Bioversity International

Bioversity International *Musa* Germplasm Transit Centre (ITC)

Factsheet 1

Operations, Outreach and Impact

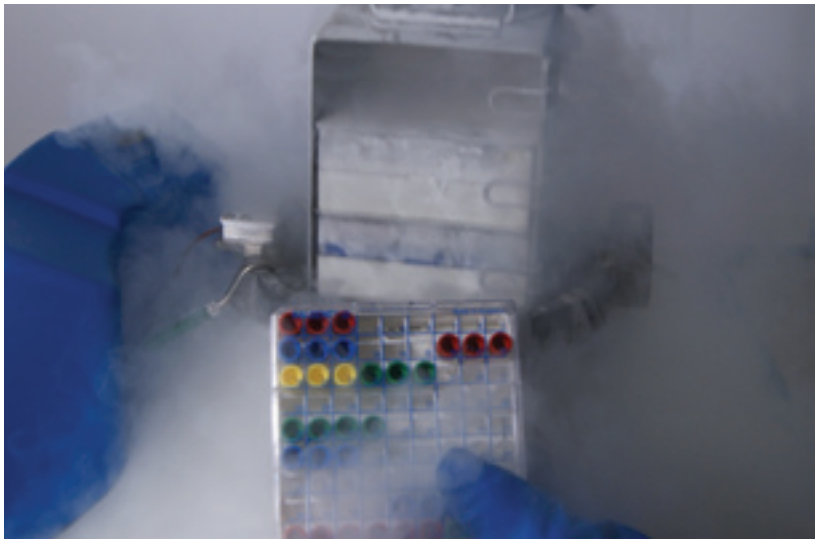
For more information about the Bioversity International *Musa* Germplasm Transit Centre, see:

- Factsheet 2: *Unravelling the genetic basis of banana traits using Next Generation Sequencing technologies*
- Factsheet 3: *Phenotyping for drought*
- Factsheet 4: *Screening for resistance to Fusarium wilt*
- Factsheet 5: *Use of banana diversity for nutritious diets*

Bioversity International has a standing commitment to the long-term conservation of the global banana (*Musa* spp.) collection held in trust at the Bioversity International Musa Germplasm Transit Centre (ITC) in Leuven, Belgium under the auspices of the Food and Agriculture Organization of the UN (FAO). Those CGIAR Genebanks that fulfil the eligibility principles and criteria, and have reached performance targets, may enter into a long-term agreement with the Global Crop Diversity Trust. The ITC will reach these eligibility targets by the end of 2016.

The ITC was established in 1985 with the core objectives of:

- Providing long-term and sustainable conservation of *Musa* genetic resources;
- Maintaining *Musa* genetic diversity and related information in the public domain;
- Contributing to understanding *Musa* diversity through characterization;
- Providing a service for the safe movement of germplasm and related information;
- Developing and transferring ex situ conservation technologies.



Taking out banana meristems that are enclosed in cryotubes from the cryotank after years of storage in liquid nitrogen (-196°C). After this they will be thawed and regenerated into new plants. Credit: Bioversity International/ B. Panis.

