

**Federal Ministry  
of Education and Research (BMBF)**

**Announcement**

Regulations governing the funding of projects on the topic  
“Modern breeding research for climate- and site-adapted crops of tomorrow”

of 26 October 2023

## **1 Funding aim, purpose and legal basis**

### **1.1 Aim of funding**

The Federal Government’s National Bioeconomy Strategy targets the sustainable development and use of biological resources in support of environmentally and nature-friendly production processes in all areas of the economy<sup>1</sup>. The bioeconomy drives new industries, the modernization of our primary production systems, environmental protection, and the protection and recovery of biodiversity<sup>2</sup>. Research funding for the bioeconomy is oriented towards the development of future-proof solutions using intelligent strategies and innovative production methods, taking account of the primacy of food security and seeking to mitigate potential conflicting aims in agricultural production and land use. Sustainability and thinking in terms of the circular economy are key factors for the successful implementation of the bioeconomy and the BMBF’s “Research for Sustainability” strategy (FONA)<sup>3</sup>.

The Federal Government’s “Future Research and Innovation Strategy” provides additional impetus for the already initiated transformation process<sup>4</sup>. It aims at innovative solutions to bring further progress to climate action, climate change adaptation, food security, and protection of biodiversity. Among other areas, the strategy focuses on the challenge of ensuring supply security for a growing global population in view of the consequences of climate change while providing support for biodiversity, soil quality and soil health and a climate-neutral economy over the long term.

Innovative plant-breeding research which is open to different methods and technologies can provide a major contribution towards meeting the increasing demand for bio-based resources on a sustainable basis – particularly in view of existing competing uses – and accords with the requirements of the EU’s Farm to Fork Strategy<sup>5</sup> developed as part of the European Green Deal<sup>6</sup>.

Modern and effective plant-breeding research is an important prerequisite for the bio-based transformation that is aimed for in this context in which fossil resources will be substituted by various renewable biomaterials on a sustainable basis. It transfers advances in breeding into agricultural practice and in this way provides the basis for efficient competitive crop

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<sup>1</sup> National Bioeconomy Strategy (Federal Government – 2020)

<sup>2</sup> EU bioeconomy strategy (“A new bioeconomy strategy for a sustainable Europe” – 2018)

<sup>3</sup> The funding measure contributes towards achieving the goals of the National Bioeconomy Strategy, the German Sustainable Development Strategy, and the Research for Sustainability strategy (FONA) and thus towards fulfilling the United Nations’ Sustainable Development Goals.

<sup>4</sup> Future Research and Innovation Strategy (Federal Government – 2023)

<sup>5</sup> EU Farm to Fork Strategy (F2F – 2020)

<sup>6</sup> European Green Deal (EU 2019)

production. Support for the breeding of climate-resilient crop varieties is particularly important in this context<sup>7</sup>.

Conventional plant breeding already has a wide variety of tried and tested techniques. Genome editing provides modern plant-breeding research with a set of additional, highly effective and precisely targetable tools. The new molecular techniques enable an unprecedented level of precision and efficiency for improving crop plants.<sup>8</sup> It is important to make full use of this innovation potential in order to achieve the Sustainable Development Goals, including for the reduction of both pesticide use and crop losses.<sup>9</sup> Because the new breeding techniques are relatively simple to use, they can be directly applied by a great number of public research institutions and local breeding businesses to generate solutions that can also be used by small-scale farmers in many parts of the world.<sup>10</sup>

