

The Global Plant Cryopreservation Initiative

CGIAR Clonal Crops Community of Practice

Presented by Marc Lateur to ECPGR Steering Committee Meeting, 7-8 June 2022

Methods of conservation of Plant Genetic Resources

- *In situ* : CWR & cultivated plants

Conservation in 'normal' habitat

- Nature, rain forests, gardens, farms

- *Ex Situ* :

- **Seed collections**

- Field collections, Botanical gardens

- *In vitro* collections for some plants

- Normal growth

- Slow growth (temp ↓, O₂ ↓, H₂O ↓, medium ~)

- Cryopreservation (-196°C)

- On Farm complementary actions



Alliance - CIAT Bean genebank, Colombia



> 1 million seed samples

Many important Food and Nutrition Security Crops Cannot be long term Conserved by Seeds Non orthodox seeds & Vegetative propagated plants – *Where Virus, phytoplasma,...are risky!*



1 BILLION TONNES

US\$100 BILLION

Annually 1 billion tonnes of these crops are worldwide produced globally, valued at US\$100 billion (FAOSTAT)

Cryopreservation is a complementary **Safe, Reliable and Feasible** way for long term PGR conservation

Not yet adapted for all crops & plants

CGIAR Centers – notably **Alliance Bioversity International & CIAT, CIP and IITA** – have cryopreserved collections.

Other genebanks and institutions also engaged in cryobanking including countries from EU, Japan and USDA.

Bioversity International and KU Leuven with support of the Crop Trust, developed **protocols for >30 species**.

Cryopreservation offers a solution for the long-term conservation of other crops that cannot be conserved by seed.



Cryopreservation at the International Potato Center, Peru. Credit: CIP



Musa varieties held in the cryopreservation lab at the International Transit Centre, Belgium. Credit: Alliance-Bioversity International

Feasibility Study

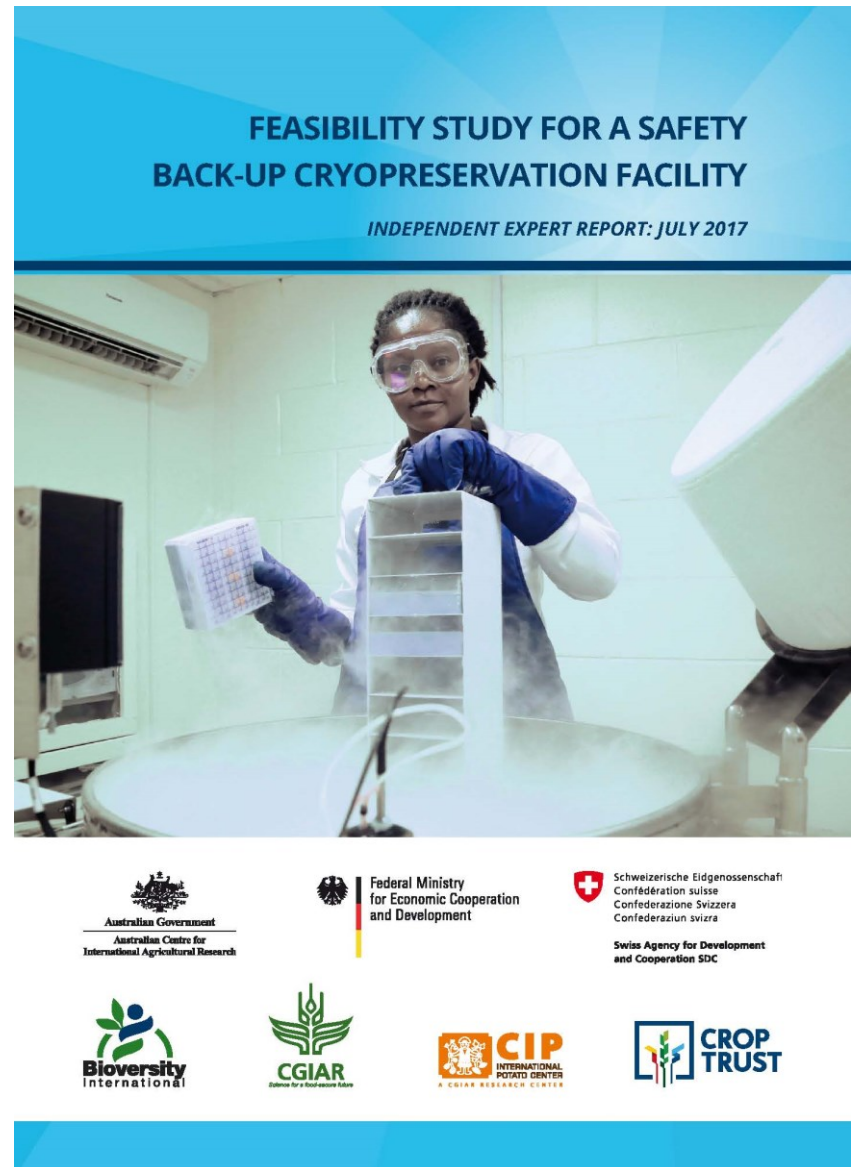
Multi-partner and multi-disciplinary task force:

