

Innova Global Coffee Breeding Network

Costa Rica Arabica Breeding: Current Progress, Challenges, and Goals

I. Report Overview & Objectives

- **Project Title:** Innova Global Coffee Breeding Network—Arabica
- **Reporting Period:** Oct 2025
- **Partner Institution & Location:** Instituto del Café de Costa Rica (ICAFE)
- **Date of Report:** October 30, 2025
- **Alignment with Core Objectives:** During this period, we have identified genotypes with stable performance across our environmental conditions, providing valuable data to the global partnership. These early results are already pinpointing the most promising populations for developing superior national varieties. Our systematic collection of first-year data on productivity, bean yield, and cupping scores will continue over the next five years. This long-term trial is designed to strengthen our institutional capacity for advanced, product-focused research, ultimately enhancing our ability to develop varieties that meet both farmer sustainability needs and market demands.



Figure 1. Innova trial located at ICAFE, San Pedro de Barva, Heredia, Costa Rica. Date 10/21/2025

II. Overall Progress

Over the past year, phenotypic data were collected for key agronomic traits, including plant height, stem diameter, and growth habit, along with evaluations of resistance to *Hemileia vastatrix* (coffee leaf rust). The first harvest of this trial is currently in progress, and preliminary results have identified several populations exhibiting highly promising productivity. These data provide a critical foundation for assessing genotype-by-environment interactions and advancing the selection of climate-resilient genotypes.



Figure 2. Some families from Innovea Plot a) WCR0133, b) WCR0140, c) WCR0139, d) ICAFE002 and e) IWCR03101 studied at ICAFE, Costa Rica. Date 10/21/2025

III. Challenges and Limitations

The first harvest (Figure 3a) aims to evaluate the plants' capacity to maintain physiological health and productivity under environmental stressors such as excessive rainfall and drought, both of which are characteristic of Costa Rica's harvest season. Identifying the most resilient varieties will enable more accurate yield predictions and facilitate the selection of genotypes exhibiting reduced pre-harvest fruit drop. These data are essential for strategic planning, as they support efforts to mitigate the impact of recurring seasonal challenges, including labor shortages affecting both institutional farms and smallholder coffee producers.

A key methodological limitation of this trial is the restricted capacity to process the full fruit volume per plant, as stipulated by the Innovea Phenotyping Protocol. Consequently, post-harvest measurements were conducted on a representative 250 mL subsample from each plant (Figure 3b).



Figure 3. (a) Harvest activities in the Innovea experimental plot, and (b) example of post-harvest processing for individual trees at ICAFE, Costa Rica. Date 10/21/2025.

IV. Next Steps and Future Goals

We have identified several promising coffee genotypes exhibiting high yield potential and resilience to climatic stressors. Validation of these selections requires long-term monitoring, for which the Innovea research network provides a robust and coordinated foundation. In the next phase, disease screening will be expanded to include *Mycena citricolor* and *Anthraco* spp., while continuing surveillance of *Hemileia vastatrix* (coffee leaf rust). The objective of this comprehensive evaluation is to identify elite genotypes that integrate optimal phenotypic performance with desirable genetic traits, ensuring adaptability and productivity across diverse agroecological conditions within our target regions.