Under the “Modern breeding research for climate- and site-adapted crops of tomorrow” call, both conventional methods and new breeding techniques are to be employed in the development of resilient and productive crops. In the last two decades, vital insights have been gained for plant-breeding research through the decoding of numerous plant genome sequences and the development of methods for the targeted genetic modification of plants. The goal of this funding measure is therefore to lay the foundations for the breeding of approvable crop varieties in order to be able to continue to ensure the reliable, climate-resistant supply of high-quality, healthy and safe food in the future. Innovative crops are to be developed with significantly reduced lead times to address the effects of progressive climate change and contribute to maintaining land productivity in an environmentally friendly and resource-conserving way. For the development and optimization of resilient, resource-efficient, climate- and site-adapted crops, it is essential to preserve, make full use of, and significantly expand the existing genetic resources, by means of both a broad spectrum of crop varieties and new crop species, including previously little used special or niche crops. In this respect, the identification of stable plant traits in the context of yield-endangering biotic and abiotic stress factors is an important approach in order to be able to predict how certain plant properties will behave in various environmental conditions in the future. The aim of this is to contribute to the strengthening of sustainable and economically viable agriculture that will take account of climate protection and adaptation and biodiversity conservation in equal measure.

This funding measure is intended to contribute towards global food security. This enormous societal and agro-economic challenge is made even harder by progressive climate change, emerging new pests, increasing scarcity of arable land and by the urgent need to reduce the use of energy-intensive inputs that are potentially harmful for the environment. At the same time it is essential to take account of the need to preserve or increase biodiversity and soil quality in food and feedstuff production and to advance climate change mitigation through the efficient use of resources. In this context, sustainable utilization of residues from agricultural production systems can serve as a driver of new industries without providing a competitive threat to food security.

## 1.2 Funding purpose

Methodological innovations in the field of plant breeding research are of key importance to overcoming global challenges. Modern resource-efficient crop varieties should have high

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<sup>7</sup> Federal Government coalition agreement (2021)

<sup>8</sup> Joint Press Release No. 34: DFG and Leopoldina Support European Commission Proposal for a Regulation on Plants Obtained by New Genomic Techniques (19 July 2023)

<sup>9</sup> Statement by the German National Academy of Sciences Leopoldina, the Union of the German Academies of Sciences and Humanities, and the DFG (German Research Foundation): Towards a scientifically justified, differentiated regulation of genome edited plants in the EU (2019)

<sup>10</sup> FAO (Food and Agriculture Organization of the United Nations): Gene editing and food safety (2023)

resilience to stressors as well as stable yield characteristics and ultimately go beyond the progress possible through conventional breeding techniques.

Funding for systemic, technology-neutral research promises to enable the development of the best solutions for the various urgent challenges, particularly those that are climate-related. Thus, the whole spectrum of available breeding technologies will be funded on a technology-neutral basis. Holistic breeding aims for crop plants which are optimally integrated into innovative cultivation systems that promote increased biodiversity and soil quality will bring about a sustainable increase in the utilization of functional diversity. A particular aim is for biological crop protection to contribute towards reducing the use of pesticides that are potentially harmful for the environment.

The purpose of the funding is inter- and transdisciplinary collaborative research that will bring together academic partners from university and non-university research institutions with commercial companies. Additionally, independent junior research groups, in which researchers with a multidisciplinary approach will carry out basic as well as applied research projects, can be affiliated to this collaboration.

A science communication mechanism to support the collaboration will be established by the funding provider with the aim of providing transparency about the breeding methods and information about the risks and possibilities as well as to identify conflicting aims at an early stage. Citizens, policy-makers and representatives of civil society and industry will be provided with information and actively included by means of both dialogue-based and participatory communication measures.

### 1.3 Legal basis

The Federal Government will award grants in accordance with these funding regulations, sections 23 and 44 of the Federal Budget Code (BHO) and the administrative regulations adopted thereunder as well as the regulations governing applications for expenditure-based grants (AZA/AZAP/AZV) and/or cost-based grants from commercial companies (AZK) of the Federal Ministry of Education and Research (BMBF). There is no legal entitlement to a grant. The granting authority will decide freely after due assessment of the circumstances within the framework of the budget funds available.

