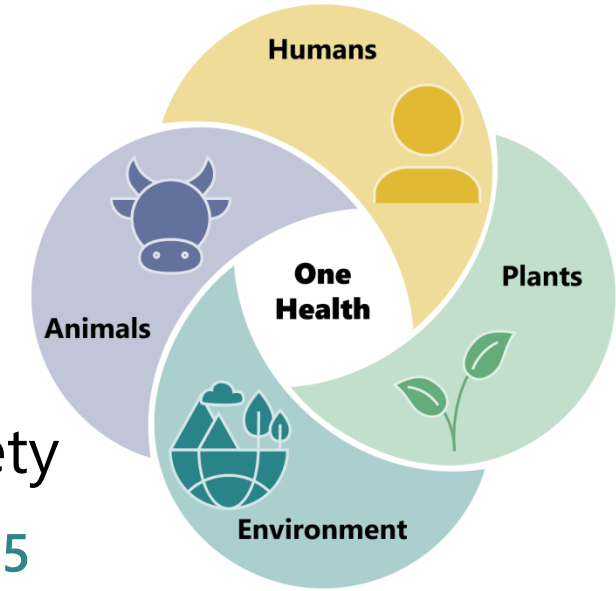
Maintaining food security in Austria – Crop breeding to adapt to a changing climate



