Unexpected coffee varietal diversity in Haitian coffee agroforestry systems

Millet Claude Patrick[1] (claudepatrickmillet@gmail.com), Allinne Clémentine[2], Vi Tram[1], Marraccini Pierre[1], Verleysen Lauren[3], Ruttink Tom[3, 4], Zhang Dapeng[5], Solano-Sanchéz William[6], Tranchant Christine[1], Jeune Wesly[7], Poncet Valérie[1]

[1] UMR DIADE, IRD, Montpellier, France ; [2] UMR ABSys, CIRAD, Montpellier, France ; [3] ILVO, Melle, Belgium ; [4] University of Ghent, Ghent, Belgium ; [5] USDA, Beltsville, MD, USA ; [6] CATIE, Turrialba, Costa Rica ; [7] Faculté des Sciences de l'Agriculture et de l'Environnement, Université de Quisqueya, Port-au-Prince, Haiti

Rationale:

Though they face significant challenges, Haitian Coffee (*Coffea arabica*) Agroforestry systems are important providers of several ecosystem services, and generate incomes for around 200.000 coffee farming families. To ensure their long-term sustainability, enhancing the value of their genetic heritage is a major lever. However, little is known about the diversity of coffee trees growing in these systems. Several varieties are often grown together and allowed to mix, with recruitment from the seed bank common. In light of this, there is a need to characterize Haitian coffee diversity to help inform strategies for revitalizing this sector.

Methods:

In this study, we sampled coffee trees from 28 diverse farms in historically important coffee growing regions of Northern and Southern Haiti. We performed targeted multiplex amplicon sequencing and KASP-genotyping of highly polymorphic markers in *C. arabica* on our samples, as well as a large panel of Ethiopian and commercial accessions from international collections. These reference accessions allowed us to assign Haitian trees to varietal groups.

Results:

Our analyses revealed that Haitian farms hold a high level of genetic diversity, higher in fact than many farmers realize, and comparable to that held in germplasm collections. Genetic sStructure analyses revealed the presence of main clusters related to the Typica, Bourbon, Catimor and Kent groups respectively, one which was not represented in our reference accession panel, as well as several admixed individuals. While diversified farms were found across our study area, we also identified monovarietal farms where only the traditional Typica coffee trees grow.

Conclusions & Perspectives:

This study is, to our knowledge, the first to have genetically characterize Haitian *C. arabica* and shows that some Haitian Coffee Agrosystems are repositories of historical, widely-abandoned varieties while others are generators of new diversity through genetic mixing. Future study of the latter may reveal adaptive potential and suggest ways of mobilizing this diversity to respond to challenges faced by farmers.