1: Assessment of current and future potential use

2: Analysis of the state of conservation of propagated and recalcitrant seed species

3: Policy and technical requirements for the location and operation

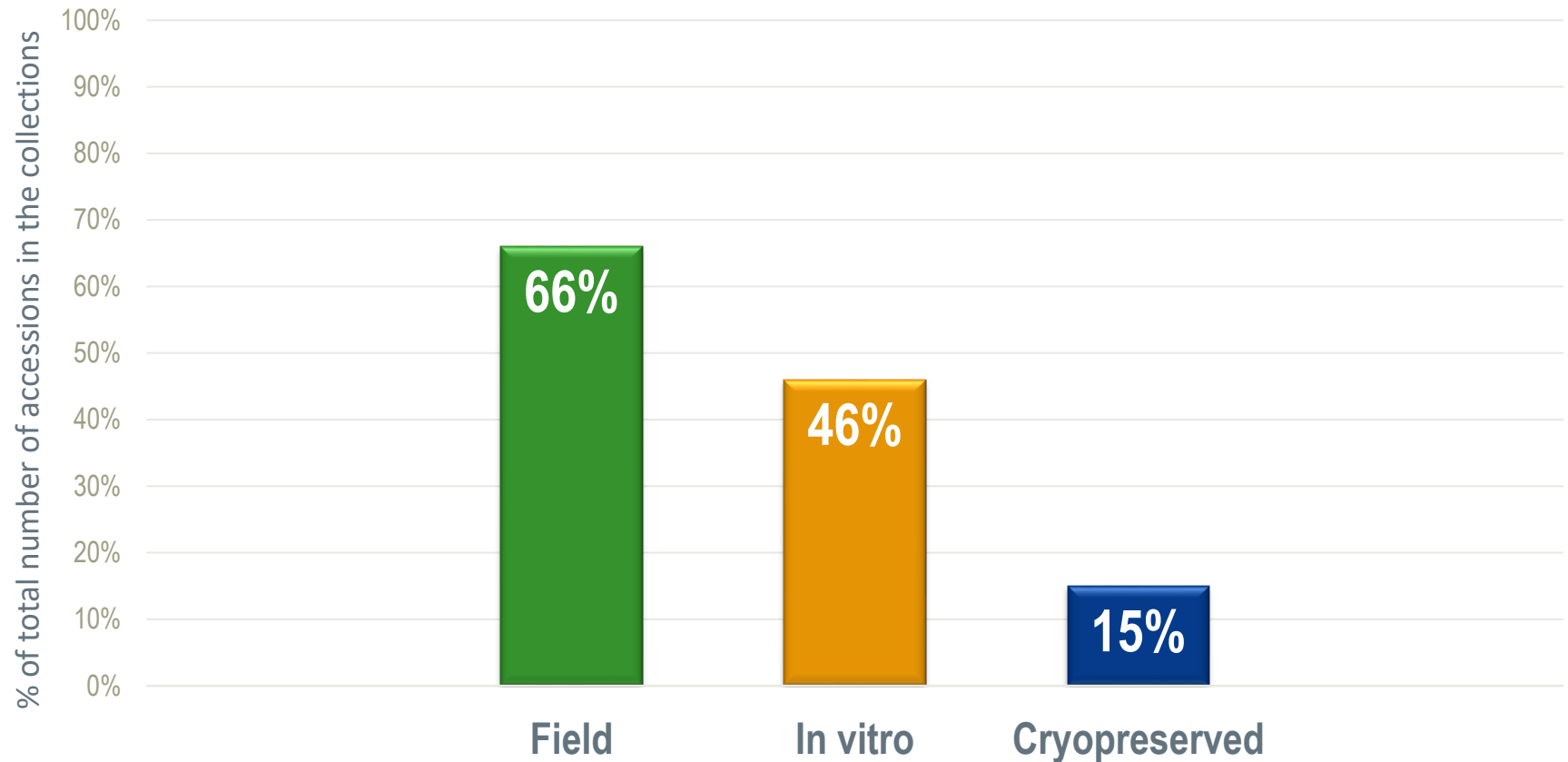
4: Costs of establishing and running a safety back-up cryopreservation facility



