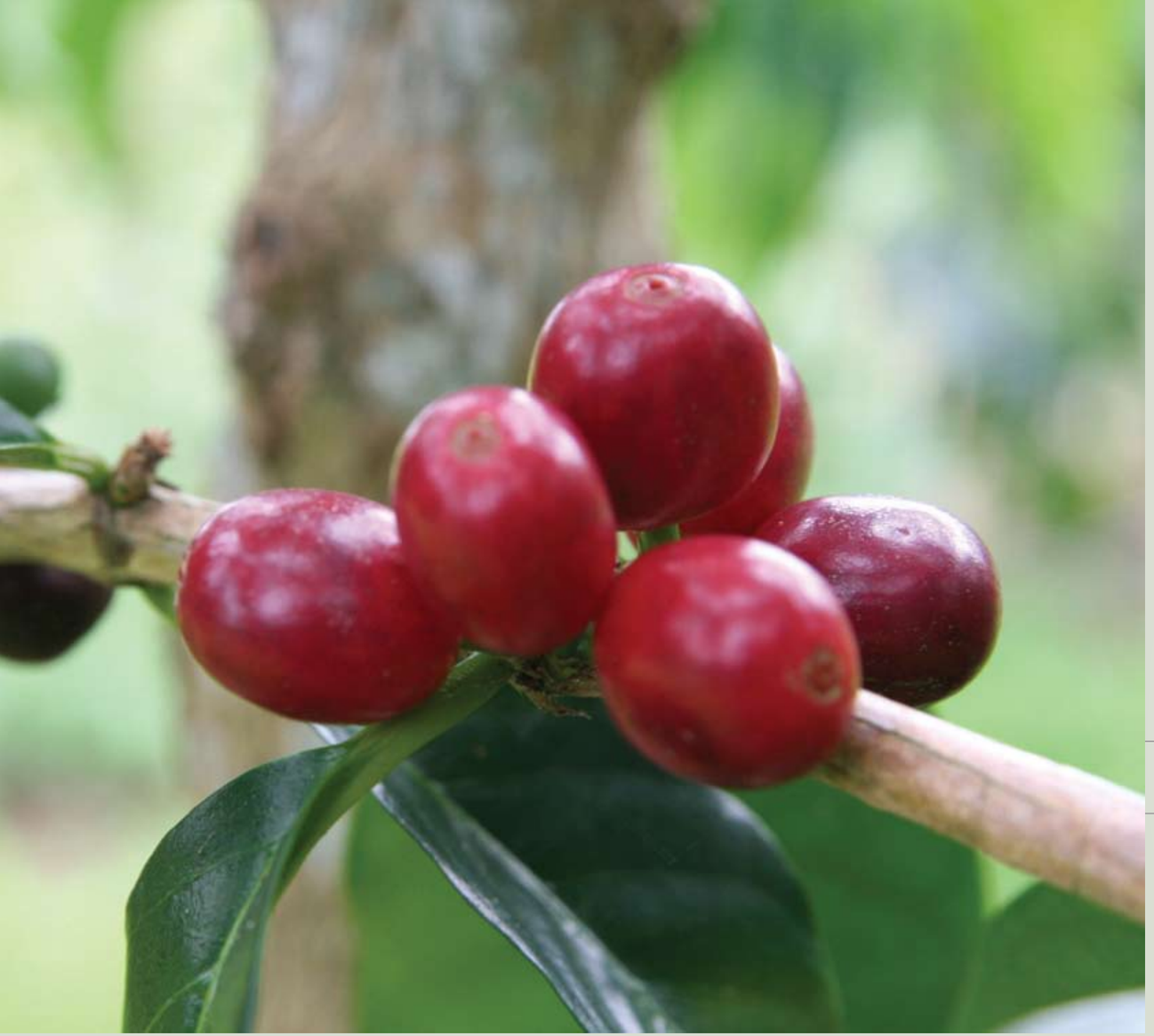

Handling *the* Cherry

The Risks and Rewards of Processing Methods

ORIGIN CASE STUDY: HAWAII

by Shawn Steiman

photos taken at Kona Earth Coffee Farm

Before the notion of specialty coffee made it to Hawaii coffee farms, the industry was fairly simple. For nearly a century, only one region had a significant amount of commercial coffee production: Kona (though there were others in the 1800s). For all that time, only a few processing mills handled nearly all the coffee. The coffee that came out was a blend of many farms. This homogeneity led to the creation of the Kona cup profile: simple, low to medium acidity, and no bitterness.

