

Wet, Dry, and Everything in Between

How coffee processing affects your cup (Part 1 of 2)

Story and pictures by Willem J. Boot

DURING THE PAST DECADE I have noticed a new awareness among coffee roasters about the plight of coffee farmers and the critical impact of the cherry to green bean process on the quality of the roaster's final product.

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It is an ironic fact that this new consciousness was partially caused by the terrible coffee crisis which, during the past eight years, swept through the world of coffee farmers and producers like a destructive storm, pushing many Latin American coffee farmers out of the coffee industry in the process. While coffee farmers and producers around the world struggled to keep their businesses afloat, the trend emerged to re-engineer coffee processing mills by creating smaller and more costeffective stations, ones that are better able to meet the changing demands of international coffee buyers.

Around the same time, coffeeproducing countries became more aware of the potential negative environmental impact of the traditional coffee process. Countries like Costa Rica started to address problems caused by the serious biological contamination of drinking water as a result of coffee processing stations' waste water disposal. Water sanitation and recycling measures became mandatory for processing stations, and the installation of

environmentally-friendly pulpers was widely propagated.

Another contributing element to the changing awareness about coffee processing issues was the creation of coffee industry development programs financed by USAID and other European agencies. These programs are designed to benefit small farmers and producers and to provide an important source of education about quality improvement and coffee cupping practices.

Last but not least, there were the competition and auction programs like Cup of Excellence that introduced many Western coffee roasters and cuppers to the world of coffee farmers and producers.

As a result of all these developments, a new awareness has evolved among specialty roasters regarding the critical steps that make or break the quality of green coffee beans. Over the past years, a growing number of specialty roasting companies have developed direct continued on page 34



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relationships with coffee producers. The direct link allows both parties to communicate about the quality requirements of the deliveries, which obviously will strengthen the relationship over time.

#### Forays into Processing

My personal intrigue with the cherry to green bean process started while developing a direct relationship with the Ruiz family in Panama. Until the early '90s, their company had only sporadically exported coffee to specialty coffee buyers, and in those years most coffee from Panama was purchased at bargain price levels by large coffee buyers.

Initially, my father spent endless days in Panama cupping with Maria, Josue and Plinio Ruiz, comparing flavor profiles of their various coffee estates and creating different mixes between typica and caturra varieties. Our first direct relationship purchase consisted of only two pallets of carefully selected specialty green coffee beans. While our specialty company grew steadily, we

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built a major part of our business with those phenomenal quality beans from Panama. Because of our direct involvement with the producer, we received exactly the quality we were looking for and as a result, the relationship with Casa Ruiz has been very strong for more than 15 years.

Many years later, during one of my first visits to a large coffee mill in Costa Rica, I remember feeling overwhelmed by the size of a processing station in the Terrazu region. These washed-coffee processing mills really come alive toward the end of the day, when the pickers delivered their day's harvest to the processing station. The coffee pickers waited anxiously in a line, while their cherries were weighed, inspected for quality and finally dumped into a large tank that separated the floaters (cherries that did not come to maturation because of insect damage or a deficiency in nutrients) from other cherries.

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## There's an old

saying that goes: "There are many ways to produce bad coffee."

While observing the processing activities, I tried to make sense of the complex workings of the coffee mill. The vast number of washing channels, the steady sound of the pulpers, the ongoing stream of wet parchment beans, and the nervous activity of the workers created a slightly frenzied scene. And then there was the fruity aroma of freshly pulped coffee cherries. Unforgettable. Wherever you travel, coffee washing stations around the world are surprisingly similar in their dynamics. And yet the processing itself, as well as the end result, can be very different.

#### **Coffee Processing Basics**

There's an old saying that goes: "There are many ways to produce bad coffee." This definitely applies to the production process of green coffee beans. It also indicates how important it is for the producer to follow a clearly established protocol in the cherry-to-green-bean process. Worldwide, there are three methods for processing coffee cherries: the fully washed method, the natural sun-dried method, and a hybrid process, called the semi-washed or pulped natural method.

