KU LEUVEN

Alliance

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

CGIAR
Science for a food secure future

Cryopreservation activities in Belgium

Bart Panis

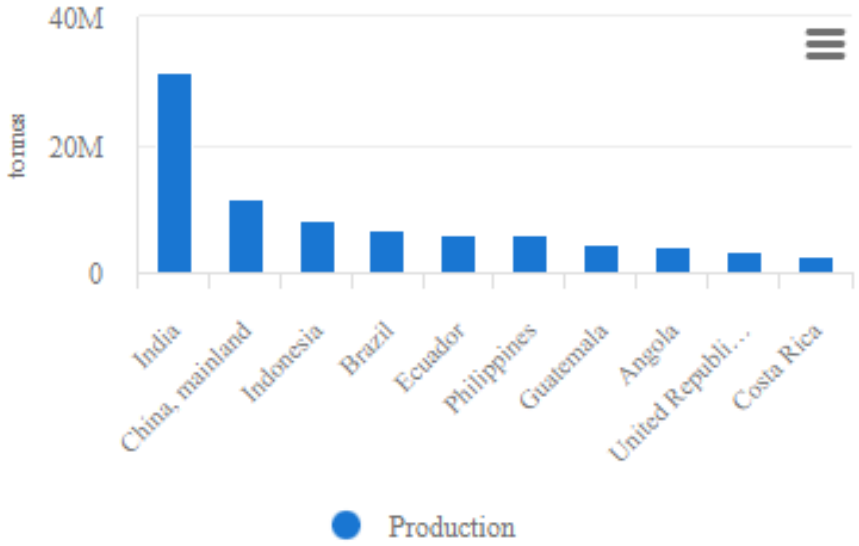
Importance of banana/plantains/cooking bananas

- Staple food for **400-1,000 million** people
- Produced in **>120** countries
- Banana and plantain (*Musa* spp.): Largest fruit crop in the world with an annual production of **158 million tonnes** (2020, FAO)(Apple: 87 million tonnes)
- International banana trade: yearly turnover of **~6 billion USD**

Production

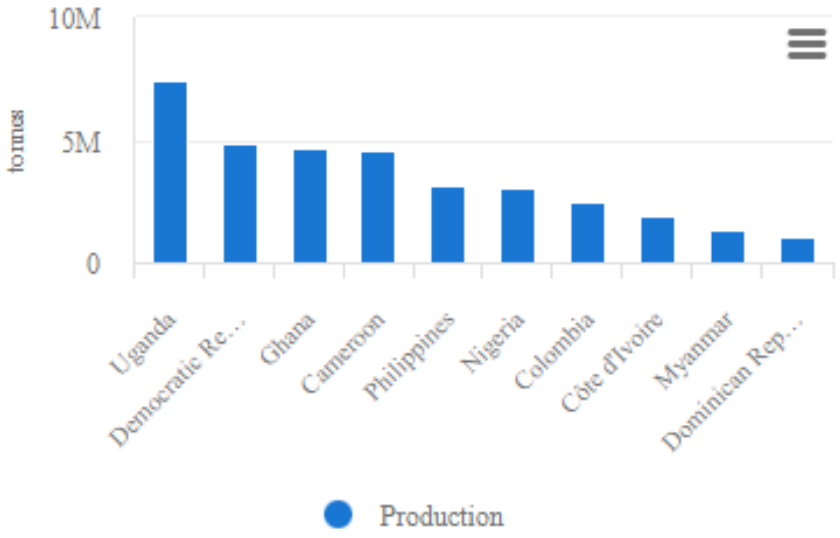
Production of Bananas: top 10 producers

2020



Production of Plantains and cooking bananas: to...

2020



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Problems in banana cultivation

Diseases (viral, fungal, bacterial, nematodes, insects).