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In the 1990s, some farmers began to realize there was a new model to be followed. They split with tradition and converted into small estate farms—farms that maintain ownership of the coffee until it is sold to the consumer, often as roasted product. They began processing the coffee themselves or contracting someone else to do it. They designed labels, launched websites and operated as individual units within an established industry. Following the national trend, they roasted their coffee on the darker side of the spectrum but kept the traditional wet method for cherry processing that had helped define the Kona cup profile. When other growing regions in Hawaii appeared or were resurrected, nearly all the farms kept entirely with wet processing. At the time, the only exceptions were the large, mechanically harvested operations.

Much like everywhere else, in the last few years the cutting edge of specialty coffee has reached Hawaii. Some farms, no longer content with the cup profile their (typically) one-variety and one-cherry processing style produce, have begun experimenting with cherry processing methods to diversify their offerings. Why exactly are they doing this? What are the benefits? Is it worth it?

This article will take place in two sections. The first section will be a short journey through coffee cherry processing—what it is, how it is done, and what is it doing to the coffee. The second section will explore the current scene in Hawaii and delve into the minds of farmers who've taken up the challenge of creating new and exciting coffees by playing with cherry processing.

Basics of Cherry Processing

A conversation about cherry processing must start with the cherry itself. "Cherry" refers to the ripe fruit of the coffee plant, so named because most varieties have fruits that, when ripe, are the color and size (more or less) of a cherry fruit (*Prunus avium*). The visible, outer layer of the fruit (botanically, the exocarp) is attached to the moist, sugary, fleshy pulp (mesocarp). Beneath the pulp is the mucilage, a sugary and, as the name suggests, sticky goop that strongly adheres to the layer beneath it. That layer is the parchment (endocarp), a thick, rough, papery material. Just beneath the parchment is a thin film called silverskin (testa, which eventually becomes chaff in the roaster). Finally, buried beneath of all of those layers are (typically) two coffee seeds.

The purpose of cherry processing is to extract the seeds from the fruit and prepare them for roasting. All of those layers must be removed and the seeds dried to the standard nine to 12 percent moisture content. How that happens exactly is less important than doing it well. The pulp and mucilage are high in water and sugar content—two attractive resources to microorganisms whose overabundant presence during drying is suspected of negatively impacting the cup quality of the coffee. Minimizing or eliminating their growth is a key aspect of cherry processing. The farmer decides how to process the cherries depending on the available resources, the climate at the time of processing and the desired taste outcome.

There are three common methods of cherry processing: natural, pulped natural and washed. There are other variations not discussed here.

The natural process, also known as the full natural or the dry process, keeps the entire fruit intact while drying the seeds. The seeds are not removed until every layer, including the seeds, has been dried. On farms where coffee is harvested mechanically, many cherries are already dry when the coffee is harvested. These cherries, sometimes called raisins, can be separated and sold as natural coffee.

The pulped natural process is one step removed from the natural process. The cherries are pulped (the skin and fleshy pulp removed) and the seeds, still covered by the parchment and mucilage, are dried. This process sometimes goes by alternate names, but "honey" is the most common.

The washed process (otherwise known as the wet process) removes not only the skin and pulp but also the mucilage before drying the coffee. There are several ways of doing this. Traditionally, the mucilage is removed by fermentation, either by covering the coffee with water until the mucilage is degraded or simply leaving the coffee to sit and ferment without water (known as dry fermentation). The term "fermentation" is used because microorganisms, naturally

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occurring on the coffee or in the environment, consume the mucilage and degrade it via metabolic fermentation processes. When the mucilage is completely removed, we deem the fermentation process complete. The fermentation process takes as few as six hours and as many as 24 to complete. The time required is dependent on the volume of coffee, ambient air temperature, and temperature of the water (if present) used for soaking.

