

Brazil nuts: Collection and Processing



Every year around October the rainy season starts in the Amazonian region of Bolivia. The rain plays an important role in the Brazil nut process. It causes the pods stem to rot and fall to the forest floor ready for collection. Another consequence is the swelling of the river Madre de Dios. This gives the collectors (castañeros) the chance to use boats to reach the areas that would otherwise be inaccessible. With this comes the task of reading the river as it can take either days or weeks to get to these remote areas depending on the flow and level of the river.

By January-March, when the majority of the pods (~90%) are expected to have fallen down 30-50mts from the trees, the collectors, with machete in hand and a basket on the back, get ready to dive into the jungle. Not only does this strategy maximise the number of nuts that can be collected at one time, but it also minimizes the risk of a 2-3kg pod falling from a tree and hitting them in the head. Once in the jungle the collectors cut the pods and empty them to remove the in-shell Brazil nuts. While collecting the pods off of the forest floor, the collectors will find pods from both the new and old crops. These can be differentiated by their colour as old pods are darker since they have been in a muddy environment for a long time. These nuts will be more prone to being attacked by microorganisms like *Aspergillus* species; therefore, they are at a higher risk of aflatoxins.

Once they have collected a considerable amount of nuts, the collectors transfer them to the “payoles”. This is a sheltered area for the nuts while they wait to be taken to the factory.

The collection of nuts (old and new crop) and the conditions in which they are maintained until they arrive at the factories will determine the quality of the raw material.

Good raw material maintenance at the forest will result in:

- better moisture control
- less rotten nuts
- less aflatoxins risk
- better yield

The transport to the factories will be by boat or by truck or both depending on the location of collection.

Freeworld Trading buy the Brazil nuts from Cobija and Riberalta, the former is a village situated next to the river Madre de Dios in northern Bolivia and is where the majority of the factories are located.

Once the product arrives at the factory, the nuts will go through a process which includes: reception, storage, drying in a cylinder, parboiling, manual/mechanical cracking, manual selection, grading, drying in oven, cooling, manual selection, inspection and packing.

At **reception** of raw material samples are taken to test the moisture level and inspect the percentage of damages, empty shells, decay, and foreign bodies. Since the collectors are paid based on volume instead of weight, the factories need to check the quality of the delivery. They do this by cutting 100 nuts in half to see their conditions and calculate the percentage of material affected. The limit of acceptance varies from 10% up to 30% depending on the time of year as well as the processor. As the time goes by the ageing process continues and as a consequence the quality of the material deteriorates. Visual inspection at reception also gives to the processor an idea of the quality of the raw material as shell of rotten nuts present a darker colour than good nuts.

The moisture level of the product at reception is between 20-35 %. This percentage varies to this extent because the moisture level depends on the time of year. As the year goes on, the nuts continue to dry, resulting in a lower moisture level later in the year. If the raw material is accepted it will be stored in warehouses where the product is shovelled. This is mostly done manually, however, a factory with higher technology will store it in large silos and aerated mechanically. The aim of this step is to balance the moisture level in the raw material.

Next, the nuts are graded by size to allow for better control during the rest of the process.

Subsequently, **drying in cylinders** for 20-30hs at 60-70 °C reduces the moisture level to 12-14%. This step also helps to remove the dust on the shell of the nut and polish it. The decrease in moisture actually benefits the nut because it slows down the rotting process and allows for it to be stored for a long period of time until the product is required for processing.

Before cracking the nuts need to be parboiled. The **parboiling** is done in 2 cycles within an autoclave (pressure cooker system that aims to make the nuts more flexible inside to avoid it getting broken when it is shelled). The autoclave is injected with steam which is kept for few seconds, and then the steam is released. A second injection with the same pressure is applied. Once this finishes the autoclave is opened from the bottom and the nuts fall in to a tray where they are immediately showered with water at ambient

temperature (the ambient temperature in Riberalta is ~30°C). The moisture at the end of this process is about 18-22 %, being more concentrated in the shell (~11%) than in the kernel (~7%), as it is the shell which absorbs most of the moisture. The temperature of the mass is estimated to be 90 °C. Depending on the factory, a short drying period could take place after parboiling before continuing through the rest of the process.

