

1.0 CONTEXT

Catholic Relief Services (CRS) and World Coffee Research (WCR) have partnered for the Colombia Sensory Trial, a multi-faceted comparison of two leading coffee varieties in Nariño, Castillo and Caturra. The field work is being conducted by CRS staff and partners in Colombia working on the CRS Borderlands Coffee Project, financed by the Howard G. Buffett Foundation (HGBF), with guidance on sample design and participant selection from researchers at the International Center for Tropical Agriculture (CIAT). HGBF has also provided additional funding to CRS to underwrite the costs of the Colombia Sensory Trial.

Caturra is a natural dwarf mutation of the Bourbon variety that is generally well-regarded in terms of its organoleptic qualities but susceptible to diseases including coffee leaf rust.

Castillo is a hybrid created by the breeding program at Cenicafé, the Colombian coffee research institute. Castillo was bred to maximize yields, disease resistance and cup quality and Cenicafé has published research to document its performance in each of these areas. Since Castillo's release, however, leading voices in the U.S. specialty coffee industry have called into question claims of Castillo's cup quality.

As a result, actors all along the coffee supply chain have had to make decisions in a context of some confusion and on the basis of less-than-perfect information about what coffee variety to plant, promote and buy. The Colombia Sensory Trial convenes renowned coffee tasters and sensory research experts to evaluate samples of the two coffee varieties collected from farms growing both varieties under the same agroecological conditions and using the same agronomic practices—a sampling approach that will eliminate much of the variability in cup profiles attributable to farming, harvest and post-harvest practices, isolating the impacts of genetics on cup quality.

The mixed-methods approach to sensory analysis involves two separate processes. In one process, leading coffee tasters from the U.S. specialty coffee industry and the Colombian National Coffee Growers Federation will blindly cup samples of the two varieties during separate panel events, the first in October 2014 and the second in January 2015. Both panels will be held at the Intelligentsia Coffee laboratory in Chicago.

In a parallel process, researchers from the sensory lab at Kansas State University, under the coordination of WCR, will also perform a descriptive analysis of the same samples.

Upon conclusion of the three sensory analyses, CIAT will lead a research team that also includes representatives from CRS, KSU and WCR to analyze and contextualize the results. Research publications will include comparative methods analysis and decision-support analysis that puts the quantitative results in the appropriate social, economic and cultural context. The project is designed to inform decision-making at multiple levels:

- On the **farm**, where growers are seeking greater clarity about the returns they can expect on their investments in different coffee varieties; and
- In the **industry**, where buyers are making purchasing decisions in a marketplace with rising standards for quality and a coffee landscape that is changing rapidly; and
- In the **policy** process, where governments, coffee institutes and public and privately funded projects determine which coffee varieties to promote, support and subsidize through the provision of certified seed, extension support, credit and grants and other services.

Preliminary results of the Colombia Sensory Trial will be prepared for delivery during the 2015 SCAA Symposium/Expo. Draft documents ready for submission to peer-reviewed journals are expected by May 2015.

2.0 SAMPLING PROCESS

CIAT and CRS, in coordination with WCR, designed the sampling approach and CRS led the sample collection effort in the field with the support of trained research staff from the Universidad Mariana in Nariño.

In 2011 and in connection with the baseline survey for the CRS Borderlands Coffee Project, CIAT and CRS collaborated to develop a representative sample of the 1,600 households participating in the project. A total of 510 households were interviewed as part of the baseline survey; 228 of these were participants and the remaining 282 constituted the counterfactual. The baseline survey included questions about coffee varieties and represented the principal source of information for CRS and CIAT in identifying farms to participate in the Colombia Sensory Trial.

CRS added to these baseline data additional information on farms growing Castillo and Caturra taken from the project field logs maintained by project field staff. More than 75 farms growing both varieties were identified through this process.

CRS field staff then visited each of the selected farms to verify that plants of both varieties were in a productive state and physically separated so as to enable strict separation of the two coffee varieties throughout the harvest and post-harvest processes. This process identified 59 farms that were deemed suitable for participation by CRS and CIAT.

CRS, CIAT and WCR worked to further winnow participating farms through an elevation stratification that would permit researchers to analyze the interaction between elevation and variety. Through the process of optimizing the distribution of eligible farms across three elevation strata (≤ 1650 m, 1651-2100 m, > 2100 m), CRS and CIAT generated a final list of 45 farms to participate in the trial.

CRS field staff worked with a team of researchers from the Universidad Mariana to train growers at participating farms on the Colombia Sensory Trial's standards of physical quality and lot separation/traceability. At harvest time, CRS rejected samples from 11 of the 45 farms selected for participation for failure to comply with established standards of physical quality, lot separation and traceability or both.

CRS and Virmax Café in Bogotá further subjected collected samples to sensory analysis to eliminate samples with quality defects or cup characteristics attributable to processing, such as pulpiness or "fruitiness." Twelve more samples were excluded from consideration through this filter.

CRS, through Virmax, shipped 2 kg of each of the 44 remaining samples (22 farms x 2 samples/farm) to the panel director for use in the sensory panels. CRS assigned each sample a unique alphanumeric code: the farm-specific ID number used by CRS and its local partners in the context of the CRS Borderlands Coffee Project to designate the farm and the letter A to denote Castillo and B to denote Caturra.

CRS further gathered the following information in connection with each sample:

- Farmer name
- Farm name

- Municipality/vereda
- Latitude and longitude
- Elevation
- Variety
- Average plant age
- Harvest date
- Drying time
- Drying technology
- Humidity level
- Water activity

3.0 CUPPING PANELS

CRS and WCR have retained Paul Songer, Technical Director of the Alliance for Coffee Excellence, to lead two laboratory-based sensory testing panels with the samples described above.