Philipp von Gehren, Austrian Agency of Health and Food Safety

Climate Change: Challenges in Agriculture and Water Sectors, 04.12.2025

Our Agency

Austrian Agency for Health and Food Safety

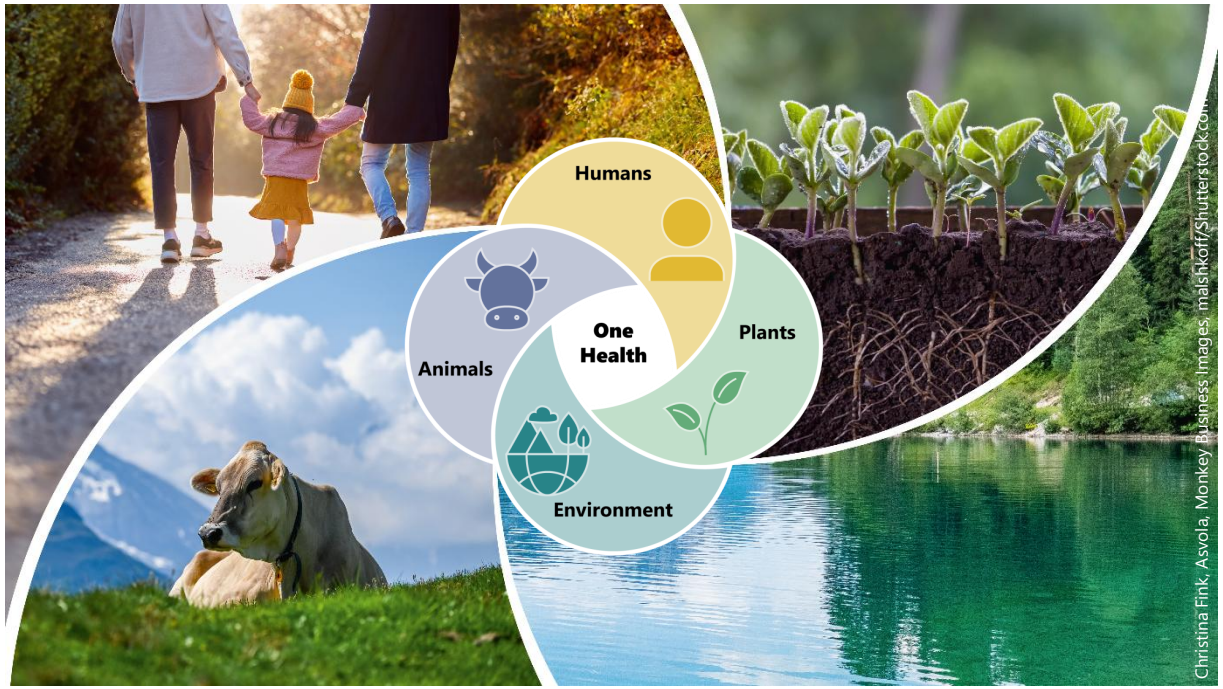
We analyse,

monitor,

assess,

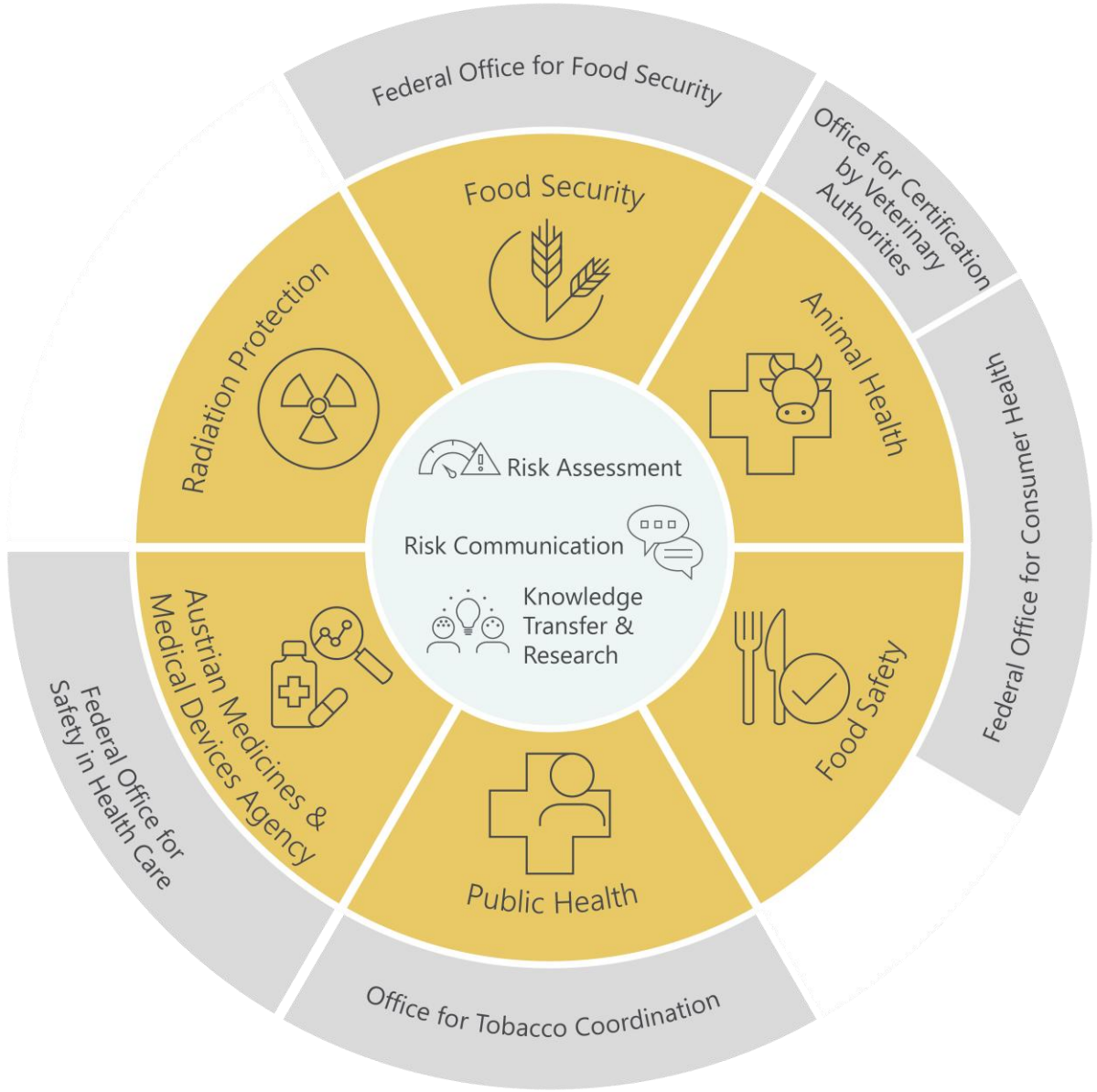
research and

communicate



365 days a year for the health of humans, animals, plants and the environment

Our Agency



Departement of Food Security:

