



KU LEUVEN



Europe. Cryobanking agricultural species

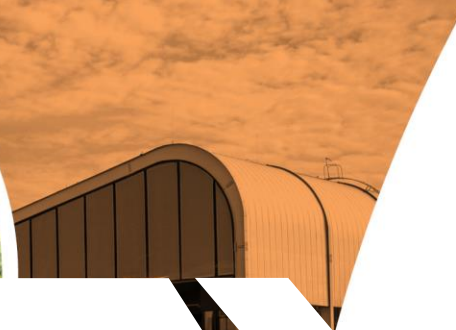
Bart Panis

Alliance of Bioversity International and CIAT/ KU Leuven

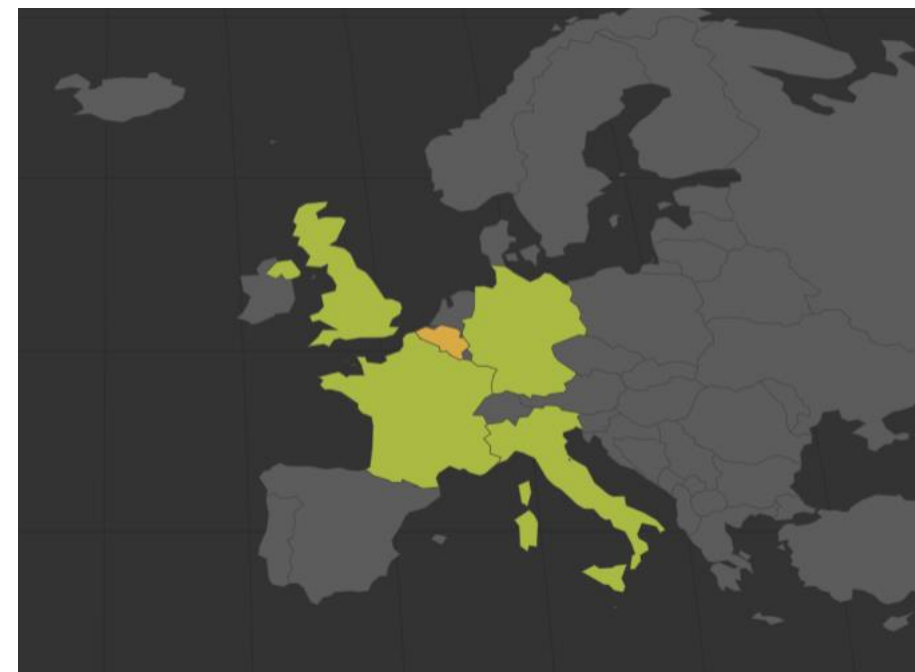
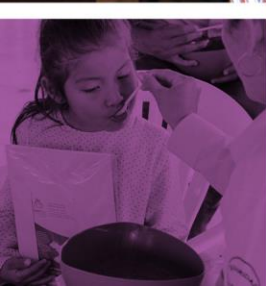
European initiatives concerning plant / crop Cryopreservation

1. CRYMCEPT (Establishing cryopreservation methods for conserving european plant germplasm collections) (2002-2005)
2. CRYOPLANET (Cryopreservation of crop species in Europe) (2006-2011)
3. ECPGR (European Cooperative Programme for Plant Genetic Resources) working group on Cryopreservation (2022-....)





CRYMCEPT



Objectives

General objective:

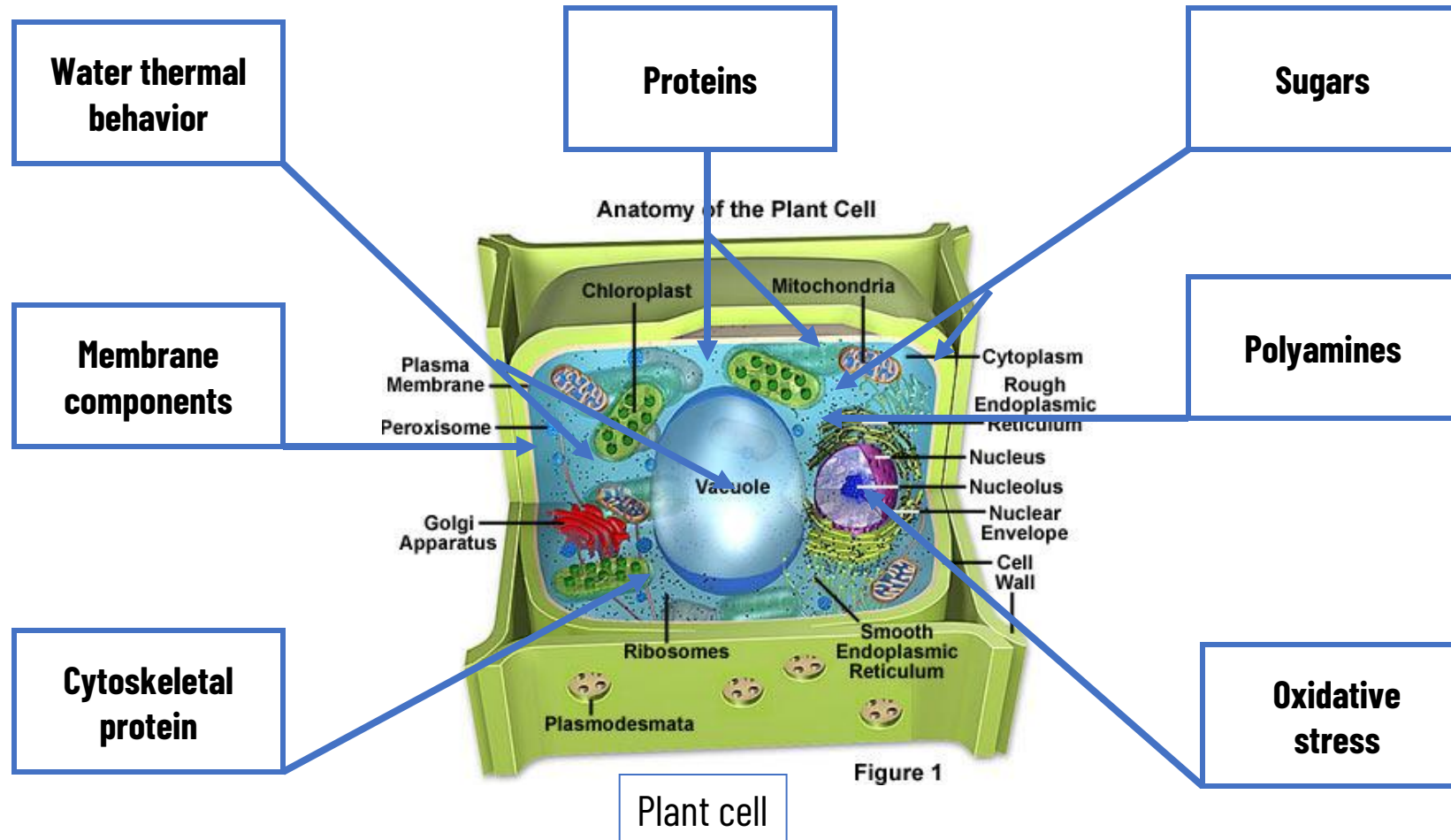
The development of new/improved cryopreservation protocols applicable to plant germplasm collections in Europe.