An alternative method uses a demucilager/demucilator to mechanically remove the mucilage just after pulping, eliminating the need for any kind of fermentation before drying. A demucilager forces the coffee into a small space, causing the seeds to rub and push against each other and the container they are in. The pressure liquefies the mucilage, allowing it to be washed away in a few minutes by the small amount of water added to the process. Since water is used to rinse the coffee seeds upon completion, we call these coffees "washed coffees." Whether a washed coffee is fermented or demucilaged, the cup quality is the same.

It is well accepted by both the industry and scientists that processing affects the cup profile. Willem Boot, owner of Boot Consulting, in a 2007 *Roast* two-part article, wrote about cherry processing, including the influence on taste. *The Coffee Review* also regularly cups and discusses coffees subjected to various processing methods. A generality on perfectly pampered and accomplished processing on hand-harvested farms is that going from washed to pulped naturals to full naturals creates an increasing intensity of sweetness, fruitiness (ferment to some), acidity and body. Some suggest that the coffees become increasingly complex through this progression.

On mechanically harvested farms, the results of perfect dry processing on cup quality aren't as predictable. Natural-processed coffees from these farms can be more acidy and fruity than washed coffees, or they can be earthy and spicy.

A big question that is largely unanswered is, how does cherry processing affect coffee quality? What is happening, biochemically, to create such organoleptically noticeable changes in the same batch of seeds? Many people in the coffee industry proffer that the sugars and "fruitness" of the mucilage and pulp diffuse into the seed. Unfortunately, this hypothesis lacks any scientific data to support it. Rather, researchers have demonstrated that some sugars, including sucrose, don't differ in content between different cherry processing methods, suggesting no diffusion into the seed is occurring. Some sugars, like fructose and glucose, do differ in content based upon processing method; however, this is a result of seed metabolism and not sugar infusion. Whether anything else migrates into the seed is anyone's guess.

Scientists have only recently begun to address the questions brought up by the current specialty coffee industry. Thus, there is not much data to address the processing question. Moreover, there is as yet no data linking specific coffee chemistry (green or roasted) to organoleptic quality. So, even when changes in coffee bean chemistry are demonstrated, there is no evidence to support that those differences are causing the tastes we experience.

The same coffee processed by different methods will present different amounts of some cellular molecules, dependent upon the processing method. Also, differences in coffee bean metabolism have conclusively been shown between washed and full-natural coffees. It is not unreasonable to hypothesize that pulped naturals might fall somewhere in the middle of these differences.

Two metabolic responses have been demonstrated. One is that the seed begins its germination sequence almost immediately after being picked. If the presence of germination-specific molecules (isocitrate lyase and β-tubulin) is measured in coffee shortly after picking and daily until the seeds reach 12 percent moisture, differences are seen between seeds that are fermented and seeds that are naturally processed. In washed coffees, the number of these molecules peaks a couple of days after harvesting and

drops significantly in about a week, whereas in natural coffees, the quantity of those molecules peak a week after harvesting and slowly decline for another week or so. Two factors explain these patterns. The first is that coffee pulp likely has inhibitors that slow down the germination process (which, incidentally, supports the idea that compounds move into the seed from the fruit). Second, washed coffees dry quickly and, consequently, quickly reach a state of cellular quiescence. Full naturals, with greater mass and higher water content, require more time to dry down to that quiescent state.

The second response is related to water stress. Natural-processed coffees accumulate a much larger amount of γ-aminobutyric acid (GABA), a molecule known to occur in water-stressed plant cells. As above, this disparity exists because the natural-processed coffees have a longer time to be metabolically active than the washed coffees.