- Seed certification
- Seed and plant health
- Integrated plant protection
- Pests and plant diseases
- Sustainability along the value chain
- Biodiversity
- **Variety testing and variety approval**

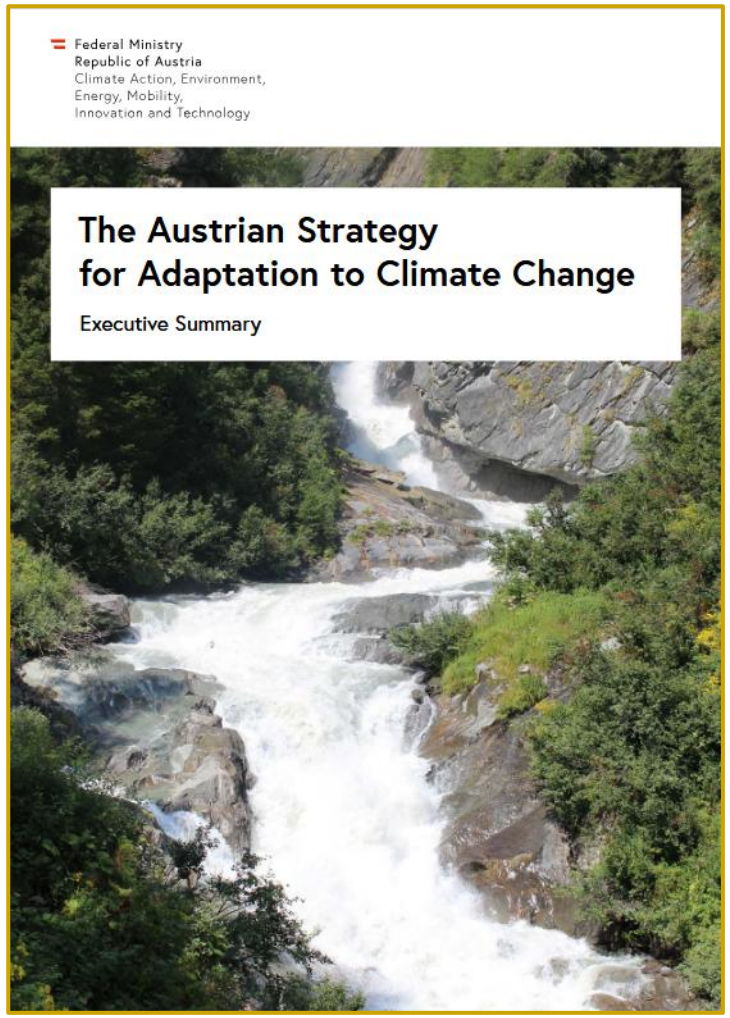
Pressure on the Austrian Agricultural Sector

Climate change as an additional risk factor

- **Heat and drought stress** as well as increased occurence of **extreme weather events** put pressure on crop production → reduced yield for established crops and varieties can be expected
- Mild winters and longer growing season facilitate the **establishment of new pests** with more reproductive cycles → spectrum of pests, vectors and plant diseases will change
- Soil erosion, acidification, saltification and soil consumption by infrastructure projects results in (agriculutrally productive) **soil being a threatened ressource** with little public awareness
- Farmers have to operate and produce food within the framework adjusted for **social and political demands** on a national or an EU level (Agricultural Strategy), for example reduced use of pesticides (including prohibition of certain groups of active ingredients) and fertilisers, increase organic production, etc.