Specific objectives:

1. Development of sensitive, reliable and use friendly techniques to measure plant species / tissue response to cryoprotection/cryopreservation.
2. Determination of physico-biochemical changes associated with tolerance towards cryopreservation.
3. Development of new plant cryopreservation protocols.
4. Validation of the improved cryopreservation protocols and their application to European germplasm collections.

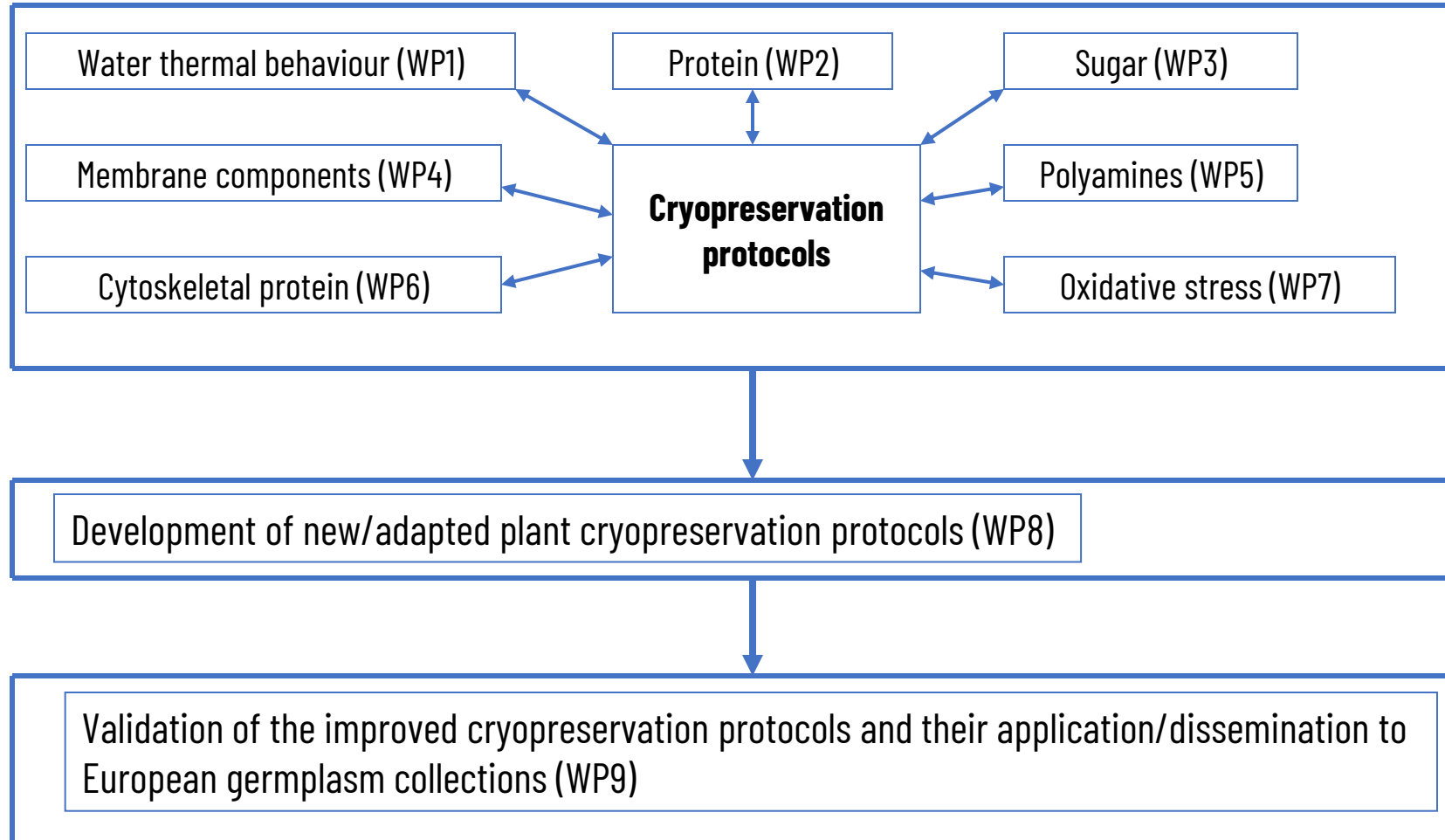
PF5 project EU contribution € 1 543 230,00