Under these funding regulations, state aid will be granted on the basis of Article 25 (1) and (2)(a) and (b) and Article 28 (1) and (2)(a) of the General Block Exemption Regulation (GBER) of the European Commission.<sup>11</sup> Funding is provided in accordance with the Common Provisions set out in Chapter I GBER, in particular taking account of the definitions given in Article 2 of the Regulation (cf. Annex with regard to the requirements of state aid legislation applying to these funding regulations).

These funding regulations apply in conjunction with the National Bioeconomy Strategy (see <https://www.bmbf.de/de/biooekonomie-neue-konzepte-zur-nutzung-natuerlicher-ressourcen-726.html>).

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<sup>11</sup> Commission Regulation (EU) No. 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty on the Functioning of the European Union (OJ L 187 of 26 June 2014, p. 1) in the version of Regulation (EU) 2017/1084 of 14 June 2017 (OJ L 156 of 20 June 2017, p. 1), Regulation (EU) 2020/972 of 2 July 2020 amending Regulation (EU) 1407/2013 as regards its prolongation and amending Regulation (EU) 651/2014 as regards its prolongation and relevant adjustments (OJ L 215 of 7 July 2020, p. 3) and Regulation (EU) 2021/1237 of 23 July 2021 amending Regulation (EU) No. 651/2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty on the Functioning of the European Union (OJ L 270 of 29 July 2021, p. 39) and Regulation (EU) 2023/1315 of 23 June 2023 amending Regulation (EU) No. 651/2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty on the Functioning of the European Union (OJ L 167 of 30 June 2023, p. 1).

## 2 Object of funding

Evidence of the expected massive impact of climate change is already clearly noticeable with consequences for people, the environment and the economy. Timely, scientifically based adaptation to climate change will help mitigate societal, economic and health-related impacts and increase risk preparedness and resilience in Germany.<sup>12</sup> Due to increased general climate changes expected in the future as well as small and large-scale extreme weather events such as extreme heat, drought, torrential rainfall, floods and associated phenomena such as soil erosion, adaptation measures must be taken at an early stage in order to limit negative impacts on people, nature and infrastructure. The focus of this funding measure is the breeding of climate-adapted crop varieties which can resist the biotic and abiotic effects of climate change while also ensuring stable yields.

### 2.1 Research topics

The results of plant-breeding research to date and the above-mentioned needs for action have led to the definition of basic priority topics which are to be investigated holistically in excellence and innovation-driven research collaborations and associated junior research groups for individual crop species under this funding activity for “Modern breeding research for climate- and site-adapted crops of tomorrow”. The themes to be addressed for an individual crop species, preferably in an overarching approach, are:

- a. Adapting crop plants to abiotic and biotic stressors,
- b. Increasing the efficient use of resources and sustainability,
- c. Establishing new, climate-resilient functional plant traits,
- d. Preserving/increasing agrobiodiversity and soil health, and
- e. Utilizing cutting-edge breeding bioinformatics.

### 2.2 Research objectives

#### 2.2.1 Adaptation of crops to abiotic and biotic stressors

The aim is the characterization and optimization of the mechanisms of climate and environmental adaptation for optimal plant development and for prospective, accelerated adaptation.

Possible research objectives include:

- a. Decoding and characterization of morphological, physiological or biochemical processes and signal paths which have influence on the compensatory abilities of the crop plant to deal with biotic and abiotic stressors and combinations thereof
- b. Contributions of agrobiodiversity for the adaptation of crop plants and production systems to yield-endangering climate impacts

#### 2.2.2 Increasing the efficient use of resources and sustainability

The aim is to optimize the production and supply as well as the recycling of nutrients and inputs necessary for efficient crop production.