- TR4 attacking the export banana worldwide
- BBTV threatening plantain production

Stress due to climate change

- Storms
- Drought

Fruit

- Shelve life
- Fruit quality
- Yield

Where do “new cvs” or “characteristics have to come fr

1. Forgotten cvs
2. Classical improvement
3. Modern improvement

→ **Access to the widest possible genetic diversity is essential**

The banana world collection in Leuven, Belgium

- Established in 1985 at KU Leuven, Belgium
- Food and Agriculture Organization of the UN ‘in trust’ collection (1994)

Cryopreserved base collection 1195 accessions

In vitro active collection 1682 accessions

Lyophilized leaf tissue collection 939 accessions

Off site black box safety back-up (IRD, France) 996 accessions

Germplasm health testing

→FAO International Guidelines for the safe movement of *Musa* germplasm – 1989/1996

Methodologies

1/ Pre-indexing

Testing of accession lines grown in screenhouse at 3 months

Specific tests :

PCR for BBTV/CMV/BBrMV/BSVs/BanMMV

2/ Virus therapy

	CMV	BBTV	BSV	BanMMV
Meristem culture	-	+++	++	
Thermotherapy	+++			+++
Chemotherapy	+		+++	+
Electrotherapy	-		+++	
Cryotherapy	+		+++	

3/ VIC indexing

Testing of accession subset of TC plantlets grown in screenhouse at 3 and 6 months

Specific tests (knowns) :

Multiplex PCR for BBTV/CMV/BBrMV/BSVs

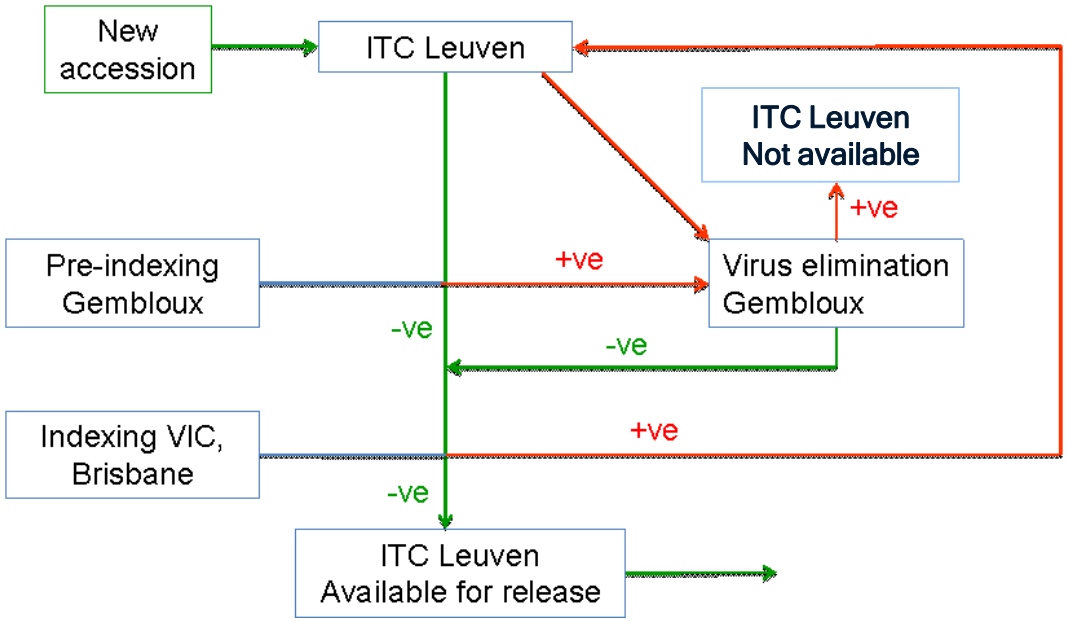
PCR for BanMMV

ISEM

Non-specific tests (unknowns) :

