Coffee and Cacao Crop Germplasm Committee

08 November 2023 Meeting Minutes

8:00 – 9:30 PM (Germany – CET); 3:00-4:30 PM (PR); 2-3:30 PM (Eastern); 1-2:30 PM (Central & Costa Rica); 12-1:30 PM (Mountain); 11 AM-12:30 PM (Pacific); 9-10:30 AM (Hawaii)

Attendees:
Eduardo Cortes, Dominique Dessauw, Kimo Falconer, Mark Guiltinan, Sarada Krishnan, Juan Medrano, Ed Seguine, Suzanne Shriner, Path Umaharan,
Ex-officio: Tomas Ayala Silva, Peter Bretting, Ricardo Goenaga, Osman Gutierrez. Gary Kinard, Tracie Matsumoto, Dapeng Zhang
Guests: Sunchung Park (Plant Geneticist, Beltsville), Luz Serrato (Plant Pathologist, Mayaguez)

Absent:
Rolando Cerda Bustillo, Vern Long, Chifumi Nagai, Ray Schnell
Ex-officio: Lyndel Meinhardt, Tim Rinehart, Gayle Volk, Christina Walters

- **Welcome & roll call**
  Sarada Krishnan, chair of the committee welcomed everyone and did a roll call to capture attendance.

- **Approval of November 17, 2022 meeting minutes**
  Tomas Ayala Silva moved and Ed Seguine seconded the approval of the minutes, and they were approved.

- **Cacao and coffee germplasm updates – Tracie Matsumoto**
  - Cacao collections –
    - Screening for cacao mild mosaic virus and cacao yellow vein banding virus.
    - Queensland Longhorn Beetle found in Hawaii in sago palms, cacao, citrus, breadfruit and passion fruit. Larvae form galleries, cause girdling and kill certain branches. Hard to manage. Very few insecticides registered for cacao. Biocontrol with nematodes, which has been distributed to growers.
    - Cacao collection has been rejuvenated through grafting.
    - Have initiated field trials of new cacao selections from ARS-MARS breeding program.
    - Organoleptic evaluation of accessions is underway.
  - Coffee collections –
    - Dapeng has done SNP genotyping.
    - HARC coffee accessions have been moved to Hilo repository. There are 112 accessions in the coffee collection.
    - For the coffee genome project, sequencing and assembly of genomes of Catimor and Kona Typica has been done.
    - In growers fields, propagation of local CLR-resistant cultivars such as Juan, Cruz and Maite are being done.
    - Propagating the WCR IMLVT varieties in tissue culture.

        - Also developing molecular markers for CLR-resistant lines and breeding of elite Hawaiian cultivars with HARC.
        - Have joined the WCR Innovea Global Arabica Breeding Network. Have finally received control import permit.
        - Building larger facilities.
        - Developing new variety pipeline.
        - Melissa Johnson is conducting insect pest evaluation.
        - Lisa Keith is identifying biocontrol methods for CLR (microparasites).

- **Cacao and coffee germplasm updates – Tomas Ayala Silva and Ricardo Goenaga**
    - Cacao management practices TARS collection–
        - Grafting of CaMMV negative trees for rejuvenating collections.
        - Characterization and evaluation being conducted on yield data, fermentation for organoleptic characteristics (Mayaguez) and molecular characterization (Beltsville).
        - 49% of trees are CaMMV positive and 51% negative.
    - SHRS Plant Science/Entomology Quarantine Complex –
        - Walkthrough of Plant Science/Entomology Quarantine Complex done on Oct. 5, 2023. Some deficiencies found but contractor was already aware of these and will act accordingly. Issues with backup generator will be resolved hopefully soon.
    - TARS cacao field research –
        - Seedling population experiment – 6 populations developed by R. Goenaga and R. Schnell. Crosses were made between TARS high-yielding clones and disease resistant materials (frosty pod, Witches' broom) selected by Schnell in Ecuador. Study also used for QTL discovery for resistance to black pod – Osman's 5-yr research.
        - Old Ecuadorian clone experiment – a few trees lost after Hurricane Maria. Most recovered well. Now trees in full production. Selected trees infected with CaMMV and established a replicated experiment to determine yield. Prior to establishing the experiment, leaf samples with visual symptoms of CaMMV from these trees were sent to J. Brown's lab for virus determination. 72% came back CaMMV-positive. As of August 2023, infected trees had very high yields (2757 – 3623 kg/ha/yr). CaMMV is distributed throughout many areas of the US and worldwide.
        - Can CGC initiate discussions with APHIS-PPQ to look into the possibility of releasing these from quarantine testing? What is the interaction of other yield limiting factors? Management is always a a factor. Plants have been in quarantine greenhouse at SHRS-Miami for 3+ years. Don't know what will happen with these materials.
        - Path – A decision on release or destruction of quarantined trees at SHRS is needed. Research is being impacted and trials delayed for lack of a final decision on the fate of these trees. Plants are doing well. Dr. Tim Widmer, ARS National Program Leader, is assisting and contacted key APHIS personnel.
        - Osman – collaborating with Brazil. A virus affecting cacao under quarantine conditions in Miami has been reported. It is called Cacao Leafroll Virus (Solemoviridae; Polerovirus). Also, another Polerovirus has been found affecting cacao in Brazil and it is called Cotton Leafroll Dwarf Virus. In addition, CaMMV has now been discovered in Brazil. CEPLAC breeding project has been impacted.