Physico-biochemical parameters related to plant cryopreservation



Project workplan

Work packages (WP)



Partners

Considerable experience with plant cryopreservation preferentially linked with a germplasm collection
Experience in and/or interest for the analysis techniques that are described in the different Work packages.



Partner 1. K.U.Leuven Catholic University of Leuven, Lab. of Tropical Crop Improvement, Belgium
in collaboration with Catholic University, Lab. of Plant Physiol. Belgium

Partner 2. UAD

University of Abertay Dundee, School of Molecular Life Science, U.K.

Partner 3. UNIV1

University of Derby, Division of Biological Science, U.K.

Subcontractor: Nottingham Trent University, U.K.

Partner 4. IRD

Institut de Recherche pour le Développement, GeneTrop - Génétique des Plantes, France

Partner 5. ISF - Rome

Fruit Tree Reserch Institute, Propagation Department, Italy

Subcontractor: University of Tor Vergata, Italy

Partner 6. DSMZ

Deutsche Sammlung Mikroorganismen Zellkulturen GmbH, Plant Cell Depart., Germany

Partner 7. IPGRI

International Plant Genetic Resources Institute, Italy

Crymcept workshops



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



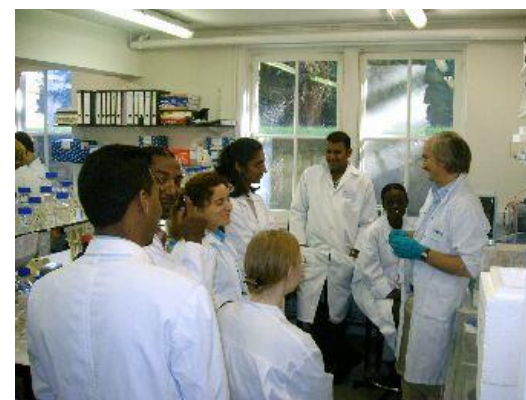
Organized by the International Plant Genetic Resources Institute (IPGRI) (Rome, Italy) in collaboration with the partners of the CRYMCEPT project:
Katholieke Universiteit Leuven, Leuven, Belgium
University of Abertay Dundee, Dundee, UK
University of Derby, Derby, UK
Institut de Recherche pour le Développement, 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.



Alliance



Deliverables

1. Analytical techniques to monitor **sugar composition** in cryopreserved plant germplasm and their application in the identification of pre-treatments that favour sucrose accumulation
2. Analysis of **membrane components** of cells and tissues to determine the effect of preculture, desiccation and freezing and application
3. Development of techniques for the analysis of changes of **protein patterns** in plant tissues during the application of pre-culture procedures indicating presence or absence of stress mechanisms (**Proteomics**)
4. The study of the **thermal behaviour of water** using differential scanning calorimetry (**DSC**) analysis is a powerful tool to optimise plant cryopreservation protocols
5. Development of **new cryopreservation protocols (droplet vitrification / seed cryopreservation coffee)**
6. **Workshops**

