Impacts & risks for agriculture from climate change:
Adaptation solutions & the role of new plant varieties
Climate change effects intensify

Heat wave in Europe: Which countries are worst hit?

Drought forces the Netherlands to adapt to climate change

Climate change: Flooding, drought, fire and heat waves around the world

East Africa prolonged drought

Heavy rains devastate communities in Kentucky, USA
Climate change global indicators

Global mean temperature difference from 1850–2022

Carbon dioxide concentrations (parts per million)
Phenological changes of four grapevine varieties grown in Hainfeld, Germany (1975–2015)

Variedades ‘Pinot Gris’, ‘Pinot Noir’, ‘Riesling’ and ‘Muller Thurgau’
<table>
<thead>
<tr>
<th>Impact of climate change on plant breeding</th>
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<tbody>
<tr>
<td><strong>Loss of genetic biodiversity</strong></td>
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<td>Changes in environmental conditions promote erosion of biodiversity</td>
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<td><strong>Outbreak of pest and diseases</strong></td>
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<td>Increase in temperature and relative humidity set the ideal environment for disease proliferation</td>
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<td><strong>Risk of water supply</strong></td>
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<td>In some areas, rainfall intensifies or on the contrary it can cause prolonged drought</td>
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<td><strong>Change in seasonality</strong></td>
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<td>Increasing occurrence of climatic events out of season such as late-spring frosts</td>
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<td><strong>Heat stress</strong></td>
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<td>A combined effect of heat and water-deficit stress leading to a reduction in plant productivity</td>
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<td><strong>Food insecurity</strong></td>
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<td>Climate change impacts agricultural production, supply chains, and food pricing</td>
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Climate change adaptation solutions

Approach of plant breeders

Increasing Climate Resilience

Accelerated Plant Breeding
Grapevine breeding

New environments
Phenology
Heat
Drought
Frost
Disease resistance
Yield
Quality
Yield
Climate change adaptation solutions

- Optimizing CRISPR Systems
  Plant regeneration methods

- Predictive breeding
  Should be extended to vulnerable crops

- Securing genetic diversity
  Finding “lost traits”

- Speed breeding
  Accelerating crop research and breeding

Accelerated Plant Breeding
Prospectives

**Heterogenous Impact**

Climate changes affect differently every crop depending on the location.

**Increase diversity**

Encourage a general expansion of genetic pool and make available functional genes.

**Accelerating Plant Breeding**

- Use of new technologies
  - Speed Breeding
- Extend the new methods to more crops
Thank you for your attention