COFFEE RESEARCH NEWSLETTER

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Another Country...Another World

The best way to visit one country is by spending time in several. My experiences in Guatemala proved to be a perfect complement to my travels in Brazil. The culture, language, environment and coffee were dramatically different from Guatemala offering a new glimpse at both countries. Guatemala's Anacafe proposes seven major coffee growing regions each with a unique microclimate and flavor profile. Although Brazil had a similar geographic diversity, it is almost eighty times larger in size. By traveling through Guatemala, I was able to see and compare the results of microclimates that might normally be found in seven different countries.

I began my trip to Guatemala in Antigua to study Spanish and to prepare for the next part of my journey. These three weeks provided me with the opportunity to quickly brush up on Spanish so that I had the vocabulary base necessary to take full advantage of my time studying coffee in Guatemala. Both of my professors worked in the coffee industry before teaching allowing me an inside peak at the Guatemalan coffee industry including its positive attributes and its imperfections.

After Antigua, I moved to Guatemala City near Anacafe, where I spent the majority of my next two months in Guatemala. Anacafe is the governing body of coffee in Guatemala and has an enormous staff of people working on nearly every aspect of coffee production from housing and social programs to soil analysis and agricultural education.

With Anacafe I was able to travel to the different coffee producing regions with Agronomic engineers, taste coffees from around Guatemala, look at the analysis of soil samples in their soil laboratory, and peruse independent studies that were never published for worldwide reading. I found one study that was so important to my understanding of each of the main coffee regions that I read and translated much of the several hundred-page report so that I could build upon it when I visited the coffee growing regions. With this report, as a foundation upon which to build, I was able to make correlations between the microclimate and the physical and organoleptic properties of a coffee. These correlations are piecing together better than I had expected, and even though there are exceptions to every rule, I am starting to be able to predict how a coffee might taste from knowing a little about its origin.

With Anacafe agronomic engineers I was able to visit several farms in the Antigua and Fraijanes region. I saw both the good and the bad. I witnessed farms struggling with diseases and farms struggling with an overabundance of coffee that they are not willing to sell at the current prices. I also observed the passion of the farmers, which despite the low prices will probably cause them to continue cultivating coffee. Guatemalans are proud of their coffee. I met many families that have been cultivating coffee for four to five generations. Their children now go to school to study business administration or agronomy to carry on the tradition. These families are humble and typically fair to their employees. The people who harvest coffee are

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treated fairly relative to current coffee prices and wages are well over the minimum wage for Guatemala. However, the wages are still below the income necessary to support an entire family and treatment of coffee harvesters is a central problem in the industry.

Besides the Antigua and the Fraijanes regions, I visited farms in Lake Atitlan, Cobán, and Huehuetenango. The first time I visited Lake Atitlan was on a weekend trip and I returned for a longer stay on my recent return trip to Guatemala. Lake Atitlan is famed as being one of the most beautiful lakes in the world. The Mayans once believed it was the center of the universe. The lake is centered between three volcanoes and is formed atop a collapsed volcano cone. Guatemala's indigenous population inhabits more than 90% of the surrounding villages, and over 70% of the people earn a living in agriculture. I visited four farms in this area ranging from huge plantations extending over several mountains to small cooperatives whose partners each harvested from 20-30 sacks of coffee a year. Unfortunately, the quality control in these cooperatives is compromised by recent coffee prices. There is very little a Cooperative can do to invest in new equipment to improve quality without being able to turn a significant profit. Yet, the only way to turn a profit is by producing and selling high-quality, specialty grade coffees. This debilitating cycle will likely continue until initial investments can allow farmers to upgrade their equipment and attain a sustainable production.

The economic situation in Cobán was quite different than the other coffee producing regions. I visited Cobán twice for a total of five days and visited five coffee farms during this time. However, coffee is not the main economic activity in Cobán. Rather, Cobán has become one of the world's largest producers of cardamom, thereby giving it the economic diversity necessary to survive in times of low coffee prices. Tourism is the third largest economic activity in the region. With these three sources of income the majority of the people in Cobán live comfortably. Cobán's climate is dramatically different than the other coffee producing regions in Guatemala and is characterized by a continuous cloud coverage often accompanied by a light rain. This unique microclimate is responsible for a coffee with a fruitlike flavor that is prized in the United States and German specialty coffee markets. During my stay in Cobán I was also able to visit Grutas de Lanquín and Semuc Champey. Grutas de Lanquín is one of the many cave systems in Cobán. Semuc Champey is locally famed as a natural wonder and is considered by many visitors to be the most beautiful place in Guatemala. It consists of a three hundred meter long limestone bridge of multicolored green and blue pools under which a raging river flows. In the short three hours I spent at Semuc Champey I took over ninety pictures trying to capture its beauty on film.