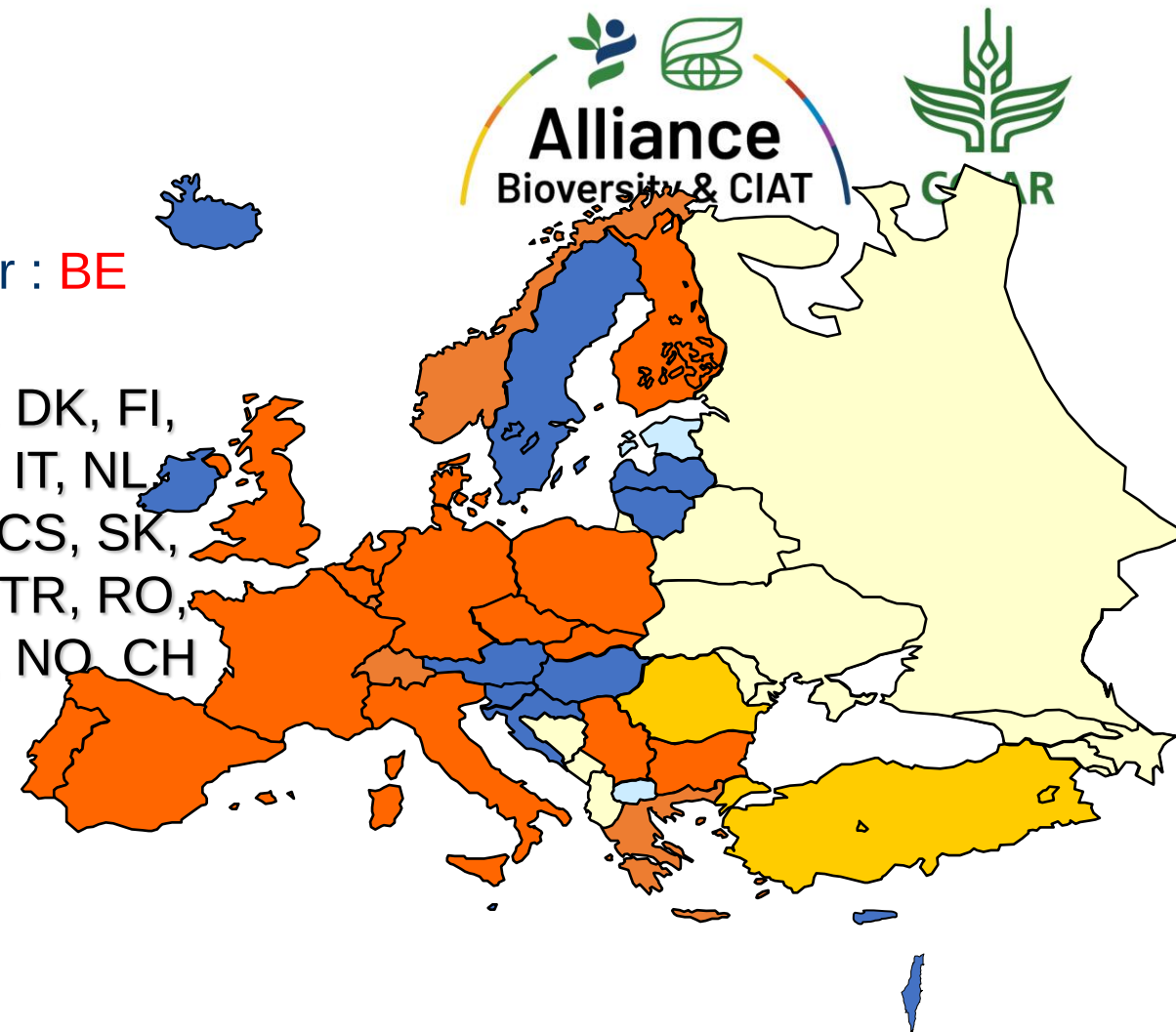


CRYOPLANET



Chair : BE

BG, CZ, DK, FI,
FR, DE, IT, NL,
PL, PT, CS, SK,
ES, UK, TR, RO,
GR, LU, NO, CH



Action 871: CRYOPLANET (Cryopreservation of crop species in Europe) (2006-2011)

What are the objectives of CRYOPLANET ?

Objective 1: To screen in detail the current utilization of plant cryopreservation in Europe.

Objective 2: To screen and compare the efficiency of existing plant cryopreservation protocols.

Objective 3: To improve fundamental knowledge about cryoprotection through the determination of physico-biochemical changes associated with tolerance towards cryopreservation.

Objective 4: To develop new plant cryopreservation protocols.

Objective 5: To assure the genetic stability and true-to-typeness of plants after cryopreservation.

Objective 6: To apply cryopreservation to European plant germplasm collections.

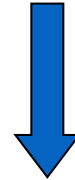
Objective 7: To proof the environmental, social and economic impact of plant cryopreservation.

Scientific programme of CRYOPLANET ?

