

# WORKSHOP

## How to better adapt breeding to organic farming?

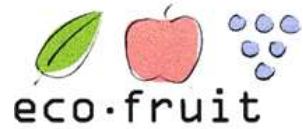


Marc Lateur, Jean-Marc Audergon, Khaled Djelouah, Danilo Christen, Claudio Bogliotti, Niklaus Bollinger, Clémence Boutry, Sy... Bureau, Sandrine Codarin, Enrique Dapena de la Fuente, Baptiste Dumont, Michael Friedli, Daniela Giovanini, Maren Korsgaard, Kostas Koutis, Boris Krska, Lidia Lozano, Mariagiulia Marini, Sabrina Micali, Patricia Mora, Niklas Oeser, David Ray, Andreas Spornberger, Daniel Traon, David Tricon, Pasquale Venerito, François Warlop



Ecofruit  
February 19<sup>th</sup>, 2024

# WORKSHOP - How to better adapt breeding to organic farming?



## AGENDA

**1:15 - General introduction: The philosophy behind the InnOBreed project and few of its general concepts and ongoing practical activities - Marc LATEUR.**

5 minutes presentation + 10 minutes Q&A.

**1:30 – Presentation of key results of the InnOBreed survey by Clémence BOUTRY.**

10 minutes presentation + 10 minutes Q&A.

**1:50 – A short prospective discussion of the future top 3 most important traits for organic farmers for several crops.**

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**2:05 – How to address the concept of “robustness” in organic breeding and variety testing processes? What does “robustness” means and how to select for it? A Survey has been distributed to the audience on Monday morning in order to collect their opinion about what is “robustness”.**

5 minutes presentation + survey.

**2:10 – The socio-economical innovations around participative breeding, variety testing and fair trade in organic farming systems.**

10 min presentation + 10 min Q&A.

**2:30 – End of the workshop**

## General introduction:

The philosophy behind the InnOBreed project and few of its general concepts and ongoing practical activities

Marc LATEUR  
Ecofruit - February 19<sup>th</sup>, 2024



20 partners,  
10 European  
countries,  
11 Research  
Institutes,  
4 NGO's,  
3 Privates  
associations,  
2 Universities



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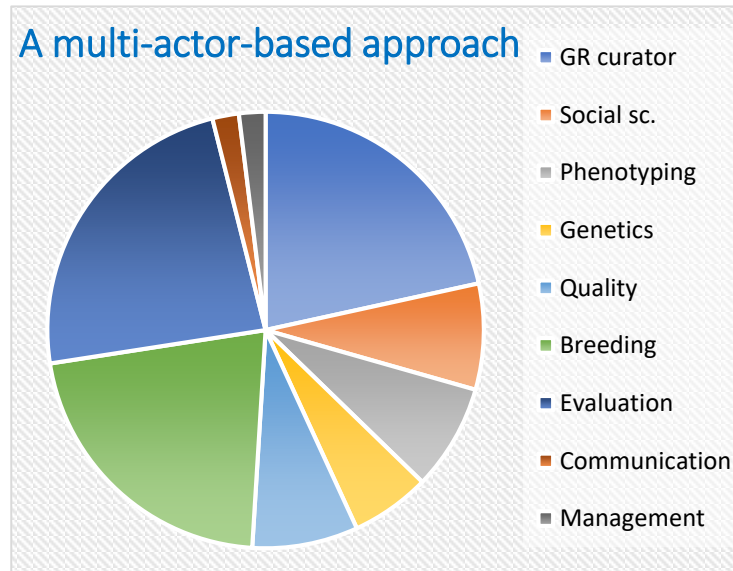


# InnOBreed - Innovative action dedicated to cultivated Fruit tree species

## Targeted on Breeding and Evaluation for Organic Farming requirements



- Pome fruits: Apple, Pear
- Stone fruits: Peach, Almond, Apricot, Cherry, Japanese Plum, European Plum
- Citrus
- Grape



Partners repartition	
Private	7
Grower's representative (NGO's)	4
Public Institutes	10