Austrian Strategy for Adaptation to Climate Change

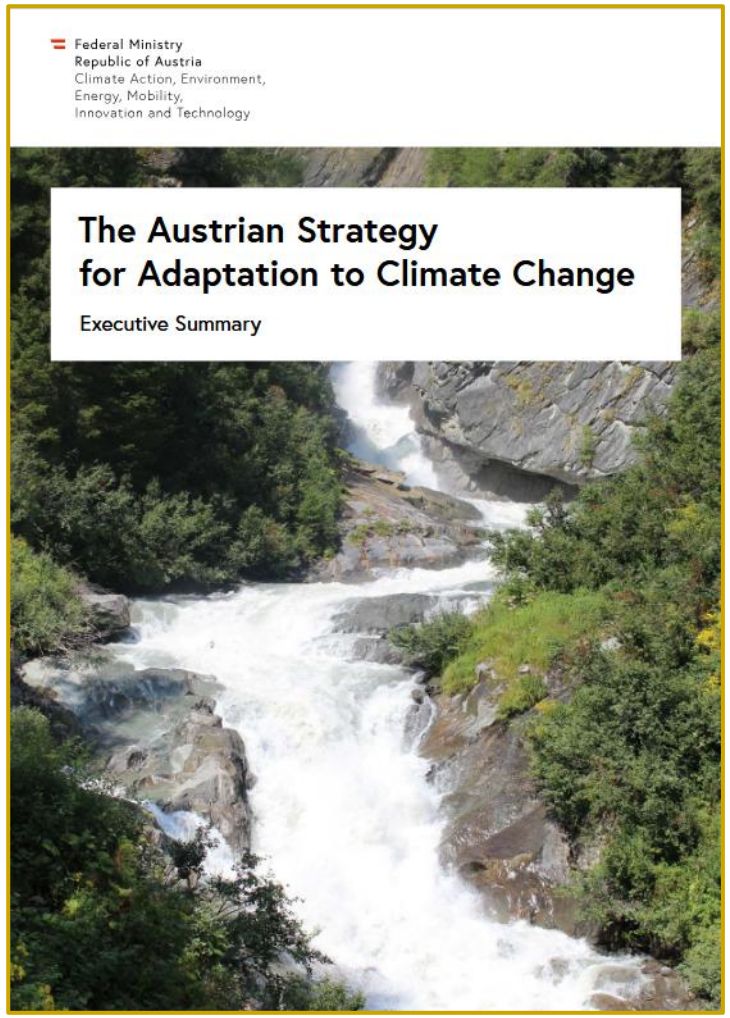
Published by Federal Ministry for Agriculture and Forestry, Climate and Environmental Protection, Regions and Water Management



- Since 2012, a **National Adaptation Strategy** has been in place, revised in 2021, based on new scientific findings
- Developed in an intensive **stakeholder process** involving a wide range of institutions, including AGES
- Action plan with a wide variety of measures across **14 fields of activities** (including agriculture, forestry, water management, tourism, etc.) spanning over 500 pages
- **Approved and adopted** by the Council of Ministers and acknowledge by the State Governors
- Accompanied by regular stakeholder-based progress **reports and revisions**

Austrian Strategy for Adaptation to Climate Change

Field of Activity: Agriculture



- **Strengthen biodiversity** in agricultural landscape by preservation and maintenance of landscape elements
- Increase the efficiency of existing **irrigation systems** and promote **water-saving management** measures
- Risk minimization and the development and expansion of **risk diversification instrument** (insurance models)
- Sustainable **building-up, restoration and conservation of soil** as a resource, and promote **organic agriculture**
- Research into and **control of alien, invasive pathogens** in crop and ornamental plants and environmentally friendly and sustainable implementation of **plant protection measures**
- Strengthen climate-resilient **plant breeding**

Strengthen climate-resilient plant breeding

National research financed by the Agricultural Ministry

- Federal Ministry for Agriculture and Forestry, Climate and Environmental Protection, Regions and Water Management implements its own **research strategy**, which has several funding mechanisms

- Most research proposals can be submitted and are via an implemented platform (www.dafne.at), which **standardizes cross-organizational research proposals**, project reporting → often funds research projects with relevance for climate change adaptation

- Additionally, projects of special relevance can be funded via the **Special Directive for the Promotion of Agriculture and Forestry through National Funds:**
  - financed exclusively through federal and/or provincial funds
  - 60 percent covered by the federal government and 40 percent by the federal state