Visual inspection for symptoms

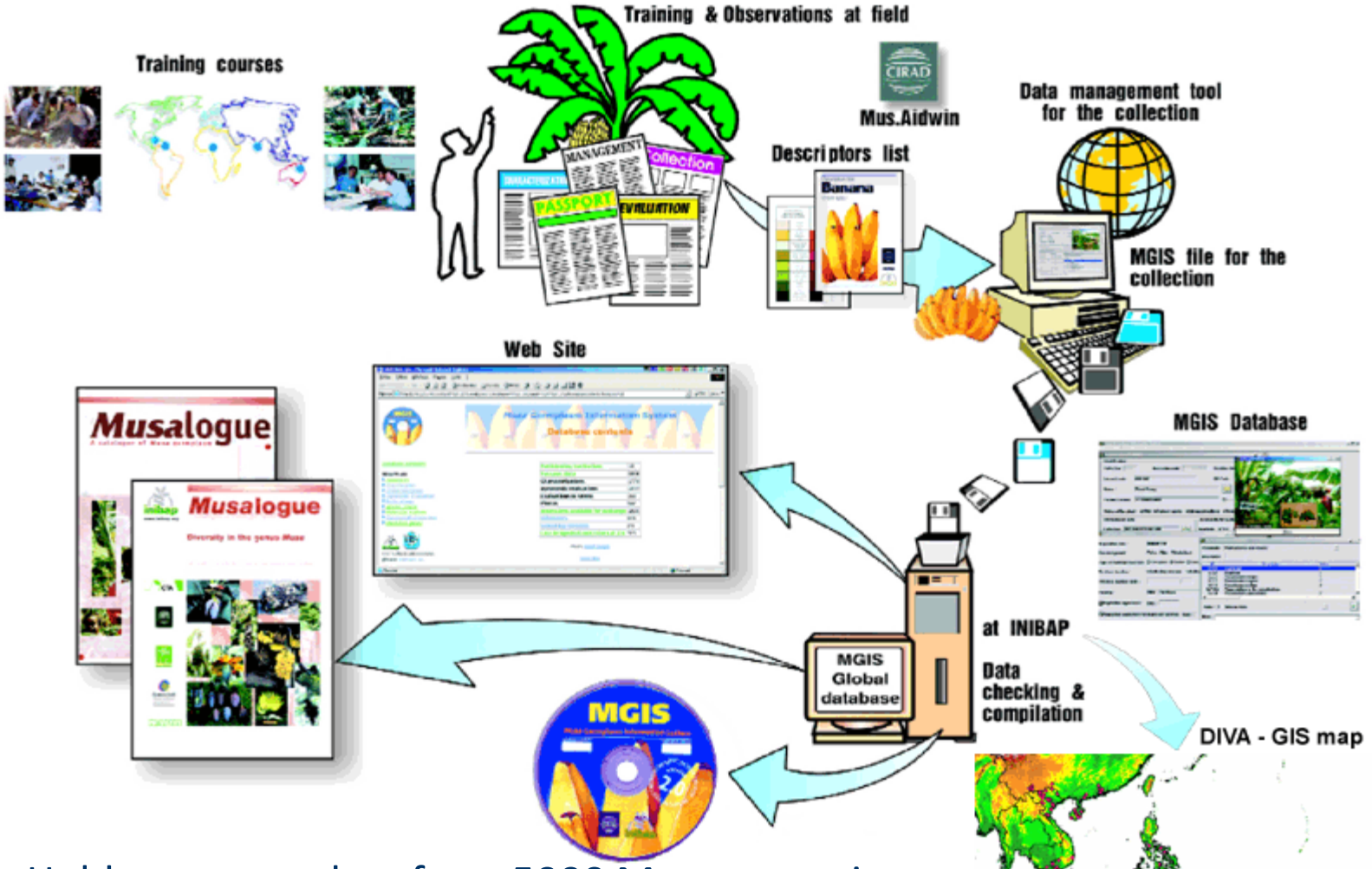
Minipreps/EM



Université de Liège

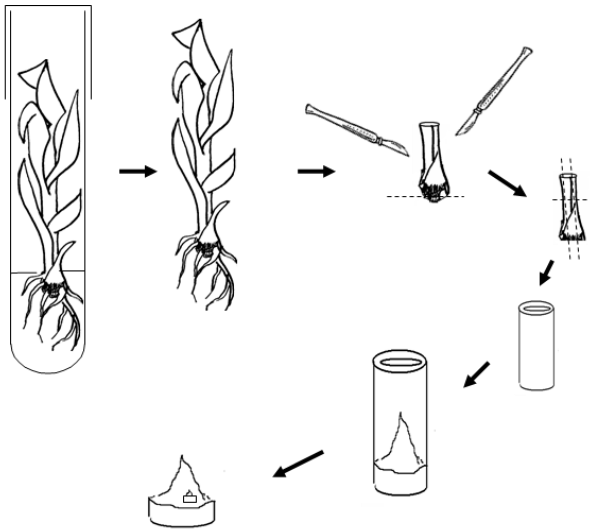
The University Of Queensland AUSTRALIA

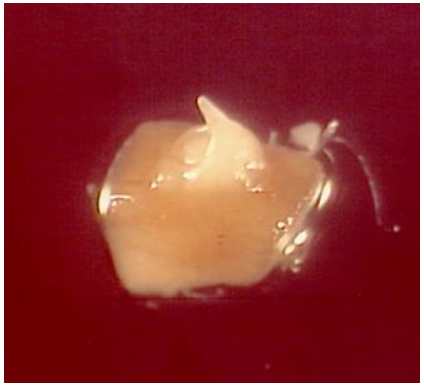
Musa Germplasm Information System (MGIS)



Holds passport data from 5000 Musa accessions maintained in 18 genebanks around the world)

By Clicking on some parts of the schema, you can access further details





Development of protocols

- **Potato** (CIP, Peru; CRPGL, Luxemburg; VIR, Russia)
- **Ulluco** (CIP, Peru)
- **Sweet potato** (CIP, Peru)
- **Chicory** (CRA, Gembloux, Belgium)
- **Strawberry** (CRA, Gembloux, Belgium)
- **Taro** (SPC, Fiji)
- **Pelargonium** (INH, Angers, France)
- **Date Palm** (Université de Sfax, Tunesia)
- **Banana** (CIRAD, France; NBPGR, India)
- **Thyme** (Univ Alicante, Spain)
- **Olive** (IFAPA, Malaga, Spain)
- **Hop** (Univ Oviedo, Spain)
- **Photinia** (CNR, Firenze, Italy; Gebze, Turkey)
- **Vitis** (CNR, Palermo, Italy, PFR, Palmerston, NZ)
- **Apple** (Fruit Tree Research Institute, Italy)
- **Cassava** (IITA, Nigeria, CIAT, Colombia)
- **Tomato** (University of Valencia, Spain)
- **Bituminaria** (University of Valencia, Spain)
- **Narcissus** (Daffodil) (University of Krakow, Poland)
- **Galanthus** (Snowdrop) (University of Krakow, Poland)
- **Lily** (PRI, the netherlands)
- **Rose** (University of Krakow, Poland)
- **Yacon** (University of Prague, Czech republic)
- **Coconut** (RDA, South Korea)
- **Spuce** (Slovac acedemy of science)
- **Pine** (Slovac acedemy of science)
- **Ash** (CNR, Firenze, Italy)
- **Byrsonima** (UFLA, Brasil)
- **Callerya** (INTAS , China)
- **Stevia** (KU Leuven)
- **Raspberry** (FTRI, Italy)

EU

establishing CRYopreservation Methods for Conserving European PlanT germplasm collections

CRYMCEPT

plant cryopreservation

QLK5-CT-2002-01279
1 November, 2002- 31 October, 2005

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Physico-biochemical parameters related to plant cryopreservation