These responses indicate a significant amount of metabolic activity that is captured by just a few molecules. Certainly, other molecular differences related to these phenomena exist. While it is possible that these differences in coffee metabolism influence the cup quality of the coffee, until more research is done, we can only hypothesize.

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Rising to the Challenge of Processing

Relative to its small size, the Hawaii coffee industry boasts a surprisingly large number of coffee farms (830). Of these, only a handful of farms intentionally plays around with cherry processing, and most of those have been experimenting with it for less than five years.

One reason farmers have been shy to experiment is the risk involved in ruining the coffee with a failed experiment. Losing even a small batch of coffee translates into hundreds, and probably thousands, of dollars of lost potential revenue. Producing pulped naturals and naturals requires a dry climate while the coffees are drying. Without low humidity conditions, the high moisture and sugar content of the mucilage and pulp will promote the growth of molds whose presence seems to result in tainted or foul cup quality. As most farms in Hawaii harvest during part of the rainy season, experimentation is a great financial risk.

Even with the risk, some farmers take on the challenge. They want to delve into the potential of their coffee and create new and exciting experiences. From small, hand-harvested operations to the large, mechanically harvested ones, farms have begun experimenting.

Four farms in Hawaii harvest mechanically. They have produced both wet- and natural-process coffees since their inceptions in the early 1990s. Mechanical coffee harvesting works by shaking the fruits free of the trees. As cherries of different ripeness levels require similar removal forces, all types of cherries tend to fall off together. To ensure the production of high-quality coffee, the harvested cherries are subjected to a great deal of separation in the wet mill. It is here that the overripes/raisins/naturals are separated from the ripes and underripes. Thus, by the very nature of this type of farming operation, these farms all produce natural coffees.

Unfortunately, it isn't as simple as it sounds. "Natural-processed coffees are by nature exposed to mold spores, and it is one of the primary challenges in processing," says Derek Lanter, manager for Waialua Estate Coffee and Cacao on Oahu. "The drier the harvest season, the lower the incidence of mold, whereas the more rain, the higher the mold. There is nothing that can be done to control this in the field. In the wet milling, water is used to separate the ripe, raisin and immature cherries. Wetting the raisin promotes the environment that spawns mold. The weather conditions and drying capacity are the keys to managing this process."

This challenge aside, being relegated to multiple processes is a huge benefit for the farm. For every variety planted, the number of coffees that can be offered doubles since the raisins taste different. Kimo Falconer, president of MauiGrown Coffee, another mechanically harvested farm, recognizes that his natural coffees are the gems of his operation because "the washed coffees are less distinctive, complex and interesting." With such an array of cup profiles to offer, his farm can satisfy a greater number of customers. After all, different people want different tastes, and having more choices is always beneficial to a business.

Waialua Estate Coffee and Cacao and MauiGrown Coffee are two of the largest coffee farms in Hawaii. They were born out of the crop diversification programs of the large, corporate sugar and pineapple growers when those crops became less viable in Hawaii. While both operations had shaky, uncertain starts, both are now successful and well regarded.

The importance of drying the coffee properly cannot be understated. Every farmer interviewed stressed that this was the key to processing coffee. Lee Patterson, owner of Hula Daddy Coffee, whose coffee consistently receives high scores from *The Coffee Review*, is unequivocal. "In Kona, these processes are subject to mold and fungus if not dried correctly."

There's another problem that can arise from poor drying, particularly with naturals. The problem is at the heart of a debate about coffees processed this way: Do the coffees taste good? Natural processed coffees can be sweet and fermented berry-fruit flavored (sweet ferment) or they can taste like fermented rotten

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fruit, sour or alcoholic (sour ferment). Some argue that there isn't an empirical difference in the cup, rather individuals respond differently to an experience and they have a preference for it or not (and give it a commensurate positive or negative descriptor). However, others think that these two taste outcomes arise from the quality of the cherry processing. Patterson believes that poor drying of naturals leads to the production of the negatively associated fermented taste. Greater attention to drying can push the coffees toward sweet ferment and eliminate sour ferment.