WG1

Fundamental aspects of cryopreservation/cryoprotection and genetic stability

Optimisation



Feed back

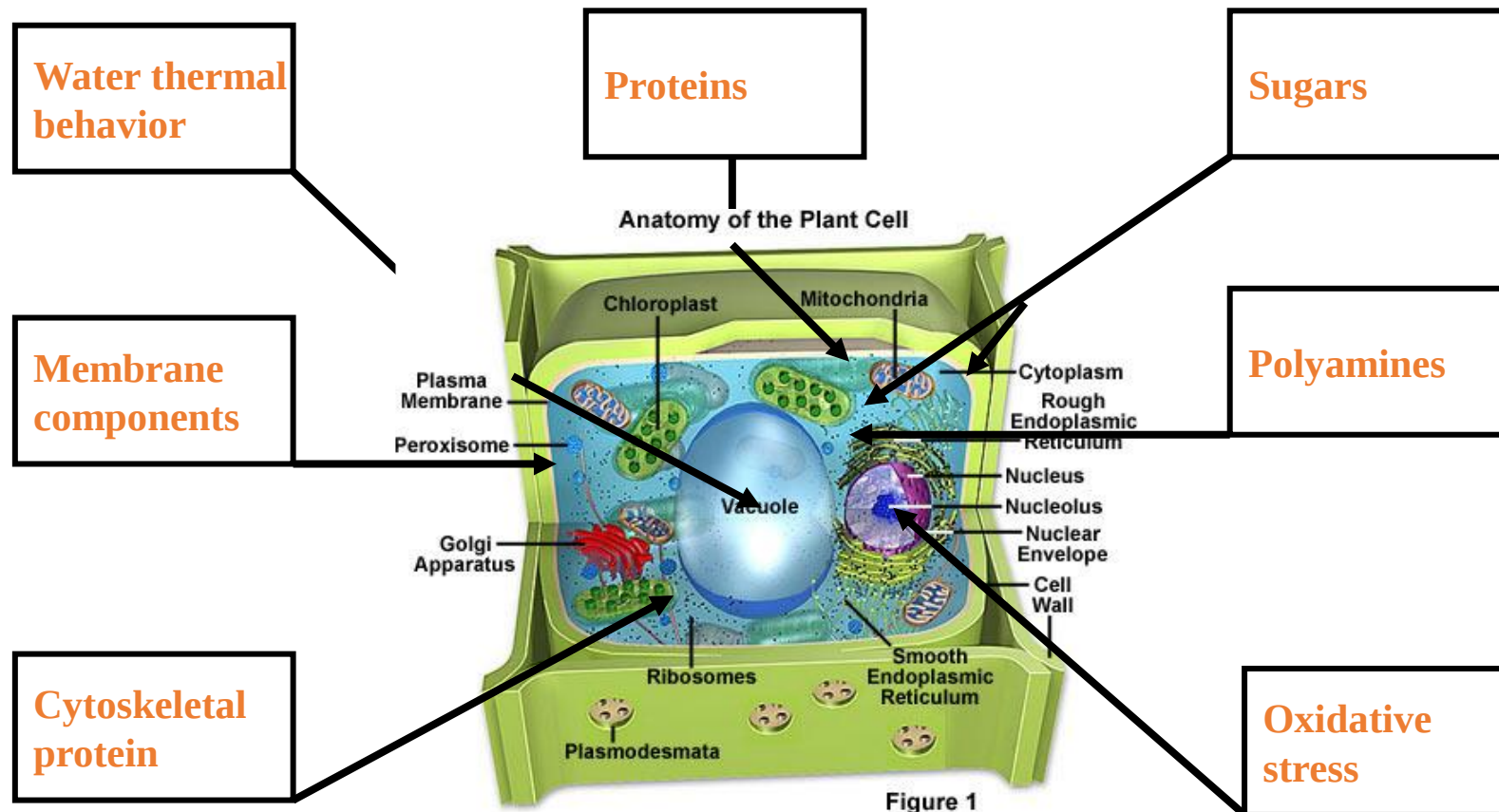


WG2

Technology, application and validation of plant cryopreservation

1.1. Fundamental aspect of cryopreservation and cryoprotection

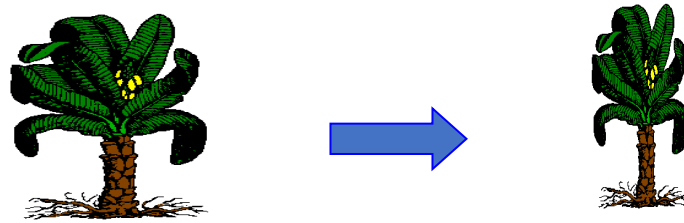
Elucidation of the physico-biochemical background of cryoprotection and cryopreservation.



WG1: Fundamental aspects of cryopreservation/cryoprotection and genetic stability

1.2. Genetic stability and authenticity

Assessment of the genetic integrity of plants to determine if they are 'true to type' after cryopreservation.