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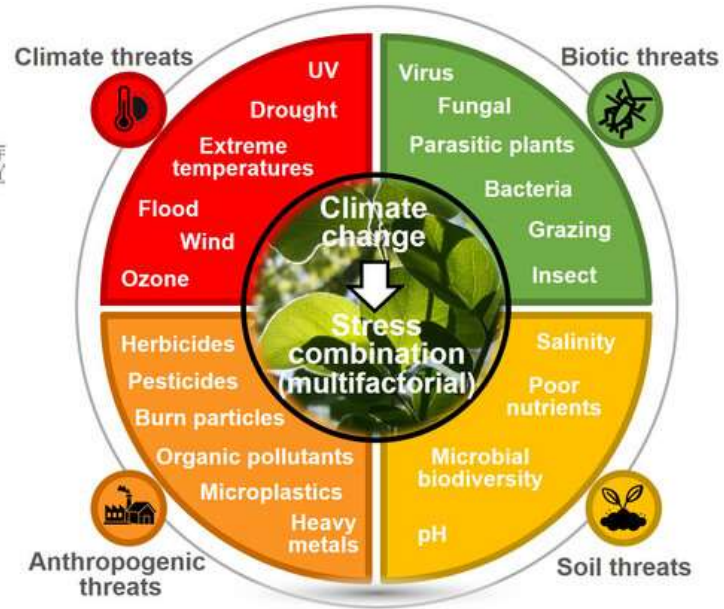
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# Future challenges Towards better 'robustness'...

Screening plant varieties/crops/trees for improved robustness: *better dynamic adaptability to biotic & abiotic stresses*

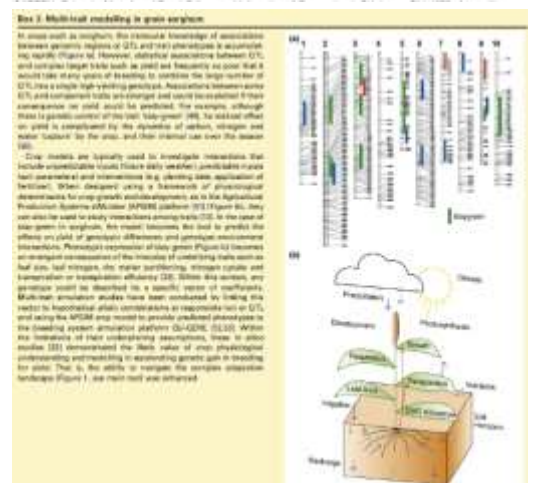


Annals of Botany 117: 103-108 (2016)  
doi:10.1093/aob/abw117 available online at www.oxfordjournals.org  
REVIEW: PART OF A SPECIAL ISSUE ON DEVELOPMENTAL ROBUSTNESS AND SPECIES DIVERSITY  
Molecular mechanisms governing differential robustness of development and environmental responses in plants  
Jennifer Ludwicki<sup>1</sup>, Christian Quasthoff<sup>2</sup> and David J. Kliebenstein<sup>1,2\*</sup>



Current Opinion in Plant Biology  
Volume 15, Issue 1, February 2013, Pages 53-60  
Molecular mechanisms of robustness in plants  
Jens Jørgensen<sup>1,2</sup>, Jennifer Ludwicki<sup>1,2</sup>, Alexander M. Silliman<sup>1</sup>, Christian Quasthoff<sup>1,2\*</sup>  
doi:10.1016/j.cop.2012.11.002

Model for navigating biological complexity in breeding improved crop plants  
Graeme Hammer<sup>1</sup>, Mark Cooper<sup>2</sup>, François Tardieu<sup>3</sup>, Stephen Welch<sup>4</sup>, Bruce Walsh<sup>5</sup>, Fred van Eeuwijk<sup>6</sup>, Scott Chapman<sup>7</sup> and Dean Podlich<sup>8</sup>



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Walloon Agricultural Research Centre  
To address today's questions and to prepare tomorrow's challenges  
[www.cra.wallonie.be](http://www.cra.wallonie.be)

# Global strategies for future O. fruit production



BRIEFING

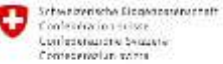


EU agricultural research and innovation

Quel progrès génétique pour une agriculture durable ?<sup>1</sup>

Jean-Marc Meynard et Marie-Hélène Jeuffroy  
UMR d'Agronomie INRA – INA-PG, 78850 Thiverval-Grignon ; me