Dr. Judy Brown (University of Arizona) has received samples from Brazil (CEPLAC) and screened them with most recent version of the MP primers. Samples were positive to CaMMV.

- Validation of primers by APHIS. If no big effects, other countries will listen. Good to speak with APHIS. Peter Bretting suggested to invite them to serve on this CGC.

Action: Invite APHIS to the Cacao subcommittee meeting in 2024 to have this discussion.

- **2023 NPGS Briefing – Peter Bretting**

Dr. Bretting gave the 2023 NPGS Briefing. Key points from the presentation:

- Accessions held at NPGS genebanks in 2022 – 605,700
- Germplasm distribution in 2022 – 233,500
- ARS NPGS budget in 2022 - $51.5 million
- Key challenges for NPGS:
  - Expanding the NPGS operational capacity and infrastructure to reduce PGR management backlogs and meet increased demand for PGR and associated information.
  - Increased operational costs (labor, inputs, overall inflation).
  - NPGS personnel transitions—hiring, training, etc.
  - Developing and applying cryopreservation and/or in vitro conservation methods for clonal and some seed PGR.
  - BMPs and procedures for managing accessions (and breeding stocks) with an increasing diversity of GE traits in more crops, the occurrence of adventitious presence (AP), and the products of gene editing.
  - Acquiring and conserving additional PGR, especially of crop wild relatives.
- FY2022 NPGS budgetary increases:
  - Pecan PGR (ca. $600,000): College Station, TX.
  - Coffee PGR (ca. $250,000): Hilo, HI
  - Pulse PGR (ca. $100,000) Pullman, WA
  - Pulse PGR (ca. $100,000) Urbana, IL

- **WCR updates – Vern Long**

Vern was unable to attend the meeting as she was traveling. She provided her slide deck before the meeting. Information for the slide deck are below:

- Innovea Global Arabica Breeding Network
  - Network launched in 2022 with nine partners and first crosses.
  - Population improvement strategy.
  - First seed distributed to global partners in 2023, currently germinating in nursery
  - Continuing with more crosses and seed shipments towards field establishment at all global sites in 2024
  - Designed new workstream using speed breeding to generate finished varieties (inbreds) within 8 years
- Planning for a Global Robusta Breeding Network
  - Industry focus group to define market trends and quality targets
  - Abacus Bio scoping study
    - Global shortfall of up to 35M bags by 2040
    - Fragmented and under-resourced global breeding programs

        - Genotyping study of available germplasm
        - Partnership discussions underway with Vietnam, Indonesia, Uganda, India, Brazil
    - Genotyping tools
        - Public release of low density SNP genotyping tool for Arabica variety ID
            - 45 SNP markers
            - Reference panel allows authentication of 23 LatAm varieties
            - Built using 1424 samples collected from Guatemala, El Salvador, Costa Rica, Honduras, Peru
        - Arabica mid-density SNP panel in development
            - Genetic diversity sampled from global collections at CATIE, ICAFE, EMBRAPA, RAB
            - Targeting 3000 SNPs
            - Sequencing currently underway at DArT
            - Public release of panel planned for Q3 2024