Klimafit I-III

Cooperative Project

Strengthen climate-resilient plant breeding

National research financed by the Agricultural Ministry

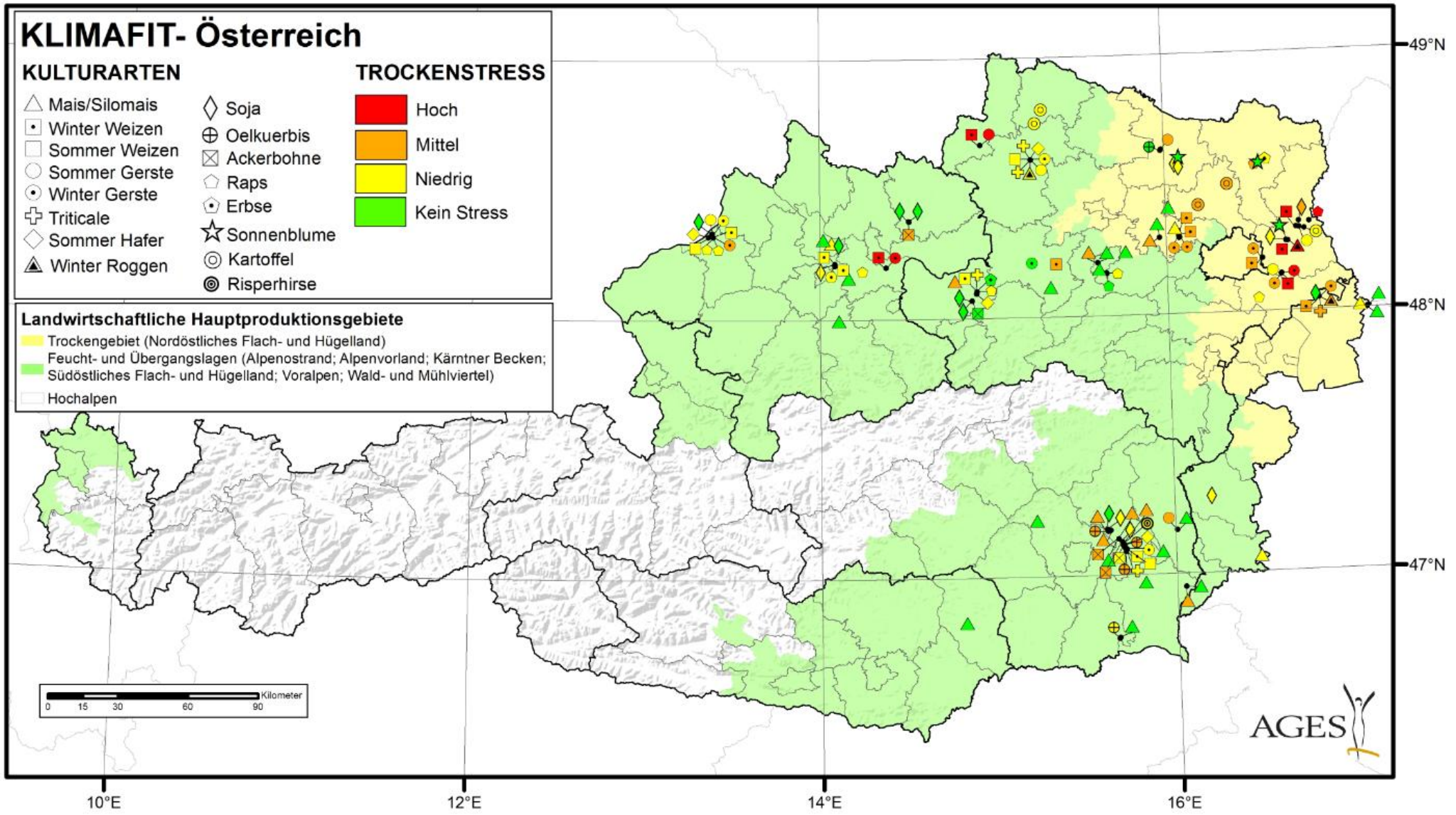
- The agricultural ministry is funding the development of **climate-fit new crop varieties** with a focus on heat- and drought resistance via the **Special Directive for the Promotion of Agriculture and Forestry through National Funds** in the projects **Klimafit I-III**
- In the cooperative project, multiple **Austrian crop breeding institutions** and the **Austrian Association of Plant Breeders, Seed Producers and Traders** work together to breed climate-resilient crop varieties