Paradigm shift: from incrementation to breaking point



Federal Department of Economic Affairs, Education and Research, SERI

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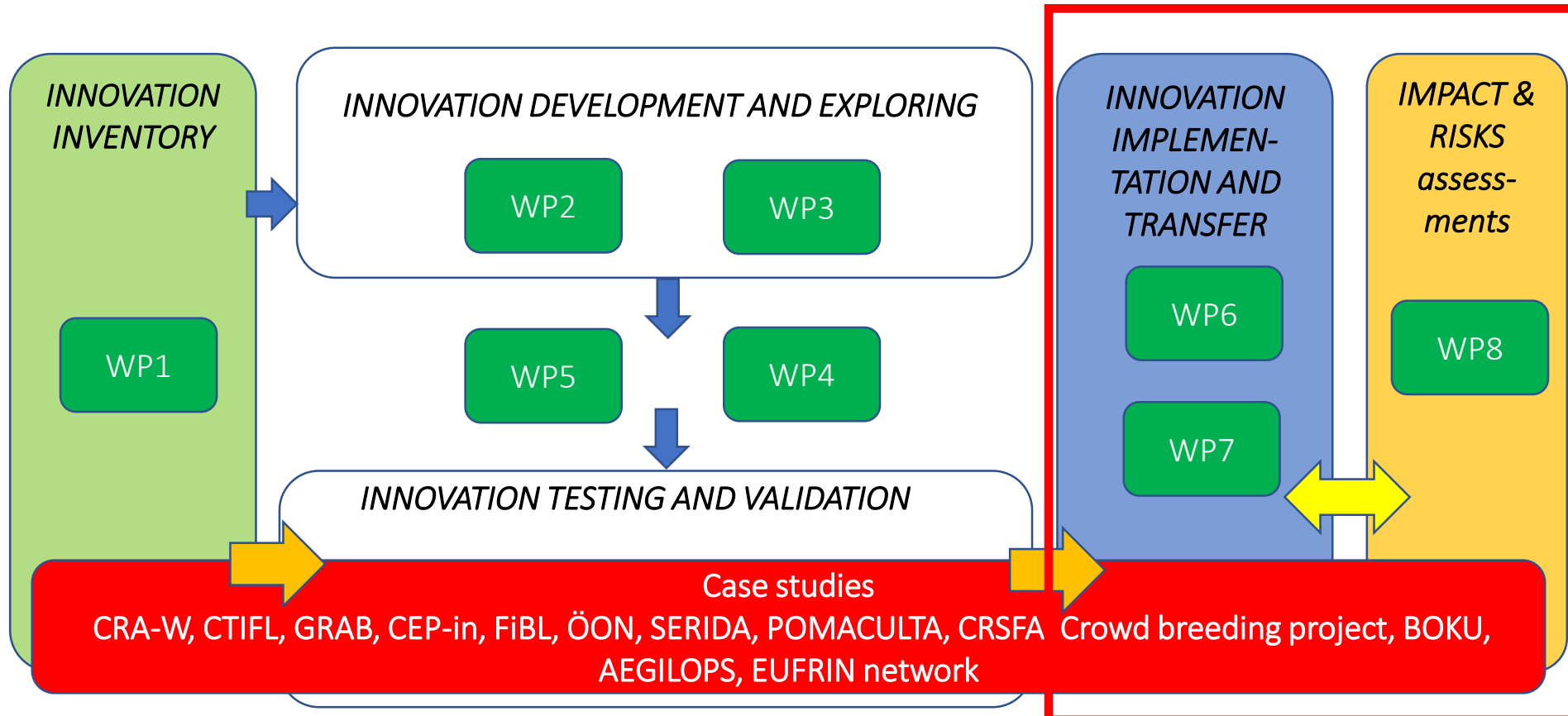
5 main topics	Diversity	Low input farming systems – Lower risks		Climatic Resilience	Quality	Socio-economical innovations
6 objectives	1. ↗↗ Use of GenRes – genetic <b>diversity + Functional Biodiversity</b>	2. ↗↗ Resistance &/or <b>tolerance</b> to <b>pests &amp; diseases</b>	3. ↗↗ <b>Nitrogen (&amp; fertilizers) efficiency</b>	4. ↗↗ <b>Flexibility</b> to abiotic stresses (drought,...)	5. ↗↗ Differential <b>Quality</b> – New healthy products	6. ↗↗ <b>Participative approaches &amp; shorter channel chains – Fair Trade</b>