I asked Abdellah Bagersh, a wellknown Ethiopian processor and exporter, about the three most critical

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#### WET, DRY, AND EVERYTHING IN BETWEEN: COFFEE PROCESSING (CONTINUED)



steps in processing. "First it's all about the preservation of quality by receiving the best cherries and by separating unripe cherries," he says. "Second, the fermentation, at least if the coffee is fermented. If it's a washed coffee, the mucilage could also be mechanically removed. The fermenting time is an absolutely critical point where the quality

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could be lost. Third, the drying process. Dry it with vigilance. Make sure there is enough ventilation."

What was his worst processing mistake ever? Bagersh thought for a moment. "Once when I was preparing sun-dried coffee. The sugar in the cherry is a very volatile product. Because I was still learning how to dry the coffee, I made a vital mistake by over-fermenting the beans."

Before we get into the process of processing coffee cherries into quality green beans, let's look at the parts of the cherries themselves.

The coffee cherry has a unique composition:

An external skin or exocarp, which is usually dark red when ripe, sometimes yellow or it has incidentally a different color. For example, the variety purpuresence develops purple ripe cherries.

**The mesocarp**, which includes the pulp with the sticky, sugar-like substance called mucilage.

> It's definitely worth the effort to focus on the quality of incoming cherries.

**Two beans** (each is called an endosperm) that contain a germ or embryo. If one of the beans does not develop, the other grows into a peaberry bean, which has a distinct oval-round shape.

#### The Essence of Quality: **Picking the Best Cherries**

An ANACAFE study in Guatemala showed that even a minor percentage (0.5 to 3.5 percent) of green cherries can have a negative impact on the quality of the coffee. In blind tests, ANACAFE cuppers detected the presence of undesirable astringency in the cup as a result of non-discriminate picking techniques. Unfortunately, most coffee pickers in the world are paid for the volume they bring back, and picking only ripe cherries often reduces their daily output by 30 percent or more.

Nevertheless, for a producer with specialty coffee aspirations, it would be much more economical to pay the pickers a bonus for selective picking; the extra investment in selective picking will always translate in a higher coffee quality and, potentially, a much higher price.

During a recent visit to Colombia, I noticed coffee farmers were becoming more and more motivated to improve the quality of their coffee in order to meet the requirements of the specialty industry. In Colombia, most farmers have planted an incredible number of trees per hectare; in one farm I counted more than 8,000 trees per hectare! As a comparison, specialty coffee farmers in Panama will generally not plant more than 3,000 trees per hectare.

The tremendous density of trees in Colombia requires an extra number of pickers to selectively harvest the ripe cherries only. And that's where the problem starts for Colombian farmers. Labor is either not sufficiently available or the producers don't want to pay the pickers an incentive to harvest the coffee selectively. As a result, pickers are stripping the branches of the coffee trees instead of selectively picking ripe cherries only. Obviously this causes major quality challenges from the get-go, and that also explains

why I have noticed that so many coffee Countries like Rwanda, whose

samples from Colombia have youngish or greenish flavor notes. During a recent trip, we measured in one mill that more than 50 percent of the picked cherries were partially or entirely unripe. specialty coffee sector is thriving, demonstrate that it's definitely worth the effort to focus on the quality of incoming





cherries. Many mills and processing stations in Rwanda utilize a stringent inspection protocol of all incoming cherries that are offered for processing.

I also saw a similar, if much less organized, process at work recently in Zambia. With a child strapped on her back, a coffee picker displayed her day's

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harvest to the foreman of the mill who was inspecting the pile of cherries with a short wooden stick. He looked very serious and gave the impression that he disapproved of her cherry selection and for a moment it seemed as if he was going to refuse her cherries. Her eyes looked tired and angry at the same time. Her face was shiny with sweat. When her coffees were deemed to be of sufficient quality, she finally did receive the compensation for her day's work, which was about half a dollar.

Some coffee farmers in Hawaii use refractometers to measure the sugar content of the coffee cherries. The ripest coffee cherries will generally have the highest Brix value. This measurement technique is well adopted in the wine industry where grape producers will not pick their grapes without a proper reading of the Brix levels.