After Cobán I made the long trek to coffee farms in Huehuetenango. In Huehuetenango I spent the majority of my time at a large farm called "El Injerto." This farm is responsible for the production of some of the highest quality coffees from the Huehue region, and has also instituted a program to provide housing, with electricity and potable water, for its permanent workers. Huehuetenango is home to the Cordillera de Los Cuchumatánes, which is the tallest mountain range in Central America. Coffee is grown in almost every valley of these mountains from 1,500-2,000 meters and the weather in this area allows the productions of coffees with a high acidity, good body, and sweet flavor.

I am currently traveling in Costa Rica with the kind assistance of Coffee Source, which has plantations in each of the major growing regions of Costa Rica. Look for a discussion of my trip in Costa Rica in the next newsletter.

Coffeeresearch.org Updates

The coffeeresearch.org website has undergone many changes since the last newsletter. The introduction page has been entirely redesigned and Flash documents are present throughout the website. Further enhancements of this nature will continue to take place

A new Flash movie showing the development of a coffee cherry was created since I found literature descriptions of the process confusing. It can be found here: http://www.coffeeresearch.org/Beandevelopment.htm

A brief tour of coffee from bean to cup has been created for people new to coffee. It should also give an idea of the layout of the site. The pictures in this section will change periodically and more tours are on the way.

Two-hundred pictures about coffee have been uploaded for free use. The link to this page can be found on the coffeeresearch.org homepage.

Coffeeresearch.org also received the honor of being www.ineedcoffee.com's website of the month.

With the new site upgrade and the website award from Ineedcoffee.com, hits have skyrocket. We have recently reached a record 7,000 hits in a day and weekly hits hover around 35,000. We have many projects and ideas brewing behind the scenes and we will let you know when these come to fruition.

Thank you for your continued support!

SCAA Site Visit 2001

On January 5th, twenty six members of the SCAA gathered in Guatemala to experience the rich variety of coffees available. Among the participants were Trygve Klingenberg, Yoshihito Kato, Ted Lingle, George Howell, Alf Kramer, David Mbugua, Vincent Schlueter, and many other importers and roasters from the United States and Canada. I was fortunate enough to join the SCAA on their one week discovery of coffee in Antigua, Atitlan, Huehuetenango, Cobán, and Fraijanes. In one week we were able to see more than I saw in the previous two months of my stay in Guatemala.

The trip was organized flawlessly by Doug Mitchell of Café Away. We saw every stage of coffee production from the germination, to the planting, pruning, harvesting, pulping, drying, hulling, and sorting of coffee. Every farm we visited had a different approach to each of these methods ensuring that no part of the trip was dull or repetitive. With the dynamic group present there was an omnipresent discussion about the farms we visited. We discussed every aspect of the coffee and how the processing and environmental factors can play a role in the flavor profile of a coffee.

The gracious reception of our hosts allowed us to get a glimpse of Guatemalan culture and hospitality during our brief visit. We covered an enormous distance in this week and had to fly between Huehuetenango and Cobán, and then from Cobn to Guatemala City. However, by covering this distance by bus and plane we saw much more of Guatemala than a tourist could see on his or her own.

After spending a week with this incredibly experienced group on an perfectly arranged trip, I must say that the SCAA site visits are a perfect in-depth look at a producing country. The next site visit will be in 2002 to Brazil. After traveling through Brazil myself, I am sure this will be an incredibly rewarding experience.

Coffee Quality and Environmental Conditions

Beyond receiving a view of how excellent coffee is grown and processed, Guatemala offers an unparalleled glimpse into how coffee flavor varies with environmental conditions. In fact, one can even develop a theory of how a coffee might taste by knowing a little about the climate, cultivar, soil, and processing conditions. I have found the following correlations to often be true, however I must warn that there are hundreds of exceptions to every one of these rules.

Altitude is related with quality. The higher grown coffees typically display the best overall flavor characteristics. Yet, this is not the whole story. Although there is a correlation between altitude and quality, this correlation is mostly a function of how slowly a coffee is grown. For example, Kona coffees are some of the lowest grown specialty grade coffees in the world; yet, they generally display a good cup. Due to the intense cloud coverage and position outside of the Tropic belt, sunlight is minimal and the coffees from Kona can mature slowly. Minimizing available sunlight via shade trees can produce the same physical and organoleptic effect as growing a coffee at a slightly higher altitude. With that said, shade is typically somewhat difficult to monitor and high altitudes will often result in a more uniform quality. Dr. Bernard Guyot found a similar correlation in his study on the influence of shade and altitude on the chemical properties and organoleptic qualities of a coffee.

