This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 727230 and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 17.00090. The information contained in this communication only reflects the author’s view. Neither the Research Executive Agency nor SERI is responsible for any use that may be made of the information provided.
Workshop program

15.30-16.00 Introduction
16.00-16.10 Questions
16.10-16.30 Personal exercise
16.30-16.50 Groupwork (in groups of two)
16.50-17.00 Discussion
Which steps are needed for implementing the systems-based breeding approach?

➢ Describe:
  • current trends in breeding
  • solution pathways: systems-based breeding
  • all relevant aspects of breeding and seed systems

➢ Provide:
  • methods for self-reflection
  • methodology for group-reflection
  • guidelines for other steps at value chain level
Current trends in agriculture and plant breeding

- Continuous focus on linear value chains
- More focus on molecular traits
- Loss of agro-biodiversity

Summary of distribution of variety registration at CPVO in the period 2012-2016, according to crop, company and country (Annual report 2016)

<table>
<thead>
<tr>
<th></th>
<th>Arable crops</th>
<th>Vegetable crops</th>
<th>Fruit crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 5 crops</td>
<td>69,4</td>
<td>67,2</td>
<td>60,9</td>
</tr>
<tr>
<td>Top 10 crops</td>
<td>85,3</td>
<td>79,5</td>
<td>81,4</td>
</tr>
<tr>
<td>Top 5 companies</td>
<td>47,0</td>
<td>69,3</td>
<td>22,2</td>
</tr>
<tr>
<td>Top 15 companies</td>
<td>63,5</td>
<td>95,3</td>
<td>43,6</td>
</tr>
<tr>
<td>Top 5 countries</td>
<td>63,5</td>
<td>94,2</td>
<td>39,9</td>
</tr>
</tbody>
</table>
How to breed for long term ecosystem-services?

Biodiversity and ecosystems services are key factors that contribute to:

• natural pest control
• pollination
• nutrient (re)cycling
• soil conservation
  (structure and fertility)
• water provision
  (quality and quantity)
• carbon sequestration

Enhancing legume ecosystems services through plant-pollinator interplay.
Suso et al. 2016
Biodiversity and ecosystems services are key factors that contribute to:

- natural pest control
- pollination
- nutrient (re)cycling
- soil conservation (structure and fertility)
- water provision (quality and quantity)
- carbon sequestration

Genetic variation in root biomass in grass (Lolium multiflorum). Deru et al. 2014
Organic 3.0 (IFOAM 2015): Broadening the organic scope for 2030

Five dimensions:
- Ecology
- Society
- Culture
- Accountability
- Economy
SDGs of UN (2015) - targets for ecological and societal resilience
Six goals for future plant breeding for ecological AND societal resilience

1. Social justice
2. Food security, food quality and safety
3. Food and seed sovereignty
4. Agro-biodiversity
5. Ecosystem services
6. Climate robustness
Current state of the art: Four breeding orientations ('paradigm positions', styles of thought)
Need for balance, optimal interaction and synergy
Hence, a need for systems-based breeding approaches
Steps needed towards systems-based breeding:

Three categories of steps:
1. Required change in attitude
2. From attitude to action
3. From actions to achievements
Three key-elements:

1. Corporate Social Responsibility
2. Circular Economy & True Cost accounting
3. Fair & Green Policy
Example 1: Required change in attitude

1. Corporate Social Responsibility
2. Circular Economy & True Cost accounting
3. Fair & Green Policy

10% of turn-over of Frank’s free varieties to Seed Company High Mowing

Organic farmer breeder Frank Morton Oregon-USA
Example 2: Required change in attitude

- New resistant potato varieties were not adopted by the market and continuous (in NL illegal) copper use and harvest failures
- In 2017, in NL full commitment of all supermarkets achieved to sell only resistant cultivars for organic potato by 2020

Three key-elements:
1. Corporate Social Responsibility
2. Circular Economy & True Cost accounting
3. Fair & Green Policy
Example 3: Required change in attitude

Three key-elements

1. Corporate Social Responsibility
2. Circular Economy & True Cost accounting
3. Fair & Green Policy

(1) EU experiment (2014-2021) to allow heterogeneous material to be described and marketed

(2) Allowing changes in official Variety Testing protocols (VCU)
From attitude to action

Three key-elements:
1. Knowledge development & Integration of knowledge
2. Breeding strategies & tools
3. Entrepreneurship
Example 2
From attitude to action

Breeding for diversity e.g. ‘heterogeneous material’ and crop mixtures

Three key-elements:

