

Crop Vulnerability Update for Cacao

Vulnerabilities & Threats

- Genetic erosion resulting in reduced genetic diversity, both *in situ* and *ex situ*
- Pests and diseases
- Climate change
- Difficulty of disseminating improved varieties and the lack of certified propagation material in many countries.
- Number of improved varieties in production
- Outside of public collections, lack of access to other collections

NPGS PGR Status & Impacts

Status:

- Global cacao molecular identification center in Beltsville, Maryland
- Germplasm collection center in Mayaguez, Puerto Rico
- Quarantine center in Miami, Florida
- Molecular program located at both Miami, Florida, and Beltsville, Maryland
- Safety duplication of a core collection at the Pacific Basin Agricultural Research Center, National Clonal Germplasm Repository (PBARC, NCGR) in Hilo, Hawaii.

Impacts:

- Development and use of internationally standardized molecular probes for DNA fingerprinting of all major germplasm collections of *T. cacao* in the Americas and other regions in the World
- Repository characterization and evaluation site for diverse accessions
- Introduction of new elite disease-resistant accessions to the collection in Mayaguez, PR
- Gene discovery, genetic mapping, gene expression and examination of population genetics
- The use of biocontrol agents, as part of an integrated pest management (IPM) strategy against the fungal pathogens causing diseases
- Collaboration with other international organizations such as CATIE in Costa Rica, University of Reading in United Kingdom, and Cocoa Research Centre in Trinidad and Tobago

Genetic research & breeding capacities

- Few breeders developing improved varieties
- Molecular tools for crop improvement available
- Availability of cacao genome resources has enabled cacao breeders to carry out more efficient research and to accelerate the breeding process in an effort to release superior cacao cultivars
- New international tools have been developed/defined to characterize collections and breeding materials for flavor
- Better knowledge about sexual compatibility systems for breeding cacao is needed

Priority Issues

- Development of pest & disease resistant and drought & heat tolerant varieties as well as varieties with superior flavor
- Collection of genetic resources for novel traits and use of underlying genes through breeding and research programs to meet evolving demands
- Research on reproductive systems
- Sustained funding for breeding programs
- Development of an inventory of genebanks with holdings of wild species
- Infrastructure and personnel for cryopreservation for long-term back-up of collections
- Train breeders in use of molecular tools already validated for Cacao
- Increase yield per area utilizing a holistic approach (e.g. breeding, improved horticultural and agronomic practices rootstock selection, etc.)