

Monitoring the genetic integrity of Bioversity's International *Musa* Germplasm Transit Centre:

A foundation for the conservation and use of banana genetic resources

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Checking the genetic integrity of the ITC banana accessions

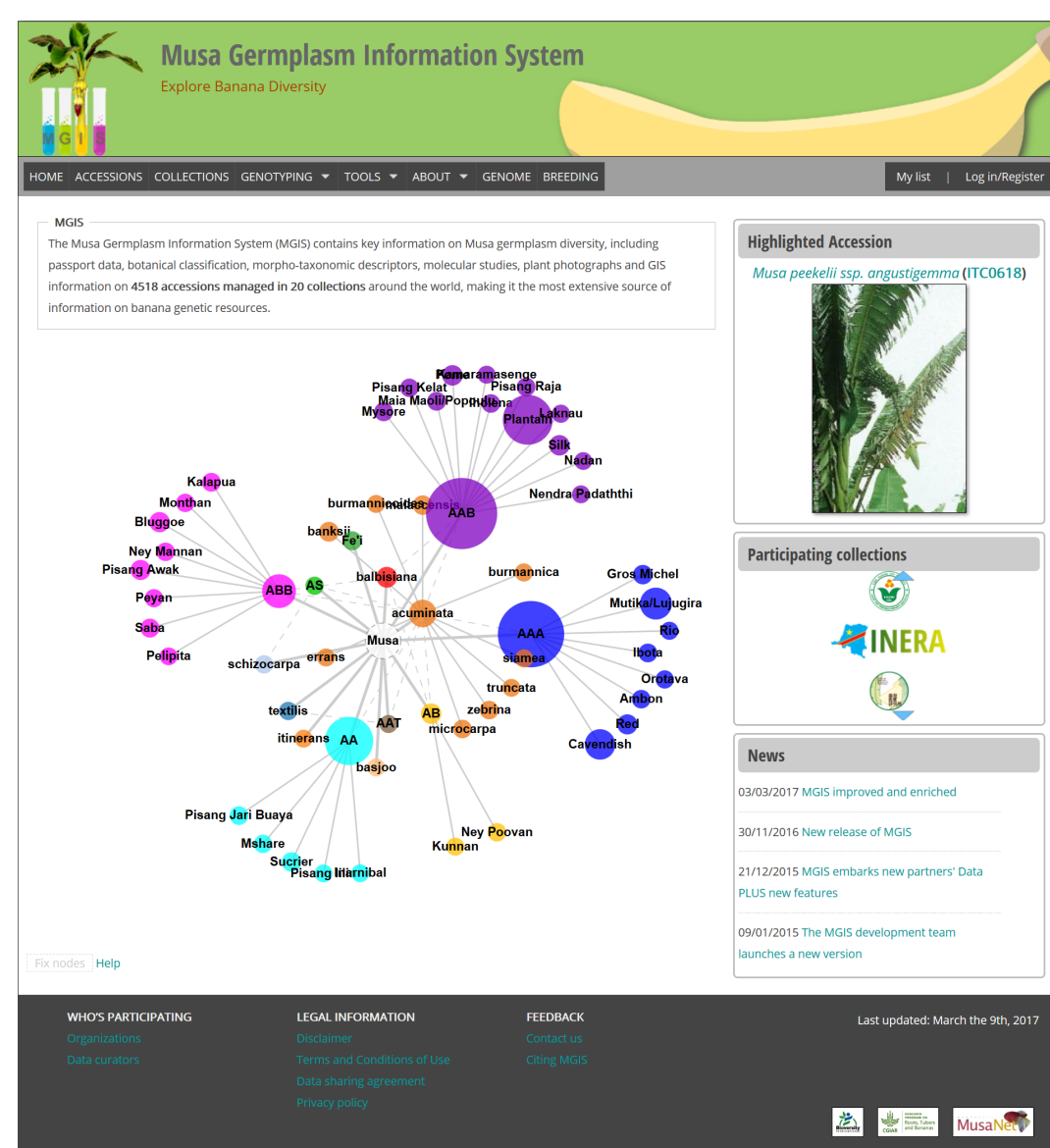
Global banana genebank (ITC)



