European Commission

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. They hold the key to diverse and healthy diets and to the adaptation of plants and animals to a changing and more variable climate. This potential is not sufficiently used and current farming modes increasingly rely on a limited number of plant and animal species. Three major crops (rice, wheat and maize) provide more than 50% of the world's plant-derived calories. Reversing this trend and increasing the resilience of farming and forestry is critical and of global concern, in particular in the current context of accelerated climate change and an ever increasing population. R&I activities aim at halting the further loss of genetic diversity by tapping into the vast genepool of plant and animals and making it available for breeders, farmers and ultimately consumers. Furthermore, particular breeding efforts are undertaken 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 Societal Challenge 2 (SC2)

37
Projects or expected grants

209 M€
EU contribution 2014-2020

588
Participations in selected projects

Key themes

Landraces and local products & value chains – Genebank management – Coordination and development of biodiversity strategies - Diversifying agriculture and forestry – Plant and animal breeding

JUNE 2019 UPDATE

Agriculture and Rural Development

Genetic resources and breeding under EIP-AGRI activities

Focus group: Genetic resources – cooperation models	bit.ly/2E3Cryv
Operational Groups (OGs) examples:	
Population management of old cattle and pig breeds	bit.ly/2utNa5N
Olive biodiversity and safeguard	bit.ly/2GjTS3N
	bit.ly/2E4JVBd

Horizon 2020 SC2 projects: Genetic resources and breeding

MA = Multi-actor

DIVERSIFOOD [MA]
www.diversifood.eu
Total cost: 4 M€
EC contribution: 3,4 M€
Coordinator: INRA
Mar. 2015 to Feb. 2019

DIVERSIFOOD seeks to increase the intra and interspecific diversity in cropping systems, thereby increasing the performance, resilience and quality of cultivated plants. It capitalises on underutilized and forgotten plant species and promotes participatory breeding methods to tap effectively into farmers' knowledge. It will demonstrate the value of on-farm seed systems.

TRADITOM [MA]
traditom.eu
Total cost: 4,4 M€
EC contribution: 4,4 M€
Coordinator: CSIC, ES
Mar. 2015 to Aug. 2018

A large number of traditional tomato varieties have been developed by local farmers ever since tomato was introduced to Europe in the 16th century. TRADITOM brings together complementary expertise from genetics, genomics, metabolism, socio-economy, agronomy and farming to identify and valorize the genetic diversity stored in traditional tomato varieties.

TREASURE [MA]
treasure.kis.si
Total cost: 3,4 M€
EC contribution: 3,4 M€
Coordinator: Agricultural Institute of Slovenia
Apr. 2015 to Mar. 2019

TREASURE focuses on the characterization and evaluation of underutilized pig breeds, using novel genomic tools, and on feeding and management strategies for high product quality. It looks at different agro-geo-climatic environments and production systems (indoor, outdoor, organic) and takes into account the needs and preferences of consumers, farmers and other actors in the value chain.

G2P-SOL
www.g2p-sol.eu
Total cost: 6,9 M€
EC contribution: 6,9 M€
Coordinator: ENEA, IT
Mar. 2016 to Feb. 2021

G2P-SOL brings together main European and International genebanks hosting germplasm of the four major Solanaceous crops: potato, tomato, pepper and eggplant. It will create a 'genetic blueprint' of main accessions of these crops and catalogue their genetic diversity and extent of duplication. It will further characterise in detail 'core collections' for each species in order to capture the potential stored in the global gene pools.

GenTree
www.gentree-h2020.eu
Total cost: 8 M€
EC contribution: 6,7 M€
Coordinator: INRA
Mar. 2016 to Feb. 2020

GenTree will support the European forestry sector with knowledge on the genomics of local adaptation, and methods and tools for sustainable management and use of forest genetic resources (FGR). The project will develop strategies for dynamic conservation of FGR in Europe as well as scenarios and policy frameworks for forest management in the context of climate change and bioeconomy.

GoodBerry [MA]
goodberry-eu.eu
Total cost: 5,1 ME
EC contribution: 4,9 M€
Coordinator: U de Malaga
Mar. 2016 to Feb. 2020

GoodBerry focuses on the genetic improvement of berry fruits in different environments, seeking to better capture their genetic complexity and plant, environment and management interactions. It will facilitate the development of high yields and quality berry fruits by working on traits that confer quality and resilience, on crop improvement and on locally adapted cultivation techniques.