- **Genotyping *Coffea* genetic resources using SNP markers – Dapeng Zhang**
    - **Goal:** to improve accuracy and efficiency of coffee genebank management in the United States and in other international institutions.
    - **Objective**: Assess genetic integrity, diversity, and population structure of coffee germplasm collections in Hawaii, Puerto Rico, Costa Rica, Ivory Coast, and other major coffee collections in national institutions.
    - Screened 1,000 SNP markers using Fluidigm Dynamic Array and selected a core panel for large scale genotyping of Arabica and Robusta coffee. This has been used by WCR for detecting “offtypes” in nurseries in Central America.
    - Genotyped the following Coffee Collections using High-throughput KASP technology:
        - HARC collection, Hawaii (Arabica)
        - University of Puerto Rico collection (Arabica)
        - ICAFE (Costa Rica) collection (Arabica)
        - CATIE International collection (Arabica)
        - TARS 1905 collection
        - CRIG collection, Ghana (Robusta)
        - CNRA collection, Ivory Coast (Robusta)
    - Genotyping farmer selections in West Java, Indonesia.
    - Genotyping progeny selections of 'Mundo Novo' in Brazil with potential for specialty coffee market.
    - Genotyping mapping populations segregating for CLR resistance HARC, Hawaii.
    - Genotyping CATIE collections:
        - Genotyped 2471 trees, representing 1852 Arabica accessions
        - Detected 1738 unique genotypes
        - Selected a core subset for USDA-ARS introduction
        - Stratified Sampling of a Core Collection Based on SNP markers
            - Wild Ethiopia
            - Africa cultivated
            - Other countries
    - Genotyping Robusta Germplasm - CRIG Coffee Collection, Ghana:
        - Genotyped entire CRIG Robusta collection

        - Identified 74 cases of mislabeling (18.6% of the collection).
        - Detected a high rate of pollen contamination. Seven-five percent of the progenies from bi-parental crossing blocks were pollinated from unwanted pollens.
    - Genotyping Robusta Germplasm - CNRA collection, Ivory Coast
        - Genotyped 1479 Robusta trees in the CNRA collection;
        - Revealed seven distinct genetic groups;
        - Detected significant gene flow from introduced Congolese varieties into native Guinean gene pool.
    - Genotyping *C. stenophylla* Germplasm - SLARI, Sierra Leone
        - Genotyped 122 *C. stenophylla* accessions using GBS technology
        - Developed 7464 SNP markers and selected a core panel for KASP genotyping;
        - Collected 846 *C. stenophylla* trees, covering all natural populations in Sierra Leone, for analysis of genetic diversity and population structure
    - Genotyping other *Coffea* species:
        - Developing a universal marker system for cross-species genotyping
            - GBS of 192 samples (out of 620) from four species (Sarada's collection)
                - *C. kianjavatensis*
                - *C. montis-sacri*
                - *C. vatovavyensis*
                - *C. commersoniana*
            - Selected a core panel to genotype all 620 samples by KASP technology, as well as other *Coffea* species in Madagascar and in the Indian Ocean Islands.
        - Developing haplotype-resolved reference genomes in collaboration with Qingyi and Tracie
            - *C. liberica* var. *liberica*
            - *C. arabica*
                Typica (KO 32)
                Short Mokka
                T.5175-7-1 (KU87)
                T.8667-6-2 (KU85)

Juan mentioned that he is working with FOFIFA, Madagascar. They want to expand the robusta industry. They have different clones that flower at different times. In Honduras, WCR has genotyped quite a bit. Juan is currently in Honduras and will do an inventory and connect with Dapeng.

- **CCCGC membership**
    - Review bylaws (members absent for 2+ consecutive meetings)
      Our bylaws state that "*Consecutive non-participation in two committee meetings without communication shall result in removal from the Committee.*" Sarada will contact members who have not attended 2+ consecutive meetings and have not notified chair of their absence at the meetings regarding their interest in participating in the committee.
    - Gaps in representation of the different industries?
      Suggestions to add new members to our committee are welcome, especially if they represent gaps in our current membership. Eduardo made a recommendation and will reach out to Sarada separately.

- **New chair for the CCCGC – someone from the Cacao sector**

No one has come forward to serve as new chair of this committee.

- **2024 meetings and other business**
    - 2024 subcommittee meetings – review and revise quad charts
    - Coffee subcommittee meeting to review coffee descriptors

Meeting dates for 2024 will be finalized via email. We will have a coffee subcommittee and cacao subcommittee meeting plus the full committee meeting at the end of the year.

The meeting adjourned at 3:30 pm ET.