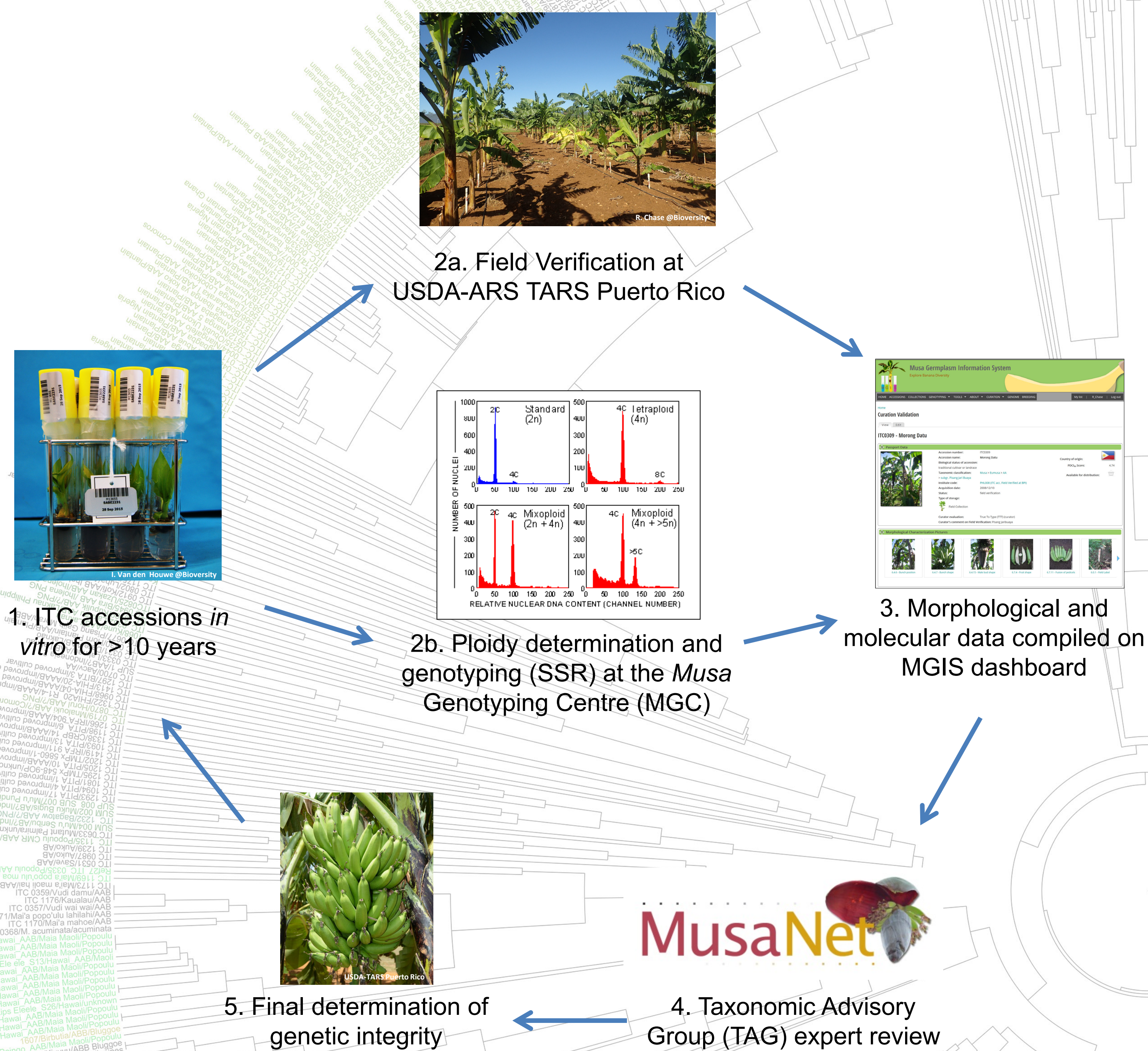
The International *Musa* Germplasm Transit Centre (ITC) is the world's largest collection of banana germplasm, with more than **1,500 accessions** (varieties in a collection) of edible cultivars and wild species, hosted at the Katholieke Universiteit Leuven (KU Leuven), Belgium. The ITC also serves as a **transit centre** and **safety backup** for banana collections worldwide. The ITC conserves accessions by ***in vitro*** storage, **cryopreservation** and **leaf lyophilization**. Protocols for **seed conservation** are currently being developed. Banana germplasm can be requested by users free of charge via the ***Musa* Germplasm Information System (MGIS)**. The genetic integrity of available germplasm is verified by a 5 step process (right).

How the data adds value to the ITC

The morphological and molecular data have a second purpose: to increase the **publicly accessible documentation associated with ITC accessions**. The link between the genetic integrity exercise and users of data is the **MGIS website** (see below), which contains passport data, botanical classification, morpho-taxonomic descriptors, molecular diversity trees, ploidy and digital images currently for more than 4,500 accessions from 21 *Musa* collections worldwide.