IMAGE www.imageh2020.eu Total cost: 9 M€ EC contribution: 7 M€ Coordinator: INRA Mar. 2016 to Feb. 2020	MAGE will enhance the use of genetic collections and upgrade animal gene bank management. It will further develop genomic methodologies, biotechnologies, and bioinformatics for a better knowledge and exploitation of animal genetic resources in breeding and farming. It will also develop synergies between ex-situ and in-situ conservation to maximise resources for the future.
NEURICE MA neurice.eu Total cost: 4,7 M€ EC contribution: 4,6 M€ Coordinator: U de Barcelona Mar. 2016 to Feb. 2020	NEURICE will develop strategies for rice productivity, stability and quality. It will do so by developing new commercial rice varieties harbouring salt tolerance alleles to protect the sector against deteriorating water quality in Mediterranean basins and apple snail invasion linked to salinization. The availability of commercial salt tolerant rice will not only prepare the rice sector to the effects of climate change but will also prevent further dispersion of this devastating pest.
TomGEM MA tomgem.eu Total cost: 5,7 M€ EC contribution: 5 M€ Coordinator: INPT, FR Mar. 2016 to Feb. 2020	TomGEM addresses yield stability in high temperature conditions with the aim to produce genotypes that are better adapted to climate change. It will select superior tomato genotypes for heat stress, identify genetic variations associated with climate change tolerance of fruit yield, set up optimal growing conditions and design innovative breeding and management strategies for various geographical conditions.
SolACE MA www.solace-eu.net Total cost: 7.2 M€ EC contribution: 6M€ Coordinator: INRA May 2017 to Apr. 2022	SolACE aims to help European agriculture face the challenge of more frequent combined limitations of water and nutrients in the coming decades, through the design of novel crop genotypes and agroecosystem management innovations to improve water and nutrient use efficiency.
BREEDCAFS www.breedcafs.eu Total cost: 6,4 M€ EC contribution: 4,2 M€ Coordinator: CIRAD Jun. 2017 to May 2021	BREEDCAFS will design and test hybrid coffee varieties which are well adapted to agro forestry systems (AFS) and show robustness against biotic and abiotic stresses. Gene by environment interactions will be assessed in a wide range of environments and low-input management inherent to AFS. Farmers' experiences with new hybrids (profitability, social acceptance) will inform the farm assessment and the breeding strategy.
LIVESEED MA www.liveseed.eu Total cost: 9 M€ EC contribution: 7,5 M€ Coordinator: IFOAM Jun. 2017 to May 2021	LIVESEED will help to establish a level playing field in the organic seed market across Europe, improve the competitiveness of the organic seed and breeding sector, and encourage greater use of organic seeds by farmers. LIVESEED will improve guidelines for cultivar testing and strategies for ensuring seed health. It will develop innovative breeding approaches suited to organic farming.
TomRes MA www.tomres.eu Total cost: 6 M€ EC contribution: 6 M€ Coordinator: U di Torino Jun. 2017 to Nov. 2020	TOMRES will select tomato rootstocks and scions tolerating combined stress, while retaining fruit quality and yield, taking advantage of innovative screening approaches. Novel below-ground and hormone linked resilience traits will be identified. TOMRES will test and optimize sustainable crop management strategies and the use of rootstocks more suited to water and nutrient uptake from the soil.
GenTORE MA www.gentore.eu Total cost: 7,6 M€ EC contribution: 7 M€ Coord: INRA Jun. 2017 to May. 2022	GenTORE will develop innovative genome-enabled selection, phenotyping and management tools to empower breeders and farmers to optimize cattle resilience and efficiency (R&E) in different and changing environments. These tools will be applicable across the full range of systems (beef, milk and mixed), and will increase the sustainability of European cattle meat and milk production.