Cracking could be done manually or automatically depending on the supplier. The system of the automatic cracking machine is by centrifugal force crashing the nuts against the wall and the shell is broken. With manual cracking the worker de-shells nut by nut with a cracker attached to a table.

The difference between these two systems is that the automatic cracking is more aggressive and can cause more damaged to the kernel as sometimes the same nut goes to the spinning drum twice. The manual cracking not only has the benefit of each nut being personally cracked resulting in less damage, but it also boosts the local economy as it requires more employees, generating a source of employment for the region.

Each person can de-shell between 60-120kg of raw material per day. This yields 20-25kg of shelled nuts every ~ 60kgs per worker per day.

After cracking the kernels are visually inspected and classified in to categories: first grade, chipped or broken.

Since workers are paid by kilogram of product, before continue on with the process the product is inspected for quality by the supervisors of this area.

In factories with advanced technology the nuts will undergo an inspection under UV lights. Aflatoxins appear fluorescent under UV light as a yellow-orange-green colour depending on the type of toxin and the concentration.

The next step is **grading** by size on a shaking table. The product is classified then in tiny, midget, medium, and large.

Once the product is selected and graded it is placed in trays or boxes and piled to go into the oven. Trays made of a wooden frame and metal mesh are checked daily and maintained when needed. This is where a possible contamination risk of wood, metal nails and wires could appear in the finished product. The boxes are made of wood and metal mesh or are just metal boxes. The disadvantage with the boxes is that the thickness of the layer of nuts in comparison to the trays. This thickness makes it more difficult for the nuts to be heated evenly in the oven.

The **drying** process in the ovens is variable: 12-14hs from January until June, and 8-10 hours from July onwards. This discrepancy is due to the changes in the

moisture level as the year goes by, as discussed earlier. The drying step in the oven is the first critical control point as this step will eliminate the microbiological risk that cannot be controlled in a subsequent step.

The product enters the oven when it has a temperature of ~ 40 °C. Every 2 hours the temperature is checked to ensure proper heating of the oven. The temperature slowly increases until it reaches 75 -80 degrees Celsius, where it is held for at least two hours as this the critical limit.

The initial moisture level of the kernels before entering the oven is 14-15 % and it finishes with a moisture level between 2.5-4.5%.

A cooling period takes place before the final selection processes.

The trays are taken into the final selection and packing room (high risk area) to pour the kernels on to the selection tables. In this room nuts are given their final selection and packed. Before **packing** each box is examined by inspectors on the area. Both, the packer and the supervisor have a distinguishing code that is printed on the carton, so each box can be identified by the day it was processed, the packer and the supervisor.

In each selecting table there is a funnel through which the nuts are poured into a plastic basket. Under the funnel there are one or two powerful magnets that are used to catch potential metal foreign bodies. This is the second critical control point, and as such, the magnets are challenged every day before processing. Six different pieces of metals are mixed with the nuts and passed through the funnel to confirm that the magnets still work.

Each carton is weighed to verify it is a satisfactory net weight. If not it is balanced by adding or removing nuts from the same lot.

Everyday personnel from the laboratory Labcar (Laboratorio de Control de Alimentos de Riberalta) visit each factory to take samples of the producing lots. Samples of 30g are taken until 3 samples of 10kg are formed. From this 30kg, 20kg go to the laboratory for a retention sample and for analysis (microbiological, chemical, physical and Organoleptic) and 10kg are kept by the factory.

Finally the metal foil bags are vacuum packed and the cartons sealed.

Once the 800 cartons that form the lot are finished, they are transported to La Paz as the storage conditions are better due to the weather, until it is shipped and continues its journey to the customer.