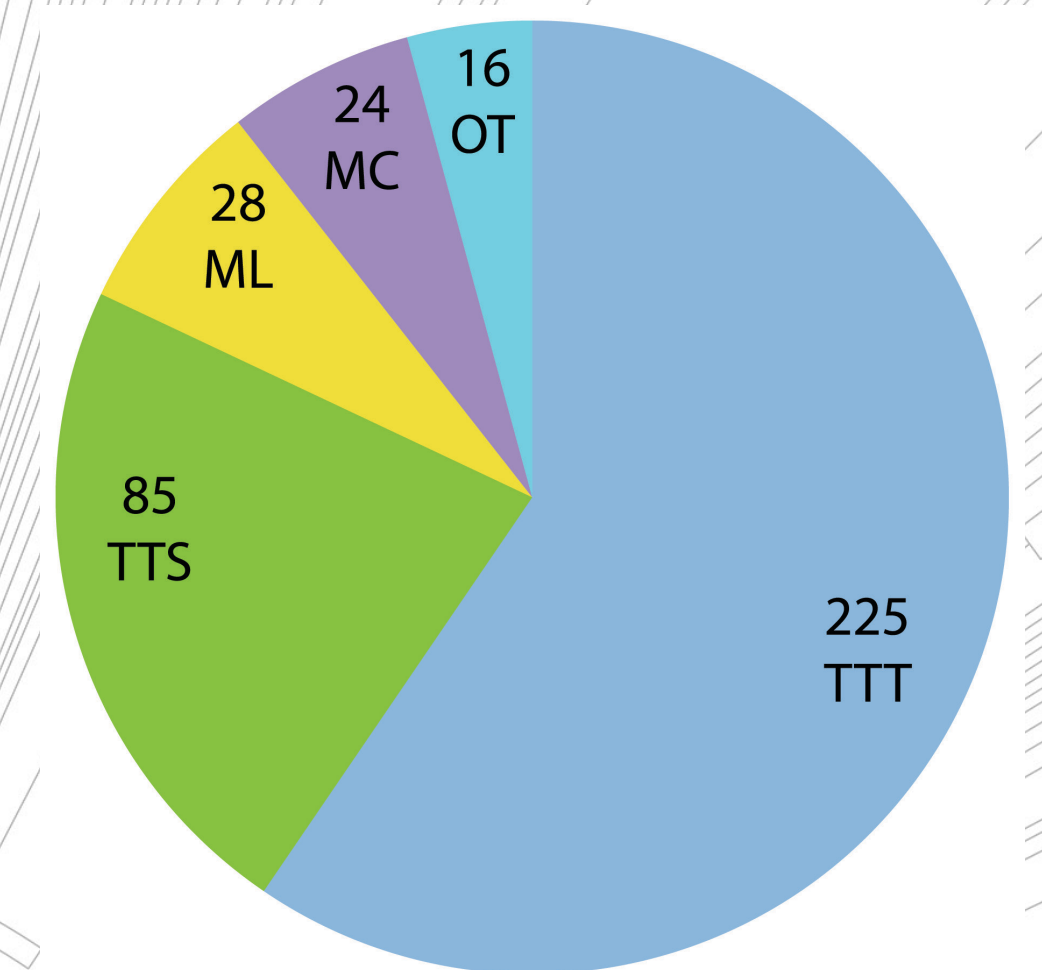


www.crop-diversity.org/mgis



Results

Final conclusions on the **genetic integrity** of an accession is determined to be either: **True to type/subgroup (TTT/TTS)** or **non-true to type** (i.e. off-type (OT), mislabeled (ML) or misclassified (MC)). As of 2017, determinations have been made for **378 accessions**: **310 accessions** are true to type/subgroup, and **68 accessions** are non-true to type (pie chart below).



The plantain Ihitisim (photo left) was found to be off-type in the ITC (photo right).

How better documentation contributes to greater use of PGR

An impact study carried out by Bioversity International in 2016 on the **use of ITC accessions** by *Musa* collections in the Latin America and Caribbean region showed the importance of well-documented accessions in regional and national collections.

More diverse collections

At the Instituto de Investigaciones de Viandas Tropicales (INIVIT) in Cuba, ITC materials were used to test tolerance of varieties to black Sigatoka before it spread to the country. They also received the ITC accession Zanzibar (ITC1471) as part of the IMTP evaluation trial, which is now a common and important variety known as PV 0630.

Training and research

At USDA-ARS Tropical Agricultural Research Station the diverse ITC accessions are used in the field and the lab to train students, interns, and Extension Agents from the University of Puerto Rico and the Department of Agriculture. They also produced a catalogue of their diverse field collection using the phenotypic descriptors from the collaborative field verification exercise (photo bottom right).