The processing of a coffee will have the most dramatic effect on the flavor. The flavor differences between a dry-processed and wet-processed coffee will typically be more dramatic than regional flavor variations. If every stage of processing goes well the regional distinctions become prominent.

If any step along the processing chain is flawed, the defect produced will obscure the regional distinctiveness.

After flavor changes that can result in processing, the next most influential factors in coffee flavor are microclimate, coffee variety, and soil. The number of variables and exceptions inherent in these three factors makes forming any correlations a daunting task and there are exceptions to every correlation. The following correlations have been observed in Guatemala and are generally accurate. The chemical analysis was performed by CIRAD-CP in France.[2] The methodology was poorly reported and has not been verified. Therefore, the following chemical results warrant further scientific investigations.

1) A higher grown coffee is generally more acidic. The highest grown coffees in Guatemala, Huehue and Fraijanes, produce a more potent acidity than other regions. High grown coffees have a lower fat concentration than low grown coffees.[3] The combination of these two factors may be responsible for the higher perceived acidity in high grown coffees. Higher altitudes are also correlated to higher sugar concentrations. A 10% increase in sucrose was observed for a 300-meter increase in altitude (1,100 to 1,300 meters).[2] Shaded coffees will also have a higher acidity and higher sugar concentration. Finally, high sugar and acid concentrations are believed to augment the production of aromatic compounds. To summarize: growing coffee slowly (altitude and/or shade) can result in a higher perceived acidity, a more potent sweetness, a softer cup, and a more aromatic coffee.

2) For every 100 meters above sea level there is a corresponding drop of 0.6°C in temperature. High humidity can promote the spread of varying molds whereas long dry spells promote the spread of leaf miners. The following description of pests and diseases has been adapted and translated from Wintgens.

a. Certain pesticides can also impart off flavors. HCH for example, causes the development of a moldy

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flavor that is very pronounced in the cup.

b. Certain insects have a negative effect on the coffee quality. Mediterranean flies (Ceratitis capitata) feed on the mucilage of the cherry and infect the coffee with microorganisms that impart a potato-like flavor due to the production of secondary bacteria.

c. The coffee miner (Hypothenemus hampii), eats and procreates within the bean, thereby deteriorating quality.

d. The coffee beetle (Araecerus fasciculatus) feeds on the bean and leaves it in a completely useless form, which turns to carbon during roasting.

3) The quality of the cultivar used depends on where it is grown.

4) Coffee harvested at either the beginning or very end of the season is typically of a lower quality.

5) Bean size will often increase with altitude, which is why many countries will use size to classify a coffee rather than the density classification used by Guatemala. However, coffee size also depends on the variety of coffee used and therefore is not always an accurate indicator of quality.

6) Volcanic soils often produce a potent acidity and a good body. Some people say that volcanic soils can lead to a more balanced cup. Since volcanic soils contain very high levels of sulfur and sulfur containing compounds are precursors to aromatic molecules, coffees grown in volcanic soil will often have a potent aroma. Potassium is also said to augment the body of a coffee, increase the weight of the bean, and strengthen the branches. The two non-volcanic regions in Guatemala, Cobán and Huehue, do not have the same balance present in the other coffee growing regions, but serve as excellent single origin coffees.

7) The most humid climates often result in coffees with fruity flavors. Coffees from the most humid region in Guatemala, Cobán, display a potent fruitiness not encountered in the other regions. The fruit-like flavor observed in coffees from Cobán is dramatically different than the fruity defect encountered in fermented coffees.

8) Humid climates are said to help sugar production in fruits. The sweetest fruits often originate in countries with humid climates. Since coffee is a fruit and the bean interacts directly with the sweet pulp, humidity undoubtedly plays a role in the sweetness of a coffee. Most of the coffees producing regions in Guatemala have a high humidity. High humidity and heat have been found to accelerate maturation and therefore decrease quality, but the humid regions in Guatemala are typically cool.

9) Caffeine increases with altitude. There was a 10% increase in caffeine content observed for a 300-meter increase in altitude (1,100 meters versus 1,400 meters).[2] Chlorogenic acids decrease in concentration with altitude. There was a drop in concentration of the chlorogenic acids by 5% with the same 300-meter increase in altitude.[2] Both caffeine and the chlorogenic acids have a bitter taste and this relationship could play a role in the bitterness of a coffee.