CRYMCEPT
plant cryopreservation

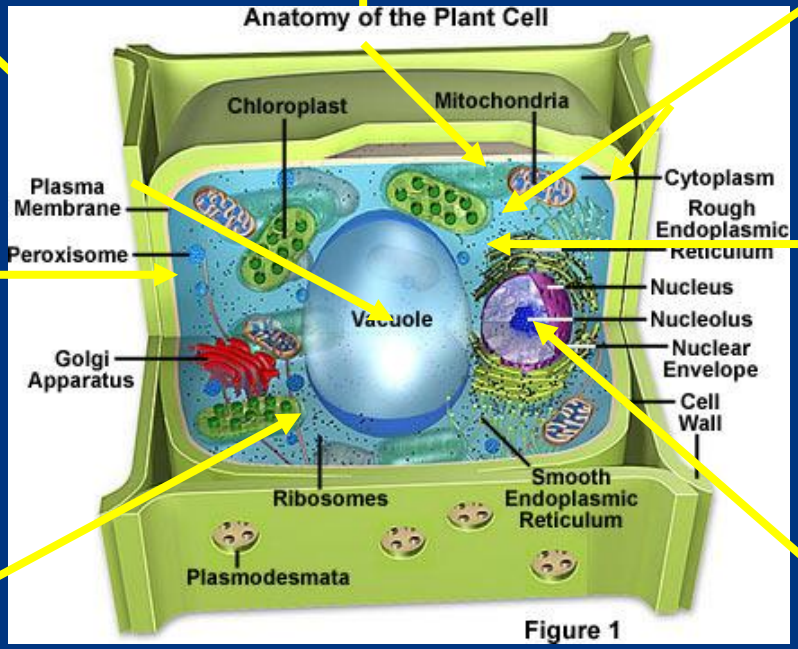
Water thermal behavior

Proteins

Sugars

Membrane components

Polyamines



Cytoskeletal protein

Oxidative stress

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Crymcept workshops

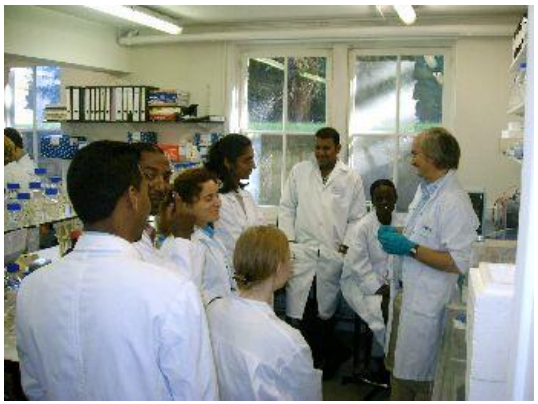
Workshops on Cryopreservation in Support of the Conservation of European Plant Genetic Resources

Organized by the International Plant Genetic Resources Institute (IPGRI) (Rome, Italy) in collaboration with the partners of the CRYMCEPT project:
Katholieke Universiteit Leuven, Leuven, Belgium
University of Abertay Dundee, Dundee, UK
University of Derby, Derby, UK
Institut de Recherche pour le Développement, Montpellier, France
Fruit Tree Research Institute, Rome, Italy
DSMZ-Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH, Braunschweig, Germany

Sponsored by the European Union Project mission

Venues and dates:
The First Workshop will be hosted by the Katholieke Universiteit Leuven (Leuven, Belgium), 12–22 September 2005.

The Second Workshop will be hosted by the Institut de recherche pour le développement (Montpellier, France), 10–21 October 2005.