Production and breeding

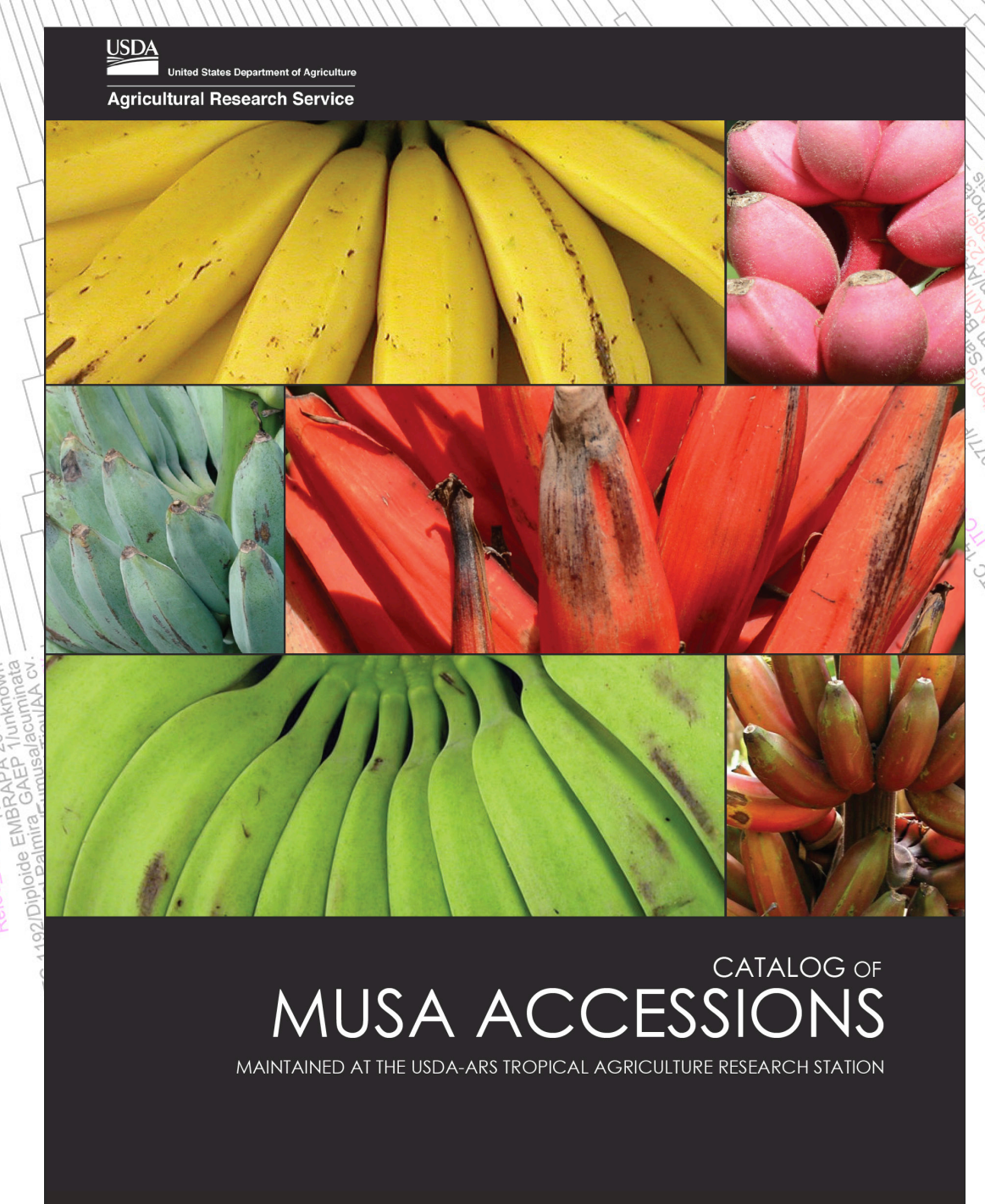
At the Corporación Bananera Nacional (CORBANA) in Costa Rica, the collection is an important backup resource for farmers in this high banana production country. They are testing disease resistance in their diverse collection, which includes many ITC accessions.

Perspectives



The wealth of data generated from the Genetic Integrity exercise will also be used to investigate other topics of interest to crop genebanks. **Genetic stocks** of the **off-type** accessions that were identified through the routine monitoring of the ITC collection will be held in perpetuity for future studies on subjects such as the **detection of somaclonal variation** at an earlier stage.

Moving further with our partners at USDA-ARS TARS and also at the Agricultural Research Institute (ARI) in Tanzania, we aim to validate the banana **cryopreservation method** by comparing the ITC accessions that have been held for years in cryopreservation, with plants held *in vitro* and plants only grown in field.



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