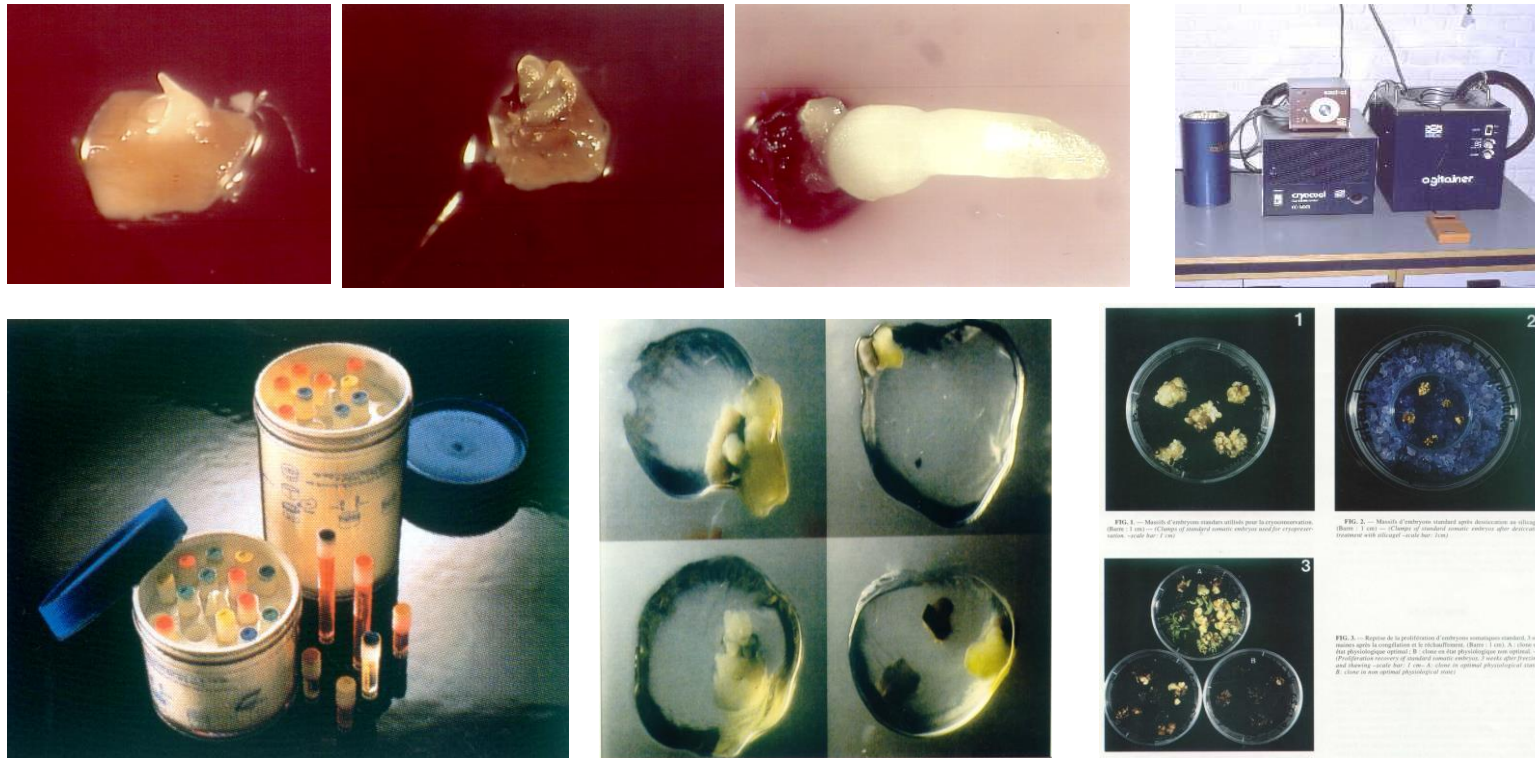


- Assessments of phenotypic variation (morphological descriptors)
- Cytological techniques to detect various types of chromosomal instability. (polyploidy, aneuploidy and other mitotic abnormalities)
- Biochemical metabolite/protein (isozyme) profiles
- Genomic DNA sequences that can be analysed using a range of hybridization and (PCR) techniques
- Epi-genetic variation in chromatin and DNA methylation of gene sequences

WG2: Technology, application and validation of plant cryopreservation

2.1. Technology aspects of cryopreservation

Applications of different cryopreservation protocols to different plant species and tissues.



WG2: Technology, application and validation of plant cryopreservation

2.2. Impact and applications of cryopreservation in plants *genebanks, establishment of cryo-bank and dissemination of results*



Meeting Cost action 871

2011

Feb 7 -11th, 2011: **Final COST 871 meeting** Angers, France

2010

April 28 - 30th, 2010: **WG1 meeting linked with Executive Committee meeting**, Poznan, Poland

September, 2010: **DSC Master class**, Prague, Czech Republic

2009

Sept 2009: **WG2-MC meeting**, Gatersleben, Germany

April 8th 2009: **EC Meeting**, Leuven, Belgium:

April 6-8th 2009: **International Symposium on Cryopreservation in Horticultural Species**, Leuven, Belgium:

February 25-26th 2009: **Workshop for the dormant bud method in cryopreservation**, Copenhagen

February 17-18th 2009: **WG1 meeting**, Kew Gardens, Wakehurst, UK

2008

September 10th 2008: **COST Action 871 MC meeting**, Copenhagen:

February 20th 2008: **EC Meeting**, Oulu, Finland :

February 20th-23rd 2008: **Cryopreservation of crop species in Europe : CRYOPLANET – COST Action 871**, Oulu, Finland

2007

September 15th 2007: **MC Meeting of COST 871**, Derby:

May 10th 2007: **EC Meeting**, Firenze:

May 10-13th, 2007: **TECHNOLOGY, APPLICATION AND VALIDATION OF PLANT CYOPRESERVATION**, Firenze:

April 13-14th 2007: **FUNDAMENTAL ASPECTS OF CRYOPRESERVATION/CRYOPROTECTION AND GENETIC STABILITY**, Oviedo, Spain :

Jan 31rd - Feb 2nd 2007: **MONITORING PROGRESS REPORT 2006**, Antalya

2006

December 12th 2006: **Kick-Off Meeting of COST Action 871 Management Committee**, Cost Office, Brussels, Belgium



Cryopreservation of crop species in Europe

COST Action 871



Proceeding of the final meeting

AGROCAMPUS OUEST INHP, Angers - FRANCE
February 08-11, 2011

Edited by:

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Bart Panis
Angeles Revilla Bahillo
Florent Engelmann

<https://www.cost.eu/uploads/2018/07/53639.pdf>

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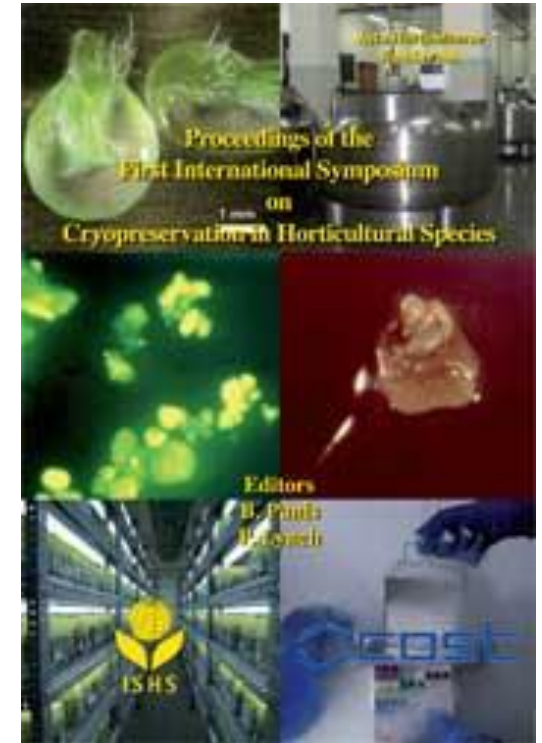




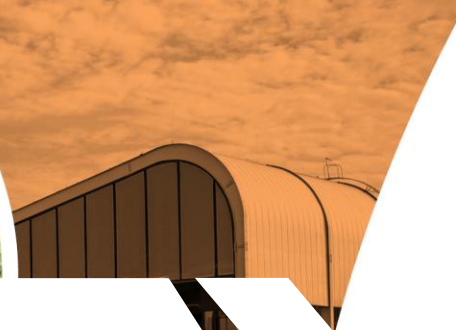
The first International Symposium on Cryopreservation in Horticultural Species was held in Leuven (5 to 8 April, 2009)