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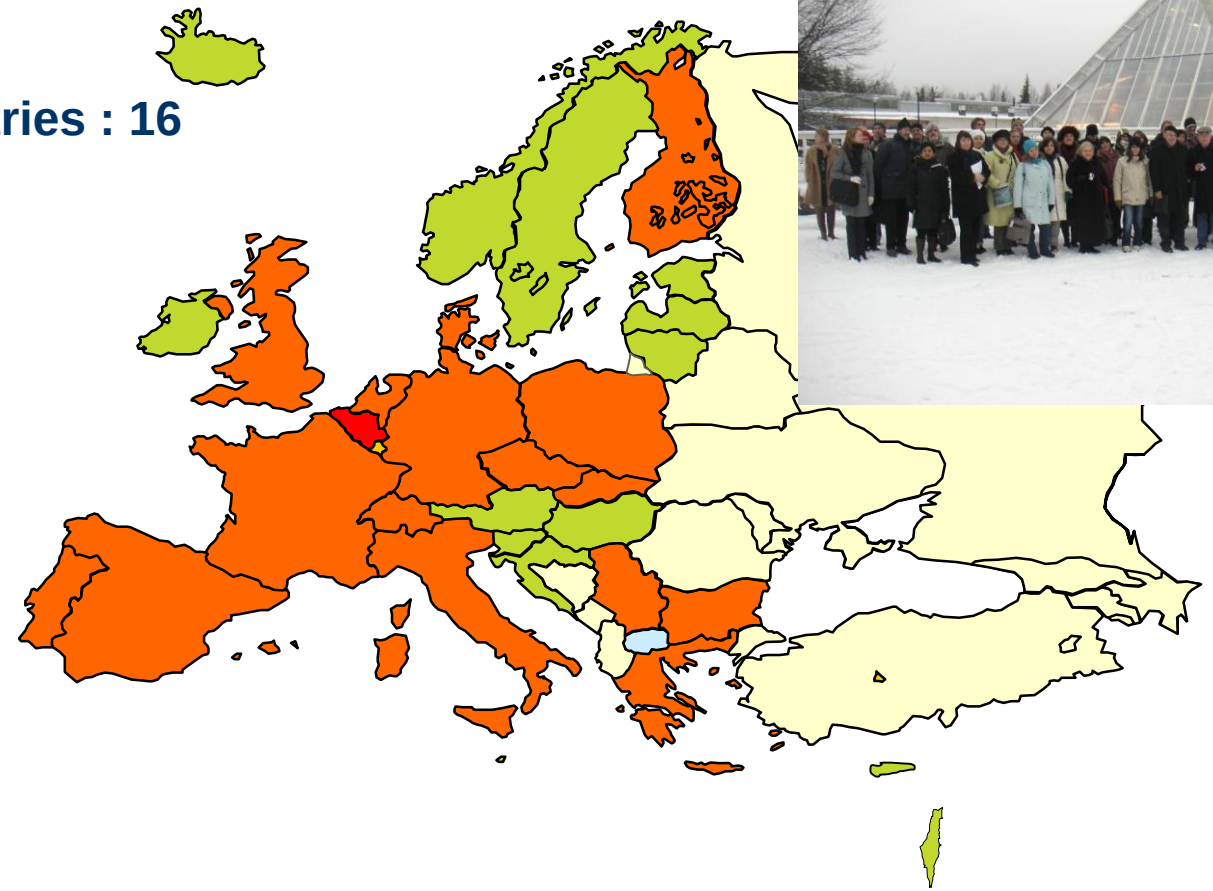
Action 871: Cryopreservation of crop species in Europe

Participating Countries : 16

Chair : **BE**

BG, CZ, DK, FI, FR, DE, IT, NL, PL, PT, CS, SK, ES, UK,GR, LU, CH

Non-COST:
Vavoliv, Russia
New Zealand
Tunesia



Duration: **4 years**

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The first International Symposium on Cryopreservation in Horticultural Species was held in Leuven (5 to 8 April, 2009)