**InnOBreed** – Co-Creation of « Common good » Innovative solutions  
*Traits value for Fruit growers = Multitrait Approach*



# InnOBreed

Case study based: Share, Evaluate, Validate and Implement Innovative solutions



Innovation flow within organic fruit breeding and evaluation



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# InnOBreed – Co-Creation of Innovative solutions

## *Social innovation = Participatory Breeding*

**Define, Characterize and evaluate what Social Innovation means in FTGR use & breeding**

### Genetics

(collection and characterization)

- PPP conservation activities ensuring access to fruit plants
- Exchanges of fruit plants among gardeners, farmers, scientists and researchers
- Valorization of biodiversity and local varieties



Pre-breeding  
(identify desired traits, incorporating of these into breeding material)  
- Breeding - Testing

- Network of exchanges of experiences and knowledge
- Innovative partnership with research
- Innovative partnership with civil society organizations
- Participative breeding where farmers and researches jointly select parents / test new varieties

Cultivar  
release and  
use

- New market opportunities – e.g. Multifunctionality and integration of tourism
- Consumers education to the specific features of OF
- Promoting farmers rights in legislation



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Contribution to the

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Education and Research, Swiss  
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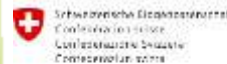
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# InnOBreed – Co-Creation of Innovative solutions

## *Selection methodology*

- **Prerequisite:** the **diversification of the Cultivation Systems**  
IPM => Zero pesticides at harvest => low input Organic Farming => No Chemicals?
- **Evaluation**
  - Genetic resources
    - From primary descriptors to the characterization for the Agronomic value
    - Highlight the key drivers of the future **VSUC**
    - Access the **Robustness** and implement the experimental designs for addressing Mandatory traits
      - Integrate **GxE** to optimize the decision system for the end-users
      - Integrate **participatory approaches** by using data issued from Growers, Editors
- **Breeding & Selection**
  - Accessment of **new mandatory traits**
  - Integration of **G x E** modelling on experimental design based on very low inputs
  - **Participatory breeding**



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# InnOBreed – Co-Creation of Innovative solutions

Examples of case studies with participatory approaches

**'NOVAFRUITS'**  
Heritage & sharing innovation  
Participative Organic Fruit Breeding

Wallonie recherche CRA-W  
espaces naturels régionaux  
Centre régional de ressources génétiques

**NOVA FRUITS**  
Patrimoine & créations partagés

**öÖN**  
Öko-Ökothek Norddeutsches  
Vermarktungs- und Beratungsges. e.V.  
www.oeon.de

**'Apple Oasis'**  
The 52 private gardeners, who are growing apple-seedlings in our crow-breeding-project, are located in nearly all parts of Denmark.

apfel:gut .v.  
Förderverein zur Entwicklung und  
Durchführung ökologischer Obstzucht  
www.apfel-gut.org

The "Pometum", the Danish National Fruit Genebank

UNIVERSITY OF COPENHAGEN

Examples of some of the preliminary selected cultivars

Examples of some of the 52 seeding-gardens



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# InnOBreed - LiveSeeding

## Take-home messages

A common base: **Local Genetic Resources anchored**

- valorization of GR to enhance the development of OF cvs

A common targeted objective: **Green deal EU regulation**

Convergent **multi-actor approaches** targeted on **Impact** assessment

Convergent thematic approaches:

- **Ideotype – Multi-Trait – GxE** instrumented
- **Climatic Change – Fruit quality – Biotic stress** anchored
- **Actor oriented** (*Social innovations*)



The 52 private gardeners, who are growing apple seedlings in our crow-breeding-project, are located in nearly all parts of Denmark.

The "Pomatum", the Danish National Fruit Genebank

The selected old Danish mother cultivars:



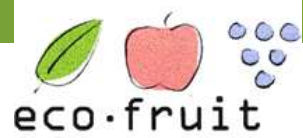
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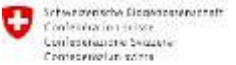
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