1. Knowledge development & Integration of knowledge
2. Breeding strategies & tools
3. Entrepreneurship

Composite cross populations:
► Multiple crosses

Crop mixtures (e.g. lupine/wheat):
► breeding for combinability

This project received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 727230.
Example 3: From attitude to action

Three key-elements:

1. Knowledge development & knowledge integration
2. Breeding strategies & tools
3. New entrepreneurial models

100% employee owned
Example 3: From attitude to action

De Beersche Hoeve

Biodynamic Seed & Vegetable Farm
100% daughter of Food Cooperative Odin

Three key-elements:

1. Knowledge Development & knowledge integration
2. Breeding strategies & Tools
3. New entrepreneurial models
From action to achievement: six goals for ecological and social resilience

Six key-elements (goals):

1. Social justice
2. Food security, quality and safety
3. Food and seed sovereignty
4. Agro-biodiversity
5. Ecosystem services
6. Climate robustness

Roles and positioning of breeding and seed systems within their economic, scientific, institutional and cultural environment (Figure 3, Lammerts van Bueren et al. 2018)
**Witzenhausen workshop 2018: workshop outcomes organised according to the four categories as described in Figure 3 (Lammerts van Bueren et al. 2018)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Solutions (in %)</th>
<th>Obstacles (in %)</th>
<th>Examples (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>85</td>
<td>68</td>
<td>39</td>
</tr>
<tr>
<td>Market and Industry</td>
<td>69</td>
<td>27%</td>
<td>37%</td>
</tr>
<tr>
<td>Policy and Governance</td>
<td>43</td>
<td>18%</td>
<td>32%</td>
</tr>
<tr>
<td>Science and Technology</td>
<td>51</td>
<td>33%</td>
<td>18%</td>
</tr>
<tr>
<td>Societal and Cultural Norms and Values</td>
<td>29</td>
<td>22%</td>
<td>13%</td>
</tr>
<tr>
<td>Key elements</td>
<td>Tool for self reflection: applying 12 key elements in an assessment</td>
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<td>--------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td></td>
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<tr>
<td><strong>Required change in attitude</strong></td>
<td>Corporate social responsibility</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Circular economy &amp; True cost accounting</td>
<td></td>
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<tr>
<td></td>
<td>Fair &amp; green policy</td>
<td></td>
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</tr>
<tr>
<td><strong>From attitude to action</strong></td>
<td>Knowledge development and integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breeding strategies and tools</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Entrepreneurship</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>From action to achievement</strong></td>
<td>Food security, safety &amp; quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food &amp; seed sovereignty</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Social justice</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Agrobiodiversity</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Ecosystem services</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Climate robustness</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Spider chart per company/initiative

Currently vs. Future
For circular economy we need rebuilding of linear value chains:
towards circular organised food systems

…..including breeders as partners in new ‘food communities’
……including shared risk taking to overcome individualism.
Lessons learned from DIVERSIFOOD on multi-actor processes: reflection in a group process especially with respect to technical and social aspects

Reflection in a group process
• Involve various actors of the value chain;
• Make the implicit explicit;
• What are our assumptions?
  ➢ We are often unaware of them
  ➢ The perspectives of each actor can be different;

Adapted scheme of Figure 7, Deliverable 1.3, EU-Project DIVERSIFOOD
Biofach workshop 2019: systems-based approach in organic plant breeding: integration into value chain partnerships

• Main questions remained to address collectively:
  • Why should different value chain actors support organic plant breeding?
  • The advantage of organic plant breeding for value chain (farmer, processors, traders)
  • The advantage of organic plant breeding for consumers and society (local and global)

• Tailor-made approaches are needed
  • Needs to include **new** approaches for: knowledge exchange, communication, marketing, education, etc
The importance of a systems-based approach

• Fostering diversity in breeding approaches and breeding initiatives helps:
  • maintain agrobiodiversity
  • make agriculture more climate robust
  • foster the development and maintenance of knowledge
  • develop new types of relationships
  • keep an open mind on what seeds are: part of our common heritage
• Thank you for your attention!

• Time for questions
Workshop program

15.30-16.00 Introduction
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16.50-17.10 Groupwork (in groups of two)
17.10-17.20 Discussion
16.30-17.10 Groupwork (in groups of two)

• Guiding questions:
  ➢ What is necessary in order to achieve the goals set in year 10 (departing in year 0, the current situation?)
  ➢ Can you do that alone, and if not, which other chain actors need to act as well?

• Question for homework:
  ➢ What will I do when I go home?
    - You can put it on a post-it