  → Adapted to climate change and to regional needs

  → Preservation of local crop varieties for sustainable crop production

RESULTS OF KLIMAFIT PROJECTS

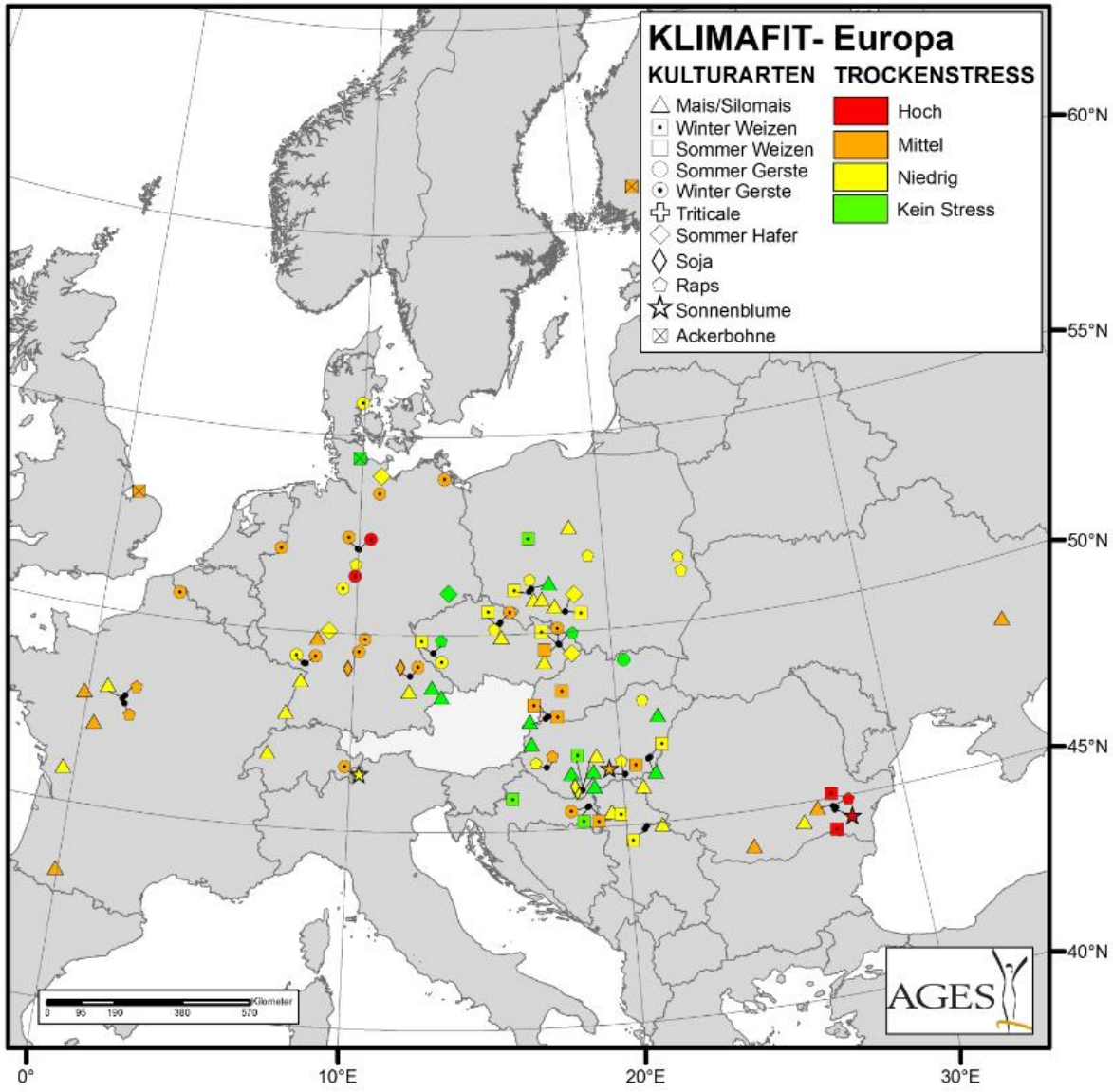
FIELD TRIALS NETWORK ALLOW FOR DROUGHT-STRESS SELECTION



RESULTS OF KLIMAFIT PROJECTS

FIELD TRIALS NETWORK ALLOW FOR DROUGHT-STRESS SELECTION

- Wide-ranging trial network:
  - >250 field trial locations in Austria and abroad
  - All relevant crop types included
  - Testing of genetic material in regions with long periods of drought and heat (extreme locations)
  - Parallel selection of breeding lines for different abiotic stress factors (e.g. heat tolerance and winter hardiness)
- Each year >100 breeding lines admitted for **variety approval**