DYNAVERSITY [MA]
dynaversity.eu
Total cost: 1,9 M€
EC contribution: 1,9 M€
Coordinator: Arcadia
Nov. 2017 to Oct. 2020

DYNAVERSITY will increase capacities for in-situ conservation of plant genetic resources by mapping and bringing together all stakeholders involved in the dynamic management of plant genetic resources. The project will develop new management and governance models, establish new forms of seed networking and exchange and promote socio-environmental practices.

FarmersPride [MA]
farmerspride.eu
Total cost: 2 M€
EC contribution: 2 M€
Coordinator: U Birmingham
Nov. 2017 to Oct. 2020

Farmers' pride aims at establishing a durable structure for *in situ* conservation of plant genetic resources in Europe. It will enhance existing knowledge of European landraces and crop wild relatives, showcase how these resources can be effectively secured and managed, and establish a modus operandi for the effective linkage of in situ conservation and farmer or breeder based utilization.

BRESOV [MA]
bresov.eu
Total cost: 7 M€
EC contribution: 6 M€
Coordinator: Universita degli studi di Catania
May 2018 – April 2022

BRESOV deals with the urgent need to provide climate-resilient cultivars for organic vegetable production systems. It will explore the genetic diversity of three of the economically most significant vegetable crops (broccoli, snap bean and tomato) and will improve the competitiveness of these three crops in an organic and sustainable environment. The consortium's overall aim is to increase the plants' tolerance to biotic and abiotic stresses, to adapt the varieties to the specific requirements of organic and low-input production processes, and to increase quality of organic seed.

ECOBREED [MA]
ecobreed.eu
Total cost: 6.2€
EC contribution: 5.7 M€
Coordinator: Kmetijski Institut Slovenije
May 2018 – April 2023

ECOBREED will improve the availability of seed and varieties suitable for organic and low input production. Activities will focus on four crop species, i.e. common wheat, potato, soybean and common buckwheat. The project will develop (a) methods, strategies and infrastructures for organic breeding, (b) varieties with improved stress resistance, resource use efficiency and quality and (c) improved methods for the production of high quality organic seed.

SMARTER [MA]
bit.ly/2VXb5qN
Total cost: 7.6 M€
EC contribution: 7 M€
Coordinator: INRA
Nov. 2018 – Oct. 2022

SMARTER will develop and deploy innovative strategies to improve Resilience and Efficiency (R&E) related traits in sheep and goats. It will explore their underlying genetic and genomic variability including genotype-by-environment interactions (conventional, agro-ecological and organic systems) in commercial populations. It will propose new breeding strategies that utilise R&E traits and trade-offs and balance economic, social and environmental challenges.

CropBooster-P
www.cropbooster-p.eu
Total cost: 3 M€
EC contribution: 3 M€
Coordinator: Stichting Wageningen Research
Nov. 2018 – Oct. 2021

CropBooster-P identifies priorities and opportunities to boost productivity of crops and to adapt them to the environmental and societal changes faced today and in the future. While engaging with the public, and by mobilizing European plant sciences, the project will produce a roadmap that will describe the pathway to sustainably doubling Europe's crop yields by 2050 and preparing these crops for the needs and the future climate of Europe.

GenRes Bridge
genresbridge.eu
Total cost: 3 M€
EC contribution: 3 M€
Coordinator: European Forest Institute
Jan. 2019 – Dec. 2021

GenRes Bridge aims to strengthen the conservation and sustainable use of genetic resources by accelerating collaborative efforts for a co-created European integrated GenRes strategy and through widening capacities in plant, forest and animal genetic resource domains by sharing perspectives and resources, exchanging best practices, harmonizing standards and carrying out trainings under the auspices of the three pan-European GenRes networks: EUFORGEN, ECPGR and ERFP.

INVITE
bit.ly/2K0uzFs
Total cost: 8 M€
EC contribution: 8 M€
Coordinator: INRA
Jun. 2019 – Jun. 2024

The aim of the INVITE project is to improve both efficiency of variety testing and the information available to stakeholders on variety performance under a range of production conditions and biotic and abiotic stresses. The valorisation and the promotion of varieties that are more adapted to sustainable management practices, and more resilient to climate change will be promoted through the project.