Acker et al. 2017.

https://www.bioversityinternational.org/index.php?id=244&tx_news_pi1%5Bnews%5D=9691

The Feasibility Study Conclusions: Few Collections back up Cryopreserved



Percentage of the total holdings of 15 institutes who responded to the survey. The data represents 29 crops that are maintained in cryopreservation, *in vitro* culture and in the field.

Institute	N° of Acc.	Crop	Cryopreservation Method
Bioversity International, Leuven, Belgium	1100	Banana	• Droplet vitrification
Association FORêt-CELLulose (AFOCEL), France	440	Elm	• Dormant bud freezing
International Center for Tropical Agriculture (CIAT), Cali, Colombia	480	cassava	• Droplet vitrification • Encapsulation/dehydration
Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Gatersleben, Germany	213	Garlic	• Droplet vitrification
International Potato Center (CIP), Lima, Peru	3227	Potato	• Droplet vitrification
Julius Kühn-Institut (JKI), Institut für Züchtungsforschung an Obst, Dresden, Germany	194	Strawberry	• Vitrification
Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Gatersleben, Germany	1818	Potato	• Droplet freezing • Droplet vitrification
National Agrobiodiversity Center (NAAS), RDA, Suwon, South Korea	1158	Garlic	• Droplet vitrification
National Institute of Agrobiological Sciences (NIAS), Tsukuba, Japan	1236	Mulberry	• Dormant bud freezing
USDA-ARS, Fort Collins and Corvallis, USA	2155	Apple	• Dormant bud freezing
USDA-ARS, Fort Collins and Corvallis, USA	451	Citrus	• Droplet vitrification
Tissue Culture and Cryopreservation Unit, NBPGR, Delhi, India	329	Mulberry	• Dormant bud freezing
Crop Research Institute, Prague, Czech Republic	157	Garlic	• Droplet vitrification

The Feasibility Study recommendations:

- A major global initiative should be launched to accelerate the development and implementation of crop cryopreservation for important crops (estimate that 100,000 accessions need to be cryopreserved)
- A back up cryopreservation facility should be set up to accommodate the estimated 10,000 accessions that are already cryopreserved (cfr Svalbard Seed Vault)

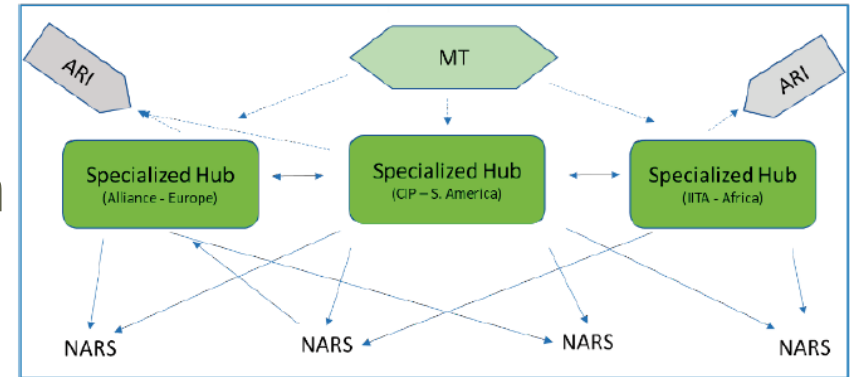


Global Plant Cryopreservation Initiative structure and function

To Create regionally situated Specialized Hubs (initially in **Europe**, Africa, and Latin America).

The role of these hubs will be:

1. To provide safety back up
2. To create regional and global communities of practice around cryopreservation (e.g. **ECPGR CRYO WG**)
3. To expand cryopreservation to as much crops needed (prioritization criteria)
4. Become **centres of excellence** for capacity building and training



Thank You !

For more information regarding the proposed Cryo Hub, that could be hosted in Europe:

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