I asked Peter DuPont, coffee buyer for Estate Coffee, Denmark, what he looks for when visiting a coffee supplier's mill. "I look a lot at the mill itself," he says. "The pulping system, how clean they are, and how well they separate qualities. How they set the tolerances for the separation of lots for the first grades from the second to the third grades. As a roaster I prefer to buy the narrow top of the crop."

Unfortunately, those stringent protocols have not yet been adopted everywhere. When I showed photos of the high protocols to a group of coffee producers in Colombia, they could hardly believe their eyes and for a few moments they even questioned the authenticity of the picture!

So, how can you recognize a ripe cherry? Most importantly, there is the dark red to burgundy color. While squeezing the cherry, you feel how the parchment beans easily pop out and then you taste the sweet, mucilage coated parchment beans that usually have a lingering flavor of well-ripened mango, papaya or

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Defect

Black bea

Insect-damag bean

Dark brow bean

Malforme bean or shell





#### Defects Due to Plantation Conditions

	Character	Origin	Flavor
n	Black surface	Fungi attack	Harsh, ashy
ged	Circular holes	Coffee berry borer	Bland to bitter
'n	Brown to black surface	Attack by bugs on immature cherry	Fruity to harsh
d	Abnormally shaped	Growth defect	Low acidity, bland

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other exotic fruit. Mmmm, I have (literally) sweet memories of tasting the ripe cherries while hiking through a wild coffee forest in Kaffa, Ethiopia. And the flavor of ripe Geisha cherries in the highlands of Panama—papaya with a lemon, tamarindo aftertaste—is truly unforgettable.

#### Processing for the **Best Flavor**

After picking and selecting the ripest cherries, the producers need to be in full control of their cherry-to-green-bean process, whether it is fully washed, sundried natural or semi-dry. The moisture content of the ripe fruit generally does not exceed 65 percent. The key-objective of coffee processing is to extract the beans from the cherry and to dry the fruit to a maximum water content of 12 percent, which allows the preservation of the bean.

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Defects	Due	to	Harvest
			1101 0 0 30

Defect	Character	Origin	Flavor
Immature	Wrinkled surface	Unripe cherry	Low acidity, astringent, bitter
Quaker	Light brown color	Unripe	Bland, bitter
Rioy bean	Medicinal smell when cut	Over-ripe cherry	Medicinal, iodine
Sour	Outside is light; Inside is brown/reddish	Molds	Sour
Foreign matter	Sticks, stones, leaves	Improper selection during picking and grading	Bitter, woody, bland





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#### The Fully-Washed Method

At least 50 percent of all coffee in the world is processed wet, and for most specialty coffee producing countries this is the preferred processing style. The wet process generally guarantees a cleaner and more consistent flavor than the sundried or pulped natural method. During the wet process, the pulp, including the exocarp and part of the mesocarp, are mechanically removed with a coffee pulper. The remaining mucilage, which sticks to the parchment, must also be removed before drying. This can be accomplished in two ways: by fermenting the parchment beans (dry or in water) or by removing the mucilage mechanically.

During the actual fermentation process, there is a biochemical reaction or hydrolysis of the mucilage that surrounds the beans. This reaction is caused by enzymes (pectinases and

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#### Contest Rules

 The contest is open to anyone employed in the specialty coffee industry. However, employees of Ambex, New Harmony, Cinammon Bay Coffee or Roast magazine (and their affiliates) and their family members are not eligible to enter the contest.

 All poems must be original and previously unpublished in a book, nationally distributed periodical or web-based magazine. Forms must be in English and submitted by the author, who must be at least 18 years old.

3. Winners will be announced at the SCAA show in Long Beach, C.A. The winning entries will be published in *Roast* magazine and featured on the Davis Demitasse, Ambex and *Roast* magazine websites. Runner-ups will be mentioned in *Roast* magazine and on the Davis Demitasse website.

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pectase) that are present in the coffee cherries. The fermentation is finished when the mucilage is completely digested, which can be verified by rubbing and washing some beans by hand. You should listen for a grating noise, and the clean beans should feel slightly rough and gritty, like freshly washed pebbles.

The more modern method of removing the mucilage with a mucilage remover has the benefit of the water consumption (and potential contamination of surface water) being much lower.

Depending on the design of the mill and the philosophy of the producer, various intermittent steps can be used in the fully-washed method to sort out the densest and potentially best beans. One example is the manual washing and grading of parchment beans. The workers push the parchment beans with rakes through the washing channel, while someone in front controls the release gate. Heavier beans flow slower than lighter beans, and, as a result, the lightest beans will leave the channel first, leaving the heavier, denser beans in the washing channel. At the same time, the parchment is thoroughly cleaned of excess mucilage.

After all the washing and grading is completed, the parchment must be dried efficiently. Ideally, the drying is accomplished in two steps: first, pre-drying to

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#### Defects Due to Processing

Defect	Character	Origin	
Damaged bean	Bean fragment	Improper setting of equipment	
Zebra bean	Zebra stripes	Antestia Bug	
Rioy bean	Medicinal smell when cut	Soil	
Over- fermented or Stinker bean	Almost unrecognizable	Contamination	
Moldy bean	Visible mold	Improper drying	
Earthy bean	Smell of wet soil	Dried on wet ground	
Rubbery bean	Unrecognizable	Dried on highway	
Funky bean	Unrecognizable; mostly occurs in Sumatra Mandheling coffees	Pollution, often caused by drying on polluted ground	W
Hidey bean	Yellowish-brown	Overheating of oven	
Faded bean	Color somewhat faded	Improper storage: insufficient air circulation, ambient temperature too high	
Hulls or husks	Parts of dried cherry and/or parchment	Improper setting of equipment	E
Parchment bean	Bean still in parchment	Improper setting of huller	





#### WET, DRY, AND EVERYTHING IN BETWEEN: COFFEE PROCESSING (CONTINUED)



remove free moisture and second, the final drying, which will dry the parchment to a maximum moisture level of 12 percent. For both steps, various methods of drying can be utilized: drying in the open sun on a cement patio, sun-drying on racks, or mechanical drying using revolving cylinders.





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#### The Sun-Dried Process

The sun-dried process is generally used in areas with little or no access to water and countries like Brazil and Ethiopia rely heavily on this processing style. Often, the sun-dried process is used in combination with non-selective picking methods or in countries (like Brazil) where coffee cherries are harvested mechanically. In this processing style the entire cherry is dried, sometimes on elevated "African beds" in the sun and often on the open soil. Once sufficiently dried, the entire hull is removed mechanically to reveal the green beans.

The sun-dried process produces the remarkable natural coffee flavor, which ranges in taste from pungent and harsh to intensely sweet and fruity. Specialty sun-dried coffees are produced in Ethiopia (Harrar and Yirgacheffe Grade 3), Brazil (most areas) and Sumatra.

With all of these processing styles, there are important decisions to be made about specific techniques that can enhance the quality of the coffee.

#### The Semi-Dry Process

The semi-dry process, also called the pulped natural process, involves fewer steps. The cherry is pulped with a slightly different pulper as in the wet process. Instead of removing the mucilage after pulping, it is dried together with the parchment. During the final step, the dry parchment is hulled and graded. Specialty semidried coffee can be found in Brazil, Ethiopia, Sumatra and Costa Rica. Currently, producers around the world are experimenting with this process, specifically because of the benefits it offers for the espresso preparation method (less acidity, more body and potentially more sweetness).

With all of these processing styles, there are important decisions to be made about specific techniques that can enhance the quality of the coffee. Popular issues revolve around the choice between traditional fermentation and the use of the mucilage remover or the application of patio drying and mechanical drying or the fundamental choice for the washed or sun-dried natural method. Coffee experts generally love to discuss these topics around the cupping table. The next article



will focus on some of the newer developments in coffee processing and we will highlight some of the current popular discussions about the processing trends.



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