Possible research objectives include:

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<sup>12</sup> Future Research and Innovation Strategy (Federal Government - 2023)

- a. Identification of the factors that ensure a sustainable stabilization or increase of crop yield per unit area – taking into account a limited availability of raw materials such as water and nutrients
- b. Reduction in nutrient input to achieve higher productivity with less resources
- c. Developing efficient mechanisms for the uptake and utilization of resources of limited availability or increasing of tolerance to deficiencies
- d. Breeding for mixed cropping, for example genotypes of a crop species with complementary root architectures for more efficient use of nutrients and water
- e. Systemic approach to the optimization of crop plants for the circular economy, i.e. thinking about the plant in its habitat – from seeds via the root (the soil) to the crop product (including sustainable residue and waste material recycling or cascaded uses; improved harvesting capacity and non-energy use of biomass; utilization of rotting plant residues remaining in the field)

### 2.2.3 Establishing new, climate-resilient functional plant traits

The aim is to achieve the desired or necessary novel qualities and physiological performance traits which give the crop plant significant competitive advantages through targeted modification of the qualitative varietal characteristics.

Possible research objectives include:

- a. Identification, optimization and, where appropriate, enrichment of high-quality ingredients (e.g. vitamins, oils, trace elements) while reducing allergens and undesirable constituents.
- b. Development of disease tolerances in the context of reducing the need for pest control including, but not solely, via the identification and characterization of plant traits with a positively increased receptiveness to so-called antagonists and other probiotic factors.
- c. Breeding focused on previously overlooked traits of the root system for a more efficient utilization of water and nutrients
- d. Identification and characterization of both primary and secondary plant substances (compounds/metabolites/ingredients) taking into account changes in dietary habits in order to ultimately be able to adapt qualitative crop plant traits

### 2.2.4 Preserving/increasing agrobiodiversity and soil health

The aim is to characterize, utilize and expand the variety of agricultural crop plants and their functional traits in order to meet the challenges of climate change and food security.

Possible research objectives include:

- a. Identification of natural genetic diversity in the gene pool of the main crop species (for example, availability of complete genome sequences; functional analyses of genomes, gene functions, gene interactions and gene networks, major genes, epigenetics)
- b. Targeted characterization and utilization of climate influences on the variety of crop species (for example, diversity of existing crops; domestication of new crop species; cross-breeding with wild varieties)

- c. Sustainable improvement of soil functions and soil health through plant breeding with a focus on the root system (for example, humus formation; improvement of soil structure including erosion prevention; promotion of soil biodiversity; development of the subsoil; utilization of plant root-soil-microorganism interactions)

## 2.2.5 Utilizing cutting-edge breeding bioinformatics

Possible research objectives include:

- a. Methods for the efficient processing and utilization of high-throughput data with the help of digitalization, neural networks, artificial intelligence and machine learning methods
- b. Development of strategies and methods for dealing with heterogeneous and multidimensional data of different levels of quality (e.g. standardization, storage, management, curation)
- c. Development of predictive models for the use of "G×E×M" (Genotype x Environment x Management)
- d. Predictive plant breeding for the development of future-viable, resilient varieties with agronomically important plant traits based on systemic models, in particular data from genome research, phenotyping as well as integrative bio- and breeding informatics

## 2.3 Funding modules

Funding will be provided within three funding modules A, B and C. Within the two separate funding modules A and B, research and development will be funded in application-oriented collaborative projects with an inter- and transdisciplinary as well as systemic structure. The respective consortia will be composed of academic (university and non-university research institutions) and commercial partners (crop-breeding enterprises or other companies, especially SMEs). With a focus on a single crop species, the respective research collaboration will work, if possible, on all the research topics listed under 2.1 and integrate them as suitable.

Independent junior research groups (module C) may be affiliated to the collaborations formed under modules A and B to carry out an independent research project in a meaningful context, thematically associated to the project of the main collaboration.

### 2.3.1 Module A: Field crops and cash crops

The focus here is on agronomically important crop plants which are cultivated as food or fodder crops or as renewable biomaterials. In this module, funding will be provided for research projects on the major crop types including cereals (barley, maize, rye, wheat), potatoes, rapeseed and sugar beet.