CharAccess I-II

Research Projects

CHARACTERISATION OF ACCESSIONS

The CHARACCESS Projects

- CharAccess: Genomics und Phenomics of Austrian **Runner bean** (*Phaseolus coccineus* L.) accessiones with a fokus on **heat tolerance**
- CharAccess II: Development of **molecular markers** to support runner bean breeding programs

- Project duration CharAccess: November 2017 – Mai 2019
- Project duration CharAccess II: Mai 2020 – August 2021
- Projectpartner & Funding:

Bundesministerium Landwirtschaft, Regionen und Tourismus
Das Land Steiermark

REDUCED YIELD UNDER HEAT

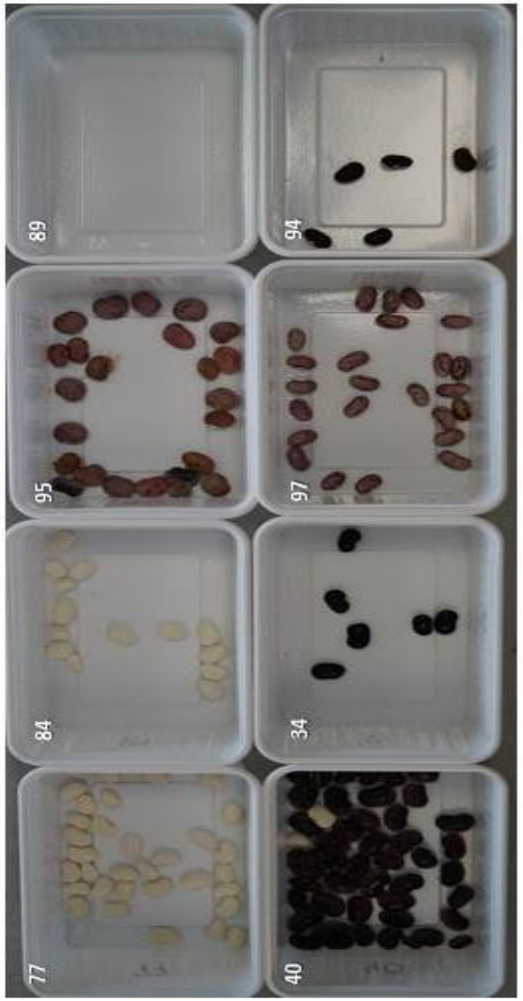
Flowers and pods are shed under heat

- Runner beans are sensitive towards heat stress
- Project goals:
  - Discovery of **heat-tolerant accessions**
  - Development of **molecular markers**
  - Characterisation of **Austrian Accessions** from the AGES-Genbank www.genbank.at
- 113 runner bean genotypes were subjected to daily artificial heat stress in the glasshouse

LARGE YIELD DIFFERENCES

Heat tolerant genetic material could be identified

Some accessions and varieties yielded better than the standard variety "Bonela".



GENETIC OF RUNNER BEANS WAS STUDIED

Sampling after raising the seedlings in the glasshouse

- CharAccess: **RADSeq (New Generation Sequencing)**
  - Method of choice for non-referenced genomes
  - Used to identify SNPs
- CharAccess II: **MassARRAY®**
  - Cheap and reliable method to validate markers and for genotyping
- GWAS was used to identify **18 SNP Marker** for heat tolerance

