kernel.

## 8. Key Factors for Successful Cashew Processing

This section describes the essential factors that determine the successful processing of raw cashew nuts. Processors must, therefore, consider and apply these factors to guarantee successful processing of raw cashew nuts.

Key factors for successful cashew processing are documentation, quality control and supervision:

- a) *Documentation*: The processors should make records at all stages of the processing process. It is especially important to record weight loss of the kernel throughout the process to make informed decisions in process management to improve efficiencies. Every section of the factory must keep records of daily processing information which are fed into a centralised reporting system for management.

### Box 1: Key parametres to be monitored in a cashew processing factory for successful processing and competitiveness

- Productivity / quantities
- Yield (per kilo / percentage of wholes / percentage of whites)
- Quality and quality consistency (percentage of whites / colour / grades / moisture content)
- Losses (quality / quantity)
- Processes
- Critical control points related to food safety
- Utilities (e.g. electricity / water / ICT)
- Traceability from stored raw cashew nut to packaged high quality kernel
- Efficient use of materials (e.g. oil / gloves / packaging materials)
- Machinery and Technology

- b) *Quality Control*: Quality assurance is important at all stages of the processing process and is an integral part of the process. An efficient Quality Management System (QMS) serves as a quality assurance tool. Quality inspections take place at each step of the processing process to achieve food safety and high quality kernels.

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## Box 2: International food safety requirements for cashew

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Cashew is directly consumed, therefore, food safety is important to minimise contamination and thus food poisoning. Consequently, the international food safety standards prescribe guidelines for food safety that also apply to cashew.

A cashew processor needs to be aware of these standards for a consistent approach to food safety management. Beyond the basic food regulations and acceptable workplace practices, the cashew processor must make contingency plans for potential crises such as product recalls or outbreaks of food poisoning. An efficient Food Safety Management System (FSMS) on factory level contributes to compliance with national food safety regulations and ensures that the finished product is safe for consumption and in accordance with international guidelines on food safety. Examples of FSMS that are applicable to cashew processing are:

- **ACA seal:** [www.africancashewalliance.com](http://www.africancashewalliance.com)
- **British Retail Consortium (BRC):** [www.brcglobalstandards.com](http://www.brcglobalstandards.com)
- **HACCP:** [www.fda.gov/Food/GuidanceRegulation/HACCP](http://www.fda.gov/Food/GuidanceRegulation/HACCP)
- **ISO 22000:** [www.iso.org](http://www.iso.org).

For more information, see GIZ/ComCashew (2018) Cashew Processing Guide Number 5: Food Safety, Traceability and Sustainability in Raw Cashew Nut Processing.

- c) *Supervision:* Cashew processing is a sequence of technical processes. It can take up to 7 days for a raw cashew nut to go through all the steps of the processing process. Mistakes at any stage of the process can reduce kernel quality or quantity and thus loss of revenue. Efficient daily supervision is, therefore, required to ensure high volumes of quality kernels result from the processing process.

## 9. Guidelines for Management of a Raw Cashew Nut Processing

The key to a profitable processing facility is good management. Here are some guidelines for the successful management of a raw cashew nut processing factory:

### *Essential Tasks*

- Make informed decisions based on facts
- Employ skilled and experienced management staff
- Assign persons with the right skills for the jobs
- Enforce proper documentation, bookkeeping and monitoring (gather data, analyse, interpret and use this information to improve the process)
- Establish and implement an efficient quality management system to ensure compliance with international food safety standards
- Monitor and enforce maintenance of machinery
- Enforce factory maintenance
- Implement an efficient pest management system in stores
- Practice good financial management

### *Daily Attention*

- Implement effective supervision of workers
- Monitor and evaluate every step of the process
- Monitor customer feedback
- Conduct strategic planning of daily activities
- Establish and monitor worker welfare, health and safety
- Implement measures to prevent fire outbreaks
- Build and maintain good customer relationships

### *Regular Attention*

- Implement traceability mechanisms
- Develop business sustainability

- Outsource and stock appropriate spare parts for your machinery
- Develop a workable procurement plan
- Provide working tools and consumables
- Conduct logistic planning and management
- Design strategies for sales promotion
- Practice environmental impact management
- Develop strategies for corporate social responsibility
- Perform insurance and risk management

Encouraging words from Cashew Master Trainer, Ardiata Traore, from Gebana Afrique in Burkina Faso: “Never stop learning”.

**Figure 4:** Master Trainer Ardiata Traore



*“Never Stop Learning” – Ardiata Traore, Gebana Afrique, Burkina Faso*

Source: GIZ/ComCashew

## Recommended Reading

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## Glossary of Raw Cashew Nut Processing Terms

**Calibration of raw cashew nuts:** Grouping the raw cashew nuts into various sizes (based on the diameter of the nuts) to facilitate shelling and reduce breakage during processing.

**Cashew Nut Shell Liquid (CNSL):** Caustic liquid found in the cashew shell.

**Cashew processing lines:** A complete set of equipment required for RCN processing.

**Conventional:** Cashew kernels produced and processed without organic or fair-trade certification.

**Drum roast:** Method of heat treatment of raw cashew nuts by use of direct heating of raw cashew nuts in a drum.

**Food safety:** Handling, preparation and storage of food in ways that prevent foodborne illness. It includes a number of routines that should be followed to avoid potentially severe health hazards.

**Grading:** Classification of the kernels based on colour, shape (whole/broken) and size. Grading is done manually or with machines.

**HACCP:** Hazard Analysis and Critical Control Points – Factory safety system.

**Hand cracking:** Shelling (separation of kernel from shell) raw cashew nut manually using small hand shelling machine.

**Heat treatment:** Application of direct heat, hot oil or steam to the cashew nuts in preparation for breaking of the shells. Heat treatment makes it easier to remove the shells.