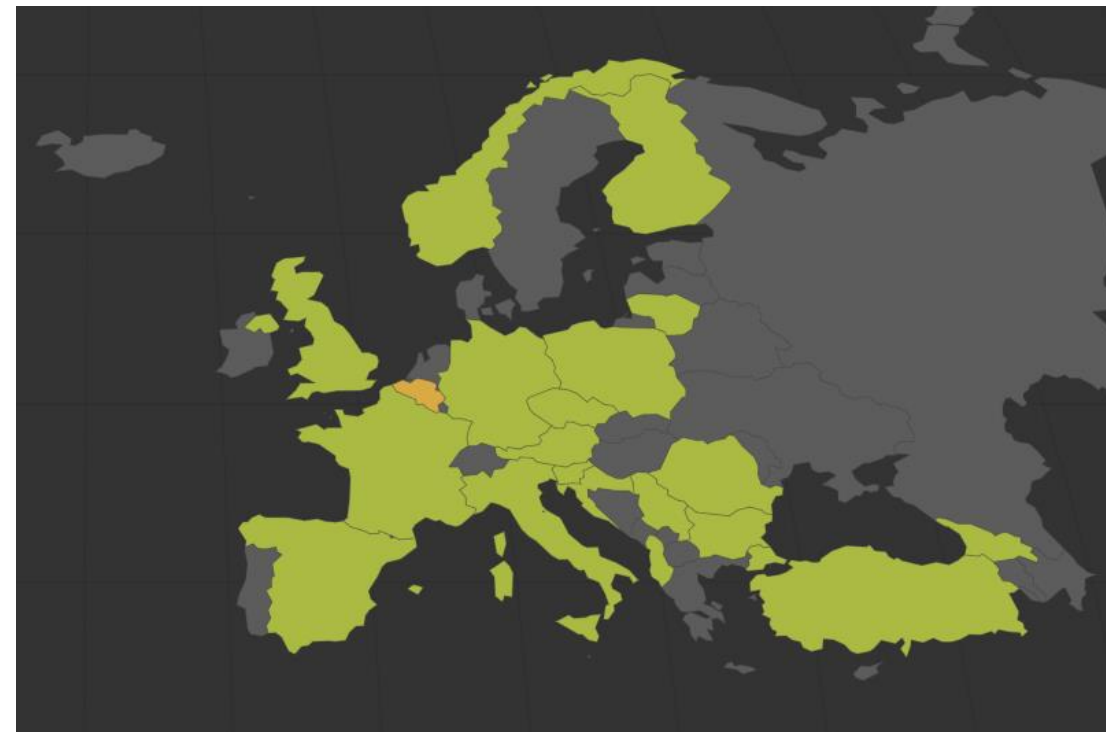
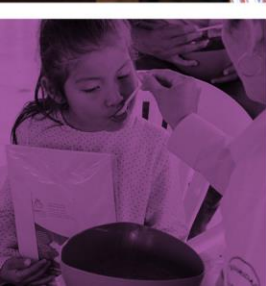
149 participants from 43 countries



Acta Horticulturae 908, 65
articles, 511 pages



ECPGR



The European Cooperative Programme for Plant Genetic Resources (ECPGR) is a collaborative programme among most European countries aimed at ensuring the long-term conservation and facilitating the increased utilization of plant genetic resources in Europe

[Read More](#)

Common Working Group Activities

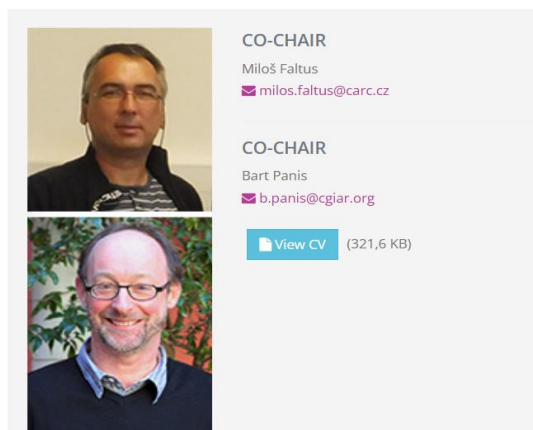
[Allium](#)[Avena](#)[Barley](#)[Berries](#)[Beta](#)[Brassica](#)[Cucurbits](#)[Fibre Crops](#)[Forages](#)[Grain Legumes](#)[Leafy Vegetables](#)[Maize](#)[Malus/Pyrus](#)[Medicinal and Aromatic Plants](#)[Potato](#)[Prunus](#)[Solanaceae](#)[Umbellifer Crops](#)[Vitis](#)[Wheat](#)[Cryopreservation](#)[Documentation Information](#)[On-farm Conservation](#)[Crop Wild Relatives](#)

EVA
European Evaluation Network

ATION IN EUROPE FOR DIVERSITY AND FOOD

an plant and food diversity: together, we are stronger!', Marc Lateur tells a happy ending (Marc Lateur is the ECPGR National coordinator from Belgium).

EVA – THE EUROPEAN EVALUATION NETWORK FOR PLANT GENETIC RESOURCES



Report of a Working Group on Cryopreservation

First Meeting, 3-4 May 2023, Prague, Czech Republic



M. Faltus, B. Panis and L. Maggioni

Working Group activities and related events

March 2025

The project on 'A Regional Initiative for a Cross-Border Cryobank in the Western Balkans and the Caucasus – A case study based on a sample of fruit tree and grape local accessions (CryoConnect)'

September 2024

The Garli-CCS-Cryopreservation workshop was held on 17-20 September 2024 in Prague, Czech Republic.