RESEARCH RESULTS PUT TO USE

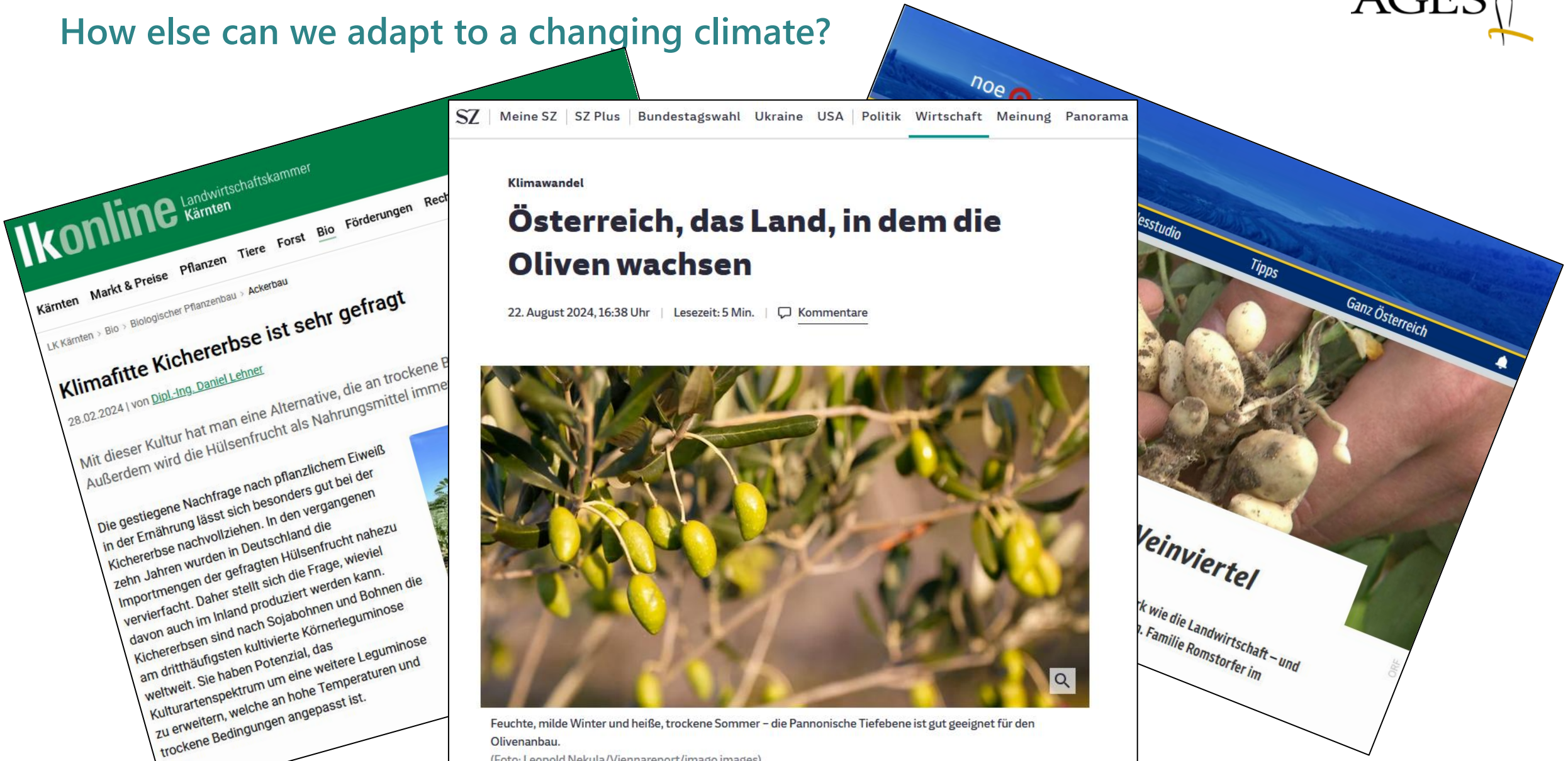
High pratical relevance for breeding programmes

The knowledge gained from the CharAccess projects can speed up the development of **new heat-tolerant breeding lines** and make them less costly!

- Use of the (potentially) **heat-tolerant accessions** as crossing partners
- Use of the **markers** for the identification and selection of heat-tolerant offspring

A LOOK FORWARD

How else can we adapt to a changing climate?



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