**Kernel:** Consumer product obtained after processing of raw cashew nut is the kernel. The kernel is the edible part of the raw cashew nut.

**Kernels Outturn:** The weight of kernels obtained during processing of a given quantity of RCN, usually expressed as a percentage.

**Oil bath:** Method of heat treatment using hot CNSL bath to extract CNSL of raw cashew nuts to make them brittle.

**Outturn (in RCN trade):** Weight of kernels in pounds per 80kg bag of in-shell nuts. Outturn (in RCN trade) is not the same as kernel outturn as the cutting test does not establish breakage, grades and processing losses.

**Oven drying & humidification of kernels:** Application of heat to kernels, followed by subjecting the kernels to humid conditions. While drying reduces the moisture levels of the kernels and brings about contraction of the testa, humidification increases the moisture levels and leads to expansion of the testa. This process facilitates the removal of the testa without breaking the kernels. The process is also described “thermal shock”.

**Peeling:** Removal of the testa from the kernels. The objective is to obtain the kernels whole and intact. Peeling is done either by peeling machines or by hand, using small knives.

**Quality standards:** A set of criteria on the requirements, specifications, guidelines or characteristics to ensure that materials, products, processes and services are fit for their purpose.

**RCN:** Raw Cashew Nuts – also known as in-shell nuts. These are dried raw cashew nuts with the shell still intact.

**Shell:** Outer coat of the raw cashew nut before shelling.

**Shelling:** Removal of the cashew kernel from its shell or separation of the kernel from its shell. This is achieved through cracking or cutting to expose the kernel with testa for separation.

**Testa:** Inner skin surrounding the cashew kernel after the shell has been removed. The testa lies between the shell and the white kernel. During processing, the testa is removed after having been rendered brittle or soft by heat treatment.

**Vacuum packing:** Method required by buyers for packaging cashew kernels. The process involves a vacuum and back flushing with a combination of carbon dioxide and nitrogen to prolong the shelf life of the kernels.

**Warehousing:** Storing the raw cashew nuts procured for processing. It ensures the continuous supply of raw nuts throughout the year.

**Yield in processing:** Mass of kernels in grams per kilogramme of in-shell nuts (%)

**Yield per hectare or tree:** Gross weight of cashew nuts per tree or per hectare

## Acronyms and Abbreviations

<b>ACA</b>	African Cashew Alliance
<b>ACI</b>	African Cashew initiative, led by GIZ (since 5/2016 renamed ComCashew)
<b>AFI</b>	Association of Food Industries, USA
<b>BMGF</b>	Bill & Melinda Gates Foundation
<b>BRC</b>	British Retailers Consortium
<b>CEPCI</b>	Cashew Export Promotion Council of India
<b>CNSL</b>	Cashew Nut Shell Liquid
<b>GIZ/ComCashew</b>	Competitive Cashew initiative, led by GIZ, formerly African Cashew initiative (GIZ/ACi)
<b>EU</b>	European Union
<b>FAO</b>	Food and Agriculture Organisation of the United Nations
<b>FAOSTAT</b>	Food and Agriculture Organisation Statistics
<b>FSMS</b>	Food Safety Modernisation Act
<b>GIZ</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German International Cooperation)
<b>HACCP</b>	Hazard Analysis & Critical Control Point
<b>NGO</b>	Non-Governmental Organisation
<b>QMS</b>	Quality Management Systems
<b>RCN</b>	Raw Cashew Nut
<b>TNS</b>	TechnoServe
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>US/USA</b>	United States of America
<b>USDA</b>	United States Department for Agriculture
<b>w/w</b>	Weight by weight







## The Competitive Cashew initiative (GIZ/ComCashew)

The Competitive Cashew initiative, formerly African Cashew initiative (GIZ/ACi) presents a new and innovative model of broad-based multi-stakeholder partnership in development cooperation. GIZ/ComCashew is a private-public partnership programme under the implementation of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, with funding from the German Federal Ministry for Economic Cooperation and Development (BMZ) as well as Cooperation Partners from the private and public sector.

GIZ/ComCashew's main objective is to increase the competitiveness of African cashew smallholders, processors and other actors along the value chain to achieve a lasting reduction of poverty in the project countries Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mozambique and Sierra Leone. GIZ/ComCashew aims at ensuring that by 2020, each of the 580,000 cashew farmers trained will earn an average additional annual family income of at least US\$600.

Beyond increasing farmers' direct income, the initiative aims at improving cashew-processing capacity in Africa, developing sustainable supply chain linkages and supporting a better organisation and coordination of the cashew sector. GIZ/ComCashew also strengthens initiatives in the cashew sector and responds to questions regarding investment and processing.

It is time to accumulate and share the valuable experience and knowledge gained in the cashew sector from farm to fork with policy makers, industry as well as potential investors in the cashew sector.

This *Guidebook on the Cashew Processing Process* is a practical guide for new investors and existing processors in the raw cashew nut processing business.

It provides valuable information on the following:

- Cashew factory size
- Specific processing steps, models, methods and systems to consider before investing in raw cashew nut processing
- The appropriate processing type to invest in
- Key steps in raw cashew nut processing
- Good practices to ensure viability and competitiveness of raw cashew nut processing

### Other Titles in this Series

- **Cashew Processing Guide Number 2:** Opportunities and Challenges in Raw Cashew Nut Processing
- **Cashew Processing Guide Number 3:** Guide to Raw Cashew Nut Processing Equipment
- **Cashew Processing Guide Number 4:** Guidelines for Choosing Raw Cashew Nut Processing Equipment
- **Cashew Processing Guide Number 5:** Food Safety, Traceability and Sustainability in Raw Cashew Nut Processing