Hula Daddy is a fairly recent addition to the Hawaii coffee scene, and it was one of the first small, hand-harvested farms to begin experimenting with cherry processing. Hoping to find more body and a more complex flavor, the farm gave free reign to its then-roaster Miguel Meza to tinker with processing methods. With an array of offerings of various processes and blends of those processes, Hula Daddy was able to increase demand for its coffee.

The fear of mold and sour ferment has kept Gary Strawn, computer game programmer turned farmer and owner of Kona Earth Coffee Farm, away from experimenting until this past year. "I work so hard to avoid over-fermenting my coffee. I've learned to associate it as a defect," he says. "I think pulped naturals are a nice balance between the washed and naturals. So, I went with that," adds Strawn. However, even losing a small batch of coffee would be a significant loss to his farm's revenue. To minimize the chance of loss, Strawn explains, "I waited until the very end of the harvest season, when it was hot and dry out, to try even a small lot of coffee. I was worried right up until we milled it."

The production of moldy coffee during drying isn't the only risk involved. Less often discussed is the risk of uneven drying. This can add an extra challenge to storing the coffee but, more likely, will be a burden to an unsuspecting buyer or roaster.

Fortunately, these risks are not enough to deter exploration. When asked why Pavaraga Coffee plays with processing, Leo Javar, the farm's operations manager, replied, "In essence, we are coffee treasure hunters. We love to seek the best way or find the potential of our coffees." Their treasure hunting has amassed 12 different types of processing styles, most of which are hybrids of processes on the continuum from fully washed to full naturals.

Pavaraga Coffee originated out of the Javar family farms. While the Javars have a long history of farming, their coffee operation is a fairly recent addition. Although their coffee farming in Hawaii began in the Ka'u region of the Big Island, they now operate farms in Kona and on Oahu.

Another Ka'u coffee farm known for experimentation and passion is Rusty's Hawaiian Coffee. Lauded with awards (2010 Hawaii Coffee Association Cupping Contest first-place winner, 2010 Outstanding Producer of the Year by the Speciality Coffee Association of Europe, and several 92+ scores from *The Coffee Review*), Rusty's is a paradigm of meticulous processing. Owner Lorie Obra works tirelessly to process her coffee to perfection. The pulped naturals can require raking every 20 minutes the entire day after pulping whereas the full naturals need the most attention three to five days after being laid out.

"Non-washed coffees must be raked very frequently so they will dry faster and avoid getting moldy," Obra explains. The level of attention necessary to dry the coffee properly requires a great deal of time and energy. This translates into higher labor costs as someone (Obra, usually, or her daughter, Joan) needs to babysit the coffee and monitor the weather once drying begins until the critical periods have passed.

These labor costs, of course, show up in the final cost of the coffee, making non-washed coffee significantly more expensive than its washed counterparts (though this isn't true for the mechanically harvested farms; their coffees cost the same). Considering the already relatively high cost of Hawaii-grown coffees and the resistance some consumers have to them, offering coffees that are seemingly even more outrageously priced is a significant risk. Fortunately, as the specialty coffee market persistently demonstrates, consumers are willing to pay almost any price for coffees they find to be extraordinary. Both Hula Daddy and Rusty's Hawaiian consistently sell out of non-washed coffees priced as high as $60 per roasted pound.

Risks and Rewards

Even though non-traditional processing methods are new to Hawaii, they have been a remarkable and nearly instant success. They've not only contributed to new, exciting Hawaii cup profiles, but they've also garnered accolades and respect for the mavericks who've risked product and reputation to try something new.

Admittedly, consumers get to experience only the successes of this experimentation. Every farm has produced failures unfit for general consumption, resulting in the loss of coffee that could otherwise have been produced under the relative safety of the washed process. There is no guidebook for how to process coffees. At best, farmers can glean what they can from others who've discovered success. Ultimately, with the limited scientific understanding of cherry processing available, farmers must experiment as the conditions on their farm present unique challenges to be overcome. It is up to consumers to encourage them, work with them, and reward them for their successes.

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