May 2024

The Training School on Dormant Bud Cryopreservation was held in Faenza, Italy, from 21-23 May 2024.

May 2023

The first meeting of the Cryopreservation Working Group was held in Prague, Czech Republic, from 3-4 May 2023

February 2022

The ECPGR Working Group on Cryopreservation was established.

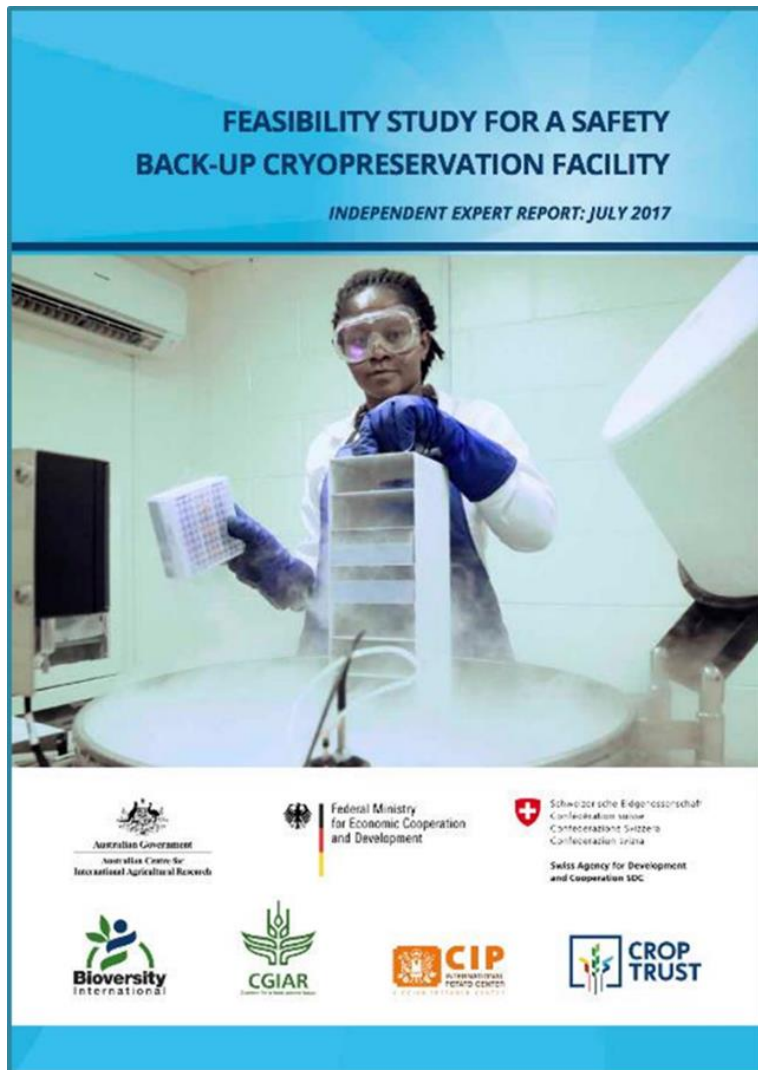
<https://www.ecpgr.org/resources/ecpgr-publications/publication/report-of-a-working-group-on-cryopreservation-2024>



Objectives

1. Obtain information about the **current status** of cryopreservation and the presence of long-term storage facilities as well as of experienced cryopreservation researchers
2. Ensure that plant **cryopreservation research in Europe is maintained at a critical mass** to enable continuing advances in the science
3. Ensure that European Crop collections conserving species that **produce non-orthodox seeds** have access to cryopreservation technologies in order to store their germplasm safely for future generations
4. Investigate the possibility for cryopreserving **orthodox seed collections** with a focus on species with short-lived seeds including many vegetable such as leeks, onions and parsley
5. Explore the application of cryopreservation to **crop wild relatives** or wild species and trees
6. **Increase collaboration** between European scientists and institutes holding crop collections to establish a European Cryo-hub
7. Create one or more **cryopreservation back-up facilities**
8. Develop new **biobank technologies and data management systems** for cryopreserved collections





Institute	N° of Acc.	Crop	Cryopreservation Method
Bioversity International, Leuven, Belgium	1306	Banana	• Droplet vitrification
Association Forêt-CELLulose (AFOCEL), France	440	Elm	• Dormant bud freezing
International Center for Tropical Agriculture (CIAT), Cali, Colombia	1466	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	3540	Potato	• Droplet vitrification
Julius Kühn-Institut (JKI), Institut für Züchtungsforschung an Obst, Dresden, Germany	239	Strawberry	• Vitrification
Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Gatersleben, Germany	2400	Potato	• Droplet freezing • Droplet vitrification
National Agrobiodiversity Center (NAAS), RDA, Suwon, South Korea	1104	Garlic	• Droplet vitrification
National Institute of Agrobiological Sciences (NIAS), Tsukuba, Japan	1149	Mulberry	• Dormant bud freezing
USDA-ARS, Fort Collins and Corvallis, USA	2052	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 (500)	187	Garlic	• Droplet vitrification

Acknowledgments Partnerships

- Natalia Sleziak
- Hans Krohn
- Edwige Andre
- Bart Piette
- Hannes Wilms
- Ines van den houwe



Australian Government

Australian Centre for
International Agricultural Research



Federal Ministry
for Economic Cooperation
and Development



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC



European Cooperation in
Science and Technology



Belgium
partner in development



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Thanks!