149 participants from 43 countries

Acta Horticulturae 908, 65 articles, 511 pages

ISHS

cost
EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

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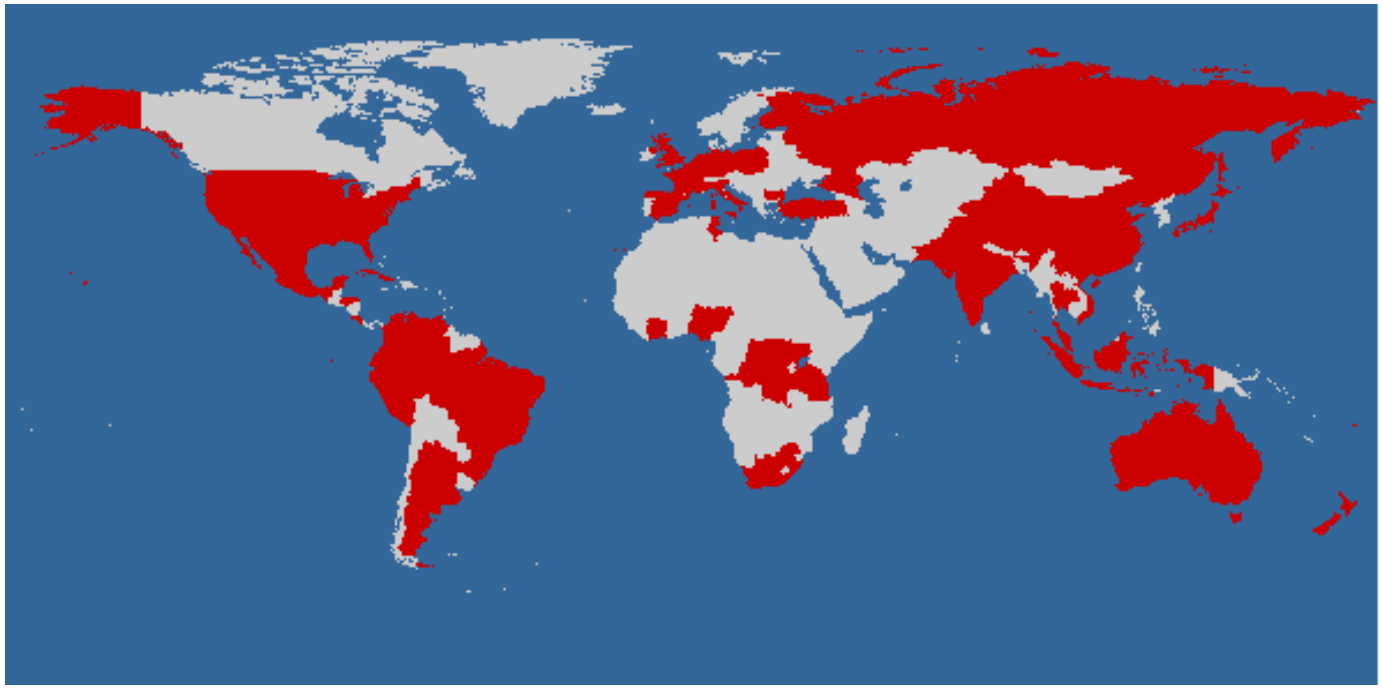
Training on plant cryopreservation

- Over the past 25 years about 140 researchers from 44 countries were trained on plant cryopreservation techniques in Leuven.
- The length of their training ranged between 3 days and 1 year and they were financed by different sources (FWO, World Bank, EU, Development cooperation,….).



Other Cryopreservation activities in Belgium

- Cryopreservation of azalea (ILVO)
- Cryopreservation of *Abies nordmanniana* (CRA-W)
- Cryopreservation of chicory meristems and chicory seeds (Plantenteelt, KU Leuven)
- Cryopreservation hairy root cultures of *Maesa lanceolata* and *Medicago truncatula* (U GENT)
- Cryopreservation of Stevia (Plant Physiology Lab, KU Leuven)

ILVO
Flanders Research Institute for Agriculture, Fisheries and Food

Wallonie recherche CRA-W

UNIVERSITEIT GENT

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Thank you

www.bioversityinternational.org

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