GENE-SWitCH bit.ly/2Z6oZ7J Total cost: 6 M€ EC contribution: 6 M€ Coordinator: INRA Jul.2019 - Jun. 2023	GENE-SWitCH aims to deliver new underpinning knowledge on the functional genomes of two main monogastric farm species: pig and chicken. In full coordination and synergy with global effort and ongoing projects of the Functional Annotation of ANimal Genomes (FAANG) community, we will characterize the dynamics of the functional genome from embryo/fetus to adult life by targeting a panel of tissues relevant to sustainable production.
BovReg bit.ly/2Wctyvz Total cost: 6 M€ EC contribution: 6 M€ Coordinator: Leibniz-Institut für Nutztierbiologie Sep. 2019 – Aug. 2023	BovReg provides a comprehensive map of functionally active genomic features in cattle and how their (epi)genetic variation in beef and dairy breeds translates into phenotypes. BovReg brings together a critical mass of experts in ruminant research, bioinformatics, animal breeding and ethics and social science encompassing 20 partners from the EU, Canada and Australia. BovReg is fully integrated into the global Functional Annotation of ANimal Genomes (FAANG) initiative.
InnoVar bit.ly/2QKYamE Total cost: 8 M€ EC contribution: 8 M€ Coordinator: AFBI Oct. 2019 – March 2024	InnoVar will develop next generation plant variety testing by building tools and models that augment current practices fosuing on advances in genomics, phenomics, imaging technologies and machine learning. Cutting-edge science will be integrated with tested DUS and VCU processes to deliver an invigorated EU variety evaluation system capable of delivering increasingly productive and more sustainable cropping to meet future challenges.

Some projects under “Ecological approaches” and “Animal production systems” also contribute to this cluster (like **EUCLEG** www.eucleg.eu or **FEED-A-GENE** www.feed-a-gene.eu).

Interesting activities under other Horizon 2020 sections

Many other parts of Horizon 2020 include interesting activities on genetic resources and breeding.

Marie-Skłodowska Curie Actions support individual fellowships, innovative training networks and Research and innovation staff exchange. Examples include:

- **DIAGRASS**, which works on differential adaptation capacity of dryland grasses to changes in water availability (bit.ly/2pLGona - EC contribution: 0.2 M€ - Apr. 2018 to Mar. 2021)
- **Bioinformatics4Breeding**, which harnesses the power of bioinformatics to improve genetic selection for fertility in dairy cows (bit.ly/2GG60LN - EC contribution: 0.2 M€ - May 2016 to Apr.2018.)

Several **research infrastructures** are also supported, like EMPHASIS-PREP on plant phenomics (bit.ly/2uzqYai) and the **European Plant Phenotyping Network 2020** (bit.ly/2GkEjIY).

The **European Research Council** also finances a wealth of basic science projects in this area, such as **CRISBREED** on the use of CRISPR/CAS mediated plant breeding, while the **SME Instrument** supports many more applied projects, such as **SWINE-GEN** on Genetic markers assisted selection for improvement of swine breeding productivity.

In the pipeline – 4 projects to start under 2019 H2020 SC2 calls (24 M€)

Agri-Aqua-Labs - Looking behind plant adaptation	(2 projects, 10 M€)
Genetic resources and pre-breeding communities - Adding value to plant GenREs	(2 projects, 14 M€)

Funding opportunities - Open H2020 SC2 calls for 2020 (33 M€)

SFS-13-2020: Genome and epigenome enabled breeding in terrestrial livestock [MA]	(2 projects, 14 M€)
SFS-28-2018-2019-2020: Genetic resources and pre-breeding communities C. (2020): The GenRes-user interface and pre-breeding activities	(2 projects, 14 M€)
SFS-30-2018-2019-2020: Agri-Aqua-Labs C. (2020): Plant energy biology	(1 project, 5 M€)

Preparatory actions on EU plant and animal genetic resources

Following an initiative tabled by the European Parliament in 2013, the European Commission (DG Agriculture and Rural Development) contracted two "**Preparatory actions on EU plant and animal genetic resources in agriculture**". The first preparatory action (2014-2016) consisted in a study that mapped activities in the Member States and identified missing links. The second action (Jan. 2016 – Dec. 2018) sought to develop and collect examples on how to valorise the use of neglected breeds and varieties in an economically viable way. More information: www.geneticresources.eu

European map of genetic resources

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