10) Stark differences between daytime and nighttime temperatures is said to promote the production of sugars in fruits. Therefore, large variations in temperature may increase the sweetness of a coffee.

11) The harvesting of green coffees will add an astringent and harsh flavor to the coffee. These coffees have lower lipid content and less aromatic compounds than ripe cherries.[3] Green coffees do not contain sucrose.[3] The chlorogenic acid (bitter taste) content of green coffee drops as it matures.[3] On the other hand, over mature beans produce a fruity flavor. Even worse, black cherries produce a strong fermented flavor that is accompanied by a harsh woody flavor.[3]

12) Coffees should be pulped immediately after harvesting. Around 4 hours after being picked the mucilage begins to brown and the cherries begin to ferment.

13) Stinker beans can result from the final stages of over fermenting. Stinker beans are characterized by a smoky and sour flavor or aroma.

14) Mechanical dryers should not be set over 42°C. Doing so will result in a dulled or baked cup. The vast majority of dryers I have seen have internal temperatures from 50-60°C, which undoubtedly causes some damage. Temperatures higher than this will cause the green coffee to be crystallized. Final sun drying usually improves the color of the green coffee.

15) Coffees dried on clay patios could result in a clay-like earthy taste. Asphalt or concrete with no cracks is preferred.

16) All tanks in contact with coffee must be cleaned thoroughly every day. Black residue in the tanks can impart fermented tastes. Beans left on the wall from the day before will be fermented and can ruin a lot depending on the amount of old beans present.

17) At no time should burlap bags be allowed to contact the wet coffee. These bags have a strong taste and smell that will be imparted to the coffee. If covering is necessary, cotton is preferred.

18) If drying on patios the piles should be kept thin and no shadows should be produced by the piles. Shadows are

reduced and even drying is promoted by forming the piles in an east to west direction allowing the sun to hit both sides of the piles evenly. The piles should be shifted frequently. If the coffee is piled up at night it should be done so in small piles to allow the equalization of internal temperatures to prevent uneven drying.

19) Moisture content over 12% allows the spread of microorganisms in the coffee.
20) At a temperature of 20°C a coffee with 12% moisture content will remain at equilibrium as long as the humidity remains below 50%. Above this humidity the equilibrium can shift and the coffee can absorb moisture, thereby deteriorating the coffee. This can result in beans with a creamy, yellow, or light brown tinge. The pergamino will serve to protect the coffee during storage. The pergamino should only be removed shortly before shipment.
21) Demucilating machines or Aqua Pulpers can be used to remove the mucilage rather than traditional tank fermentation. If this is performed the coffees must be taken to the drying patios within a couple hours of demucilation. Compared to traditional fermentation, demucilating machines have been found to improve the acidity and body of a coffee without affecting the aroma as long as drying occurs immediately. Stalling drying for over six hours will diminish the acidity. Otherwise the small portion of mucilage that remains using Aqua Pulpers will begin to ferment. Also, fermentation in water is believed to benefit the flavor by allowing the reverse osmosis of certain bitter compounds, such as polyphenols and diterpenes, to occur.[3]
22) Re-circulated of fermentation water promotes faster fermentation. From 1-2 days the use of recycled water was found to improve both aroma and acidity. From 3-4 days the aroma and acidity decreased dramatically.[5] The body is not affected by recycling water.[5]

Footnotes

1. Anacafe. *Hombres de Cafe*. Guatemala: Talleres de Litografia Galton. 1995.
2. Guyot, Bernard. Influencia de La Sombra y La Altura Sobre Las Caracteristicas Quimicas y Organolepticas de Los Cafes de Variedad Borbon y Catuai. CIRAD-CP. France.
3. Wintgens, J. N. *Factores Que Influencian La Calidad Del Café*. Instituto Interamericano de Cooperaction para la Agricultura (IICA). Presented at the XV Simposio Latinoamericano de Caficultura. Xalapa, Veracruz, Mexico. June 1992.
4. Morera, R. V.; and Ugalde, G. H. *Influencia del Desmucilaginado Mecanico del Café y de Diferented Periodos de Espera al Secado Sobre la Calidad*. Presented at Mejoramiento De La Calidad Del Café. Ed. Eduardo Suarez Salaverria. Gerente de Control de Calidad Consejo Salvadoreno del Café.
5. Morera, R. V. Influenceia De La Recirculacion de Las Aguas del Despulpado Del Café Sobre Su Calidad. Centro de Investigaciones en Café. ICAFE. Costa Rica. Presented at Mejoramiento De La Calidad Del Café. Ed. Eduardo Suarez Salaverria. Gerente de Control de Calidad Consejo Salvadoreno del Café.