Top photo: Bioversity/I. Van den Bergh

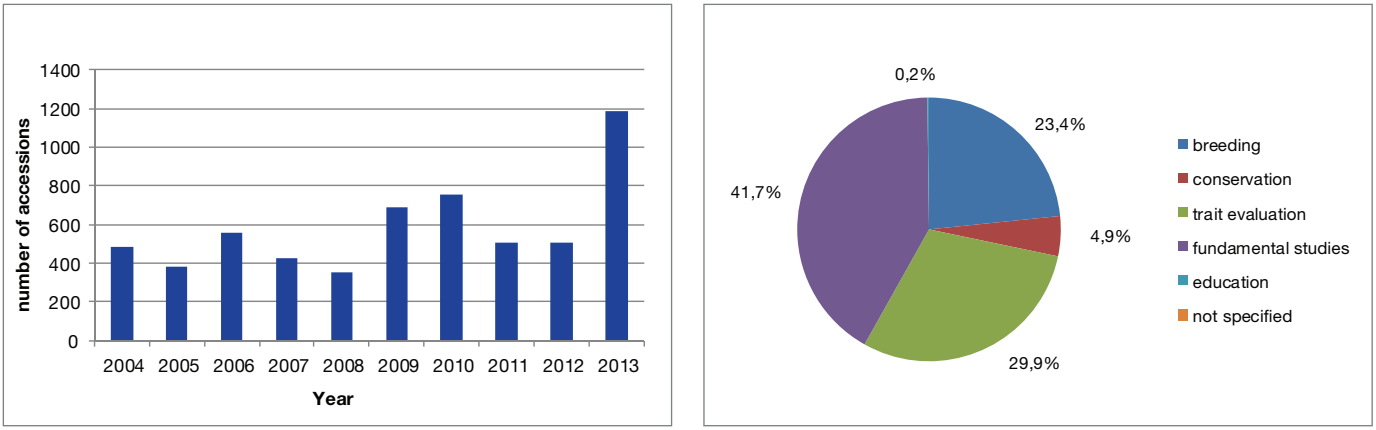


Figure 1. The upward trend in distribution of *Musa* germplasm from the ITC over the last decade, with a marked increase from 2012 to 2013 when the MGIS online requesting system was introduced and the whole genome sequence was published (left). The breakdown of how the requested *Musa* germplasm was used by the recipients (2013) (right).

Banana (*Musa* spp.) is the fourth most important food crop in the least developed countries ranked by total production and food consumption (FAOstat, 2013). Globally, a wide diversity of cultivars are grown and consumed. Further exploiting the diversity of wild and edible varieties in breeding programs and increasing on-farm diversity will lead to more resilient production and banana-based food systems.

As of the beginning of 2015, the ITC holds 1,479 *Musa* accessions, mostly cultivars, plus some improved materials and wild relatives. All accessions are kept under medium-term in vitro storage conditions, and 910 accessions are backed up by cryopreservation. The ITC also stores lyophilized leaves of 883 accessions in the DNA bank.

Through the *Musa* Germplasm Information System (MGIS - http://www.crop-diversity.org/mgis/), users can request germplasm online. MGIS also serves as the portal for documentation of nearly 2,300 accessions from the ITC and six national *Musa* germplasm collections worldwide.

Core operations

The core operations of the ITC include:

- Acquisition of new germplasm
- Ensuring the health status of the accessions (pre-indexing, virus indexing and cleaning)
- Morphological and molecular characterization
- Medium-term storage under in vitro conditions
- Long-term storage and safety duplication (by cryopreservation)
- In vitro multiplication and distribution to users
- Leaf banking for DNA studies
- Rejuvenation in the greenhouse
- Information management – including the online germplasm requesting system

The MusaNet workshop on optimising the use of germplasm through best practices and management involved 13 national collection curators. It was held at the National Research Centre for Banana, Trichy, India in 2014. Credit: Bioversity International/ R. Chase.

Adding value

Material from the ITC is contributing to advances in global research, such as improved knowledge about the *Musa* genome and the genetic diversity. The full potential of the crop's diversity will only be realized if we understand how different cultivars and wild species interact with their environment. In addition, fruit characteristics, sensory properties and consumer acceptance need to be assessed for better targeting of cultivar releases and increasing chances of adoption. More information about work that adds value to the ITC collection is found in the related factsheets entitled 'Unravelling the genetic basis of banana traits using Next Generation technologies', 'Phenotyping for drought', 'Screening for resistance to Fusarium wilt' and 'Use of banana diversity for nutritious diets'.

Outreach

Through MusaNet (www.musanet.org), a collaborative framework for the implementation of the Global Strategy for the Conservation and Use of *Musa* Genetic Resources coordinated by Bioversity International, the ITC is constantly interacting with partners in national collections worldwide. Four regional *Musa* networks are active, allowing the community to respond to the needs of researchers and end-users in the regions where bananas are grown (http://banana-networks.org/). ITC and MusaNet are also involved in capacity building in the areas of characterization and collection management, as recently demonstrated by international workshops in Guadeloupe and India, and linking closely with the global platform for knowledge sharing on banana, ProMusa (www.promusa.org).

Impact

The distribution of healthy germplasm from the ITC has played a major role in banana-related development projects. Results from a user survey and interviews with key informants showed that the most important fields where impacts have been created are:

a) The dissemination of superior germplasm to small-scale farmers with expected positive effects on their productivity
b) Research on resistance/tolerance to economically important banana pests and diseases
c) The impact and contribution to breeding of superior banana germplasm
d) The valuation of fundamental research carried out with materials from the ITC (e.g. virus testing and therapy, banana physiology, pathology and breeding techniques).

Children helping their parents, who are participating in a project distributing macropropagated plants to farmers in Burundi. Credit: Bioversity International/ P. Lepoint (source: www.musarama.org)

Looking ahead

As the genebank continues to expand, the ITC is preparing for future opportunities and challenges by:

- Optimising the conservation of *Musa* diversity, including wild species
- Ensuring the availability of high-quality characterization and evaluation data on all ITC accessions
- Establishing a technology for long-term seed conservation
- Applying expertise in cryopreservation, virus indexing and disease cleaning to other crops
- Providing a secure repository of material/information for all accessions in *Musa* national collections.

Partners

CGIAR
Science for a food secure future

MusaNet

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CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas