AGRIRESEARCH FACTSHEET

GENETIC RESOURCES AND BREEDING

Why do research and innovation on plant and animal genetic resources and breeding matter?

Genetic resources play a crucial role in agricultural and forest-based activities. Genetic diversity in agriculture and forestry - both within and between species - is key to ensure food security, sustainability as well as the resilience of crops, forests and animals vis-à-vis biotic and abiotic threats in changing environments. Widening the genetic basis of crops, animals and forest trees as well as diversifying production is therefore essential.

The importance of conservation and use of genetic resources is reflected in the EU policies, notably the **farm to fork strategy**, the EU **biodiversity strategy for 2030** and the **EU forest strategy for 2030**. The decline of genetic diversity must be reversed, including by facilitating the use of traditional varieties of crops, breeds, and forest species.

R&I activities aim at halting the further loss of genetic diversity as well as tapping into the vast genepool of plant and animals and making it available for breeders, farmers, foresters, and ultimately consumers. Particular breeding efforts are needed to broaden the genetic base of cultivated crops and create varieties that meet the manifold demands in relation to quality, resilience and sustainability.

Genetic resources and breeding under Horizon 2020 and Horizon Europe

CORDIS search keywords

plant breeding - animal breeding - genebank management - diversifying agriculture and forestry - genetic resources

Nb of projects

40 Horizon 2020

21 Horizon Europe

EU contribution

€ 233 million

€ 125 million

Horizon 2020 Societal Challenge 2 and Horizon Europe Cluster 6, including Work Programme 2023-2024 expected projects / Selection of projects logos

AGENT · UNTWIST · Root2Res (Root phenotyping and genetic improvement for rotational crops resilient to environmental change) · GEN4OLIVE · Smarter · INCREASE · GENTORE · CROP DIVA · InnOBreed · adopt · LiveSeeding

Success stories dedicated to genetic resources and breeding

Climate-resistant and resilient agriculture

With the increasing effects of climate change and a shift towards low-input production systems, there is a need for crops that are capable of capturing resources more efficiently and are resilient to abiotic and biotic stresses. Given the challenges, novel rice varieties tolerant to abiotic (salinity) and biotic (apple snail) were developed by **Neurice** through fast-breeding. **SolACE** tested solutions to overcome water and nutrient limitations by designing novel crop genotypes and agroecosystem management innovations. Breeding crops adapted to the challenging growth conditions and developing adaptation is the aim of **Untwist** and **ADAPT**. **BreedingValue**, **GEN4OLIVE** and **Harnestom** aim to increase the use of genetic resources to broaden the genetic base of crops and create new breeding opportunities. Breeding strategies for climate-resilient crops optimising the root-microbiome interaction is the main goal of the projects **Root2Res**, **BarleyMicroBreed** and **BOLERO**. **GenTORE** and **Smarter** applied breeding and precision genomic management for climate-resilient animal agriculture. **Re-Livestock** will seek for innovative practices for climate change resilient livestock farming, including breeding.

Boosting organic production and legume breeding

EU-funded research is helping to boost **organic farming** in Europe. **Liveseed**, **Ecobreed**, and **Bresov** increased the availability and quality of organic seeds and developed resilient new cultivars. **InnObreed** and **Liveseeding** aim to foster and upscale organic crop breeding.

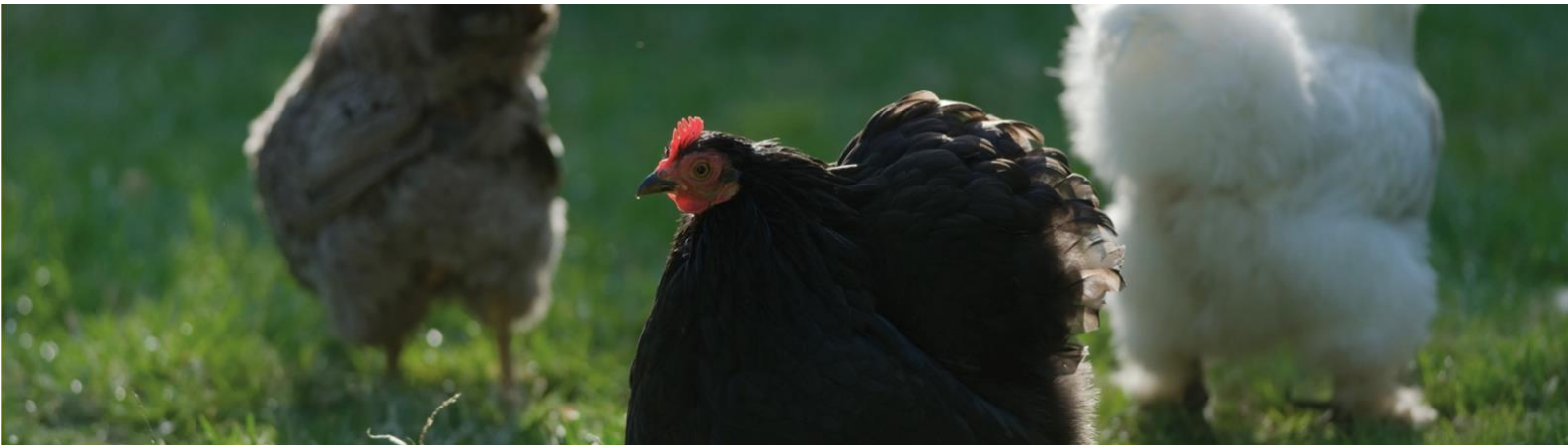
Legumes play an essential role in the transition towards more sustainable farming systems. **EUCLEG** developed strategies for the efficient breeding of legume crops and helped breeders create more adapted, performant legume varieties. **INCREASE** enhances the access, management and use of legume genetic resources. Building on the results of previous EU-funded projects, **BELIS** and **Legume Generation** will promote legume breeding to foster EU-grown plant proteins for a sustainable, resilient and competitive European legume sector.

From agrobiodiversity to sustainable value chains

Improving local breeds and crops provides opportunities for diversification in agriculture along with new openings for regional, high quality products and economic development. **Diversifood, Traditom** and **Treasure** enhanced the description and evaluation of local varieties and breeds. **Biovalue**, **Radiant**, **CropDiva** and **Divinfood** support biodiversity with value creation, promoting the use of underutilised crops and landraces. These projects aim to introduce genetically diverse crops to the value chain and to bolster the link between biodiversity, the agro-food value chain, the environment, consumers and health, paving the way to crop diversification locally adapted.

Improving capacities for genetic resources conservation

Farmers Pride and **DYNAVERSITY** built a network of stakeholders and conservation sites that coordinates conservation actions to safeguard the wealth of Europe's in-situ plant genetic resources. **GenRes Bridge** brought together the different communities from crop, forest and animal biodiversity domains to develop an integrated strategy for genetic resources for Europe.. **AGENT** aims to transform gene banks from living archives into bio-digital resource centres able to face the new technological challenges in agronomy. **IMAGE** enhances the use of genetic collections and animal gene bank management.



Horizon 2020 and Horizon Europe collaborative projects on genetic resources and breeding

Follow the CORDIS link for more information on the start-end date, EU contribution, coordinator and results. Non-exhaustive list sorted by ascending project acronym.

Acronym	Project	CORDIS
ADAPT	Accelerated Development of multiple-stress tolerAnt PoTato	862858
AGENT	Activated GEnebank NeTwork	862613
BarleyMicroBreed	Strategies for breeding climate change resilient barley, genetically equipped to optimized root-microbiome interactions	101060057
BeeGuards	Resilient beekeeping and breeding to safeguard natural genetic resources and pollination services	101082073
BELIS	Breeding European Legumes for Increased Sustainability	101081878
BioValue	Fork-to-farm agent-based simulation tool augmenting BIOdiversity in the agri-food VALUE chain	101000499
Bolero	Breeding for coffee and cocoa root resilience in low input farming systems based on improved rootstocks	101060393
BovReg	Identification of functionally active genomic features relevant to phenotypic diversity and plasticity in cattle	815668
BreedingValue	Pre-breeding strategies for obtaining new resilient and added value berries	101000747
CropDiva	Climate Resilient Orphan croPs for increased DIVersity in Agriculture	101000847
Divinfood	Co-constructing interactive short and mid-tier food chains to value agrobiodiversity in healthy plant-based food	101000383
Dynaversity	DYNAmic seed networks for managing European diversity	773814
Ecobreed	Increasing the efficiency and competitiveness of organic crop breeding	771367
EUCLEG	Breeding forage and grain legumes to increase EU's and China's protein self-sufficiency	727312
Farmer's Pride	Networking, partnerships and tools to enhance in situ conservation of European plant genetic resources	774271
FORGENIUS	Improving access to FORest GENetic resources Information and services for end-Users	862221
GEN4OLIVE	Mobilization of Olive GenRes through pre-breeding activities to face the future challenges and development of an intelligent interface to ensure a friendly information availability for end users	101000427
GenREs Bridge	Joining forces for genetic resources and biodiversity management	817580
GENE-SWitCH	The regulatory GENomE of SWine and CHicken: functional annotation during development	817998
GenTORE	Genomic management Tools to Optimise Resilience and Efficiency	727213
GEroNIMO	Genome and Epigenome eNabled 3reeding in Monogastrics	101000236
Harnesstom	Harnessing the value of tomato genetic resources for now and the future	101000716
IMAGE	Innovative Management of Genetic Resources	677353
INCREASE	Intelligent Collections of Food Legumes Genetic Resources for European Agrofood Systems	862862
INNOBREED	Innovative Organic Fruit Breeding and uses	101061028
InnoVar	Next generation variety testing for improved cropping on European farmland	818144
INVITE	INnovations in plant VarIety Testing in Europe to foster the introduction of new varieties better adapted to varying biotic and abiotic conditions and to more sustainable crop management practices	817970
Legume Generation	Boosting innovation in breeding for the next generation of legume crops for Europe	101081329
Liveseed	Improve performance of organic agriculture by boosting organic seed and plant breeding efforts across Europe	727230
Liveseeding	Organic seed and plant breeding to accelerate sustainable and diverse food systems in Europe	101059872
OptForests	Harnessing forest genetic resources for increasing options in the face of environmental and societal challenges	101081774
PPILOW	Poultry and PIg Low-input and Organic production systems' Welfare	816172
Radiant	ReAlising DynamIc vAlue chaiNs for underuTilised crops	101000622
Re-Livestock	Facilitating Innovations for Resilient Livestock Farming Systems	101059609
Root2Res	Root phenotyping and genetic improvement for rotational crops resilient to environmental change	101060124
RUMIGEN	Towards improvement of ruminant breeding through genomic and epigenomic approaches	101000226
SMARTER	SMAll RuminanTs breeding for Efficiency and Resilience	772787
SolACE	Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use	727247
UNTWIST	Uncover and promote tolerance to temperature and water stress in Camelina sativa	862524

Relevant sources of information supporting genetic resources and breeding

Other instruments like the "European Innovation Partnership for Agricultural productivity and sustainability" (EIP-AGRI) and partnerships, such as the upcoming partnership on agroecology living labs and research infrastructures, also support genetic resources and breeding.

EIP-AGRI activities

Focus Groups

- Genetic Resources - Cooperation models
- Organic farming - Optimising arable yields
- Protein crops

Workshops and Seminars

- Cropping for the future: networking for crop rotation and crop diversification

In the pipeline

- Biodiversity friendly practices in agriculture – breeding for Integrated Pest Management (IPM) (2 projects)
- Improving yields in organic cropping systems (2 projects)
- Crop wild relatives for sustainable agriculture (2 projects)
- European partnership on accelerating farming systems transition – agroecology living labs and research infrastructures. The R&I partnership on agroecology will enhance the knowledge base and deliver solutions and tools that will underpin the agroecology transition in Europe.
- European Partnership for Animal Health and Welfare. The R&I partnership aims to deliver key knowledge, services and products to significantly improve the control of animal infectious diseases and animal welfare.

Future funding opportunities

- HORIZON-EIC-2023-ACCELERATORCHALLENGES-06: EIC Accelerator Challenge: Novel technologies for resilient agriculture
- HORIZON-CL6-2024-BIODIV-01-6: Promoting pollinator friendly farming systems
- HORIZON-CL6-2024-BIODIV-01-8: Conservation and protection of carbon-rich and biodiversity-rich forest ecosystems
- HORIZON-CL6-2024-BIODIV-02-3-two-stage: Promoting minor crops in farming systems

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