CRS has also secured commitments from the following organizations/cuppers to participate in both the October 2014 and January 2015 panels:

- **Counter Culture Coffee**—Tim Hill
- **Federación Nacional de Cafeteros de Colombia**—Nestor Perilla
- **George Howell Coffee**—Jenny Howell
- **Intelligentsia Coffee**—Geoff Watts
- **Keurig Green Mountain**—Roman Bondarenko
- **Red Fox Coffee Merchants**—Aleco Chigounis
- **Starbucks**—Doug Langworthy
- **Stumptown Coffee**—Adam McClellan

This process will be comprised of three sub-processes: bench testing, cupping panels and data analysis.

3.1 Bench testing

Mr. Songer will roast and perform initial bench testing of all samples. The Consultant will do an additional evaluation of all samples to observe if any of the coffees have off-flavors resulting from processing, such as pulpiness, “fruitiness”, sourness/ferment, or other contamination. Quality parameters and training protocols will also be determined at this time. Each sample will be roasted in a small batch (“sample”) roaster to a medium-light degree (Agtron # approximately 60 on the 100-point “gourmet” scale) and 3 cups of each sample prepared and cupped by Mr. Songer. At this time, “control” samples will be selected and samples will be re-coded with randomized three-digit numeric codes.

3.2 Cupping panels

Samples are to be prepared according to Specialty Coffee Association of America protocols, including medium roast, coffee to water ratio, and grind. Each sample will have the roast degree measured by the Agtron using the “gourmet” 100 point scale. If samples are found to be too dark or light, they will be re-roasted.

The samples will be evaluated using the Q form since it is familiar to most panelists, but some specific issues will be addressed in the training that will associate known qualities and issues based upon the initial evaluation, such as quality and level of acidity, specific aromatics, or other sensory issues. The goal of the training is to establish standards of evaluation for all panelists by consensus, with the

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Consultant codifying the standards and making final decisions. All samples are to be disguised by random 3-digit codes and randomly submitted so that there will be no direct comparison of the coffee varieties by panelists. Each sample will be submitted in 2 replications for a total of 88 individual samples (22 samples x 2 varieties per farm x 2 replications per sample). An identical control sample will be randomly submitted at each session, making a total of 101 samples.

Sample pairs (those from the same farms) will be submitted within the same session but at random table positions with random codes so that each sample will be tested under the same sensory panelist conditions (relative palate fatigue, time of day, etc.). Samples submitted later in the day during the first submission will be submitted earlier in the day for the replication. Panelists are not to be informed of these balancing protocols, but are to regard the samples as random.

The session is scheduled to last 3 working days, with one half-day for calibration and introduction and 2.5 days of cupping analysis. Samples are to be submitted in groups of no more than 9, four sample pairs and one control. No more than 45 samples will be tested in one day (maximum 5 sessions/day), for a total of 13 sessions. Panelists are to receive a daily report of their response to the control and recalibration sessions will be available if some confusion seems evident.

3.3 Data Analysis

The data will first be examined using descriptive statistics of the sets of data by sample and by individual panelist. “Outliers” for which there is no reasonable explanation may be eliminated. Analysis-of-Variance (ANOVA) will also be run on the subgroups to see if there are factors skewing the data.

The attribute scores will also be examined in this way to see where the greatest differences occur, from points of view of both individual panelists and samples.

Final results are to be determined according to the Student’s t-test for of difference determination between two independent samples, in this case the two varieties of coffee. The null hypothesis is that there is no statistical difference. A two-tailed test will be used since the direction of the difference is not known (it possible that either variety will score significantly higher).

Results are to be considered in two ways: (1) varietal comparison for the initial (October) test and (2) varietal comparison for all results from both tests.

Using available data on altitude, amount of rainfall, and other climactic conditions, the difference between sets of samples will be classified using cluster analysis (agglomerated hierarchical clustering). This could indicate, for example, that more of a difference is seen at higher altitudes or under particular climactic conditions.

ANOVA procedures will also be used to observe any differences between the samples from the two tests. Each set of samples will be compared as a total group (all samples of both varieties from October to all samples of both varieties from January) and then in their sub-groups according to varietal.

4.0 DESCRIPTIVE ANALYSIS

In addition to leading the two cupping panels at the Intelligentsia Roasting Works in Chicago, Mr. Songer will prepare and roast 500 g samples of each of the 44 samples in the trial for a descriptive sensory analysis led by Dr. Edgar Chambers at Kansas State University.

5.0 RESEARCH TEAM + FOCUS

An inter-institutional research team led by CIAT Senior Researcher Mark Lundy will compile and analyze the sensory results and attempt to situate them in the Nariño context. Confirmed members of the research team also include: WCR Executive Director Dr. Tim Schilling, KSU's Dr. Edgar Chambers and CRS Coffee Advisor Michael Sheridan. The research will consider the social, economic, cultural and market factors that shape the quantitative and qualitative results of the sensory analysis in the Nariño context from which the samples were taken. Specifically, the “decision-support” focus of this research will attempt to interpret the research data from multiple decision-making perspectives: smallholder farmers in Nariño asking which coffee variety or mix of coffee varieties will give them the best return on their investment; coffee companies buying coffee in Nariño seeking clarity on the implications of variety for cup quality and volume; public institutions that set investment policy for the coffee sector trying to identify which coffee variety or mix of varieties will be most effective in mitigating risk in the field and seizing opportunity in the marketplace.