### 2.3.2 Module B: Special and niche crops

In this module, funding will be provided for research projects on special and niche crops including cereals (spelt, oats, millet, rice), buckwheat, sunflower, tomatoes, wine, yams and others, provided it is foreseeable that this research will be accompanied by clear innovations and long-term prospects for utilization up to market maturity or use by end users.

### 2.3.3 Module C: Junior research groups; target group: post-docs

Funding of a post-doctoral project leadership position in conjunction with a research team comprising up to two doctoral candidates and a technical assistant as part of an individual project. This research team, which will operate on a separate budget, will be thematically

associated to a collaboration funded under A or B and will be expected to contribute directly to its research objectives. The application-oriented research should be highly innovative and should involve a share of basic research where required. The highly qualified project leaders should have received their doctorates within the past five years. Applications are also particularly welcome from post-docs who would like to resume their careers following extended periods of maternity, parental or care-giving leave.

#### 2.3.4 Supplementary element: promotion of young research talent; target group: doctoral candidates

*[Applications for funding under the 'supplementary element' are conditional upon participation in one of the projects funded within modules A, B or C; funds for individual measures (including research stays) should be applied for prospectively under these projects by the responsible project leaders.]*

Key activities for training soft skills and establishing contact with industry mentors (support and organization through the accompanying science communication mechanism) as well as for research stays (within the respective collaboration or at other national or international locations) for technology skills development (for example in the field of bioinformatics) are eligible for funding. Furthermore, regular meetings of the doctoral candidates supported in this module are planned in the form of postgraduate seminars ("Graduiertenkolloquien") including exchanges of experience and visits to relevant companies (to be organized through the accompanying science communication mechanism). Prior to the submission of applications, project leaders with project proposals in the funding modules A, B or C should consider whether they intend to employ doctoral candidates to help carry out their projects and if these are to participate in the above-mentioned activities. Following a positive evaluation of the project outline, the project management organization must be contacted in the course of the formal submission process regarding questions about concrete budget planning. The project outline must document the intention to participate in this module and give reasons for the need for funding.

#### 2.4 Duration of funding

An excellence-driven multi-phase programme consisting of up to two successive funding phases of four years each will be employed. Thus, project outlines can be submitted for collaborative projects in modules A and B with a prospective maximum funding duration of eight years setting out achievable interim objectives to be completed after the first four years as well as plans for long-term milestones (to be achieved after eight years). Thus, each funding phase lasts no more than four years. A single funding phase lasting four years is also planned for module C. Before the expiry of each four-year period of funding, an interim evaluation will decide whether approval may be given to proceed to the next funding phase. In this process, the projects funded in the first round will be in direct competition with one another because the number of funded projects will be reduced going into the second funding round.

[...]

#### 7.2 Two-phase application procedure

The application procedure consists of two phases.

##### 7.2.1 Submission and selection of project outlines

In the first application phase, project outlines must be submitted electronically in English to Project Management Jülich by 31 January 2024 at the latest.

Project outlines for collaborative projects must be submitted in consultation with the proposed collaboration coordinator. Project outlines for module C must be drawn up and submitted by the post-docs themselves – following consultation with the prospective host research institution.

The deadline for submission is not a cut-off deadline. However, it may not be possible to consider project outlines received after the above date.

It is recommended that applicants contact the responsible project management organization before drawing up the project outline.

The input screen at the "easy-Online" site is used only to enter the project outline's core details. The detailed description of the project is to be attached to the application as a PDF file when submitting the final version. Detailed descriptions are to be formatted using the "Arial" typeface with font size 10 and line spacing of 1.5 with the following structure (where there are no alternative input screens for this purpose). The structure set out below (a to k) is mandatory. The outline must also be preceded by a table of contents:

- (a) Title page with the name of the collaborative or individual project, its acronym (max. 15 characters), the chosen research topics (see 2.1 a-e), the chosen funding module as well as the participating applicants (including the addresses of applicant institutions, the names of the project leaders with office postal addresses, telephone and fax numbers and e-mail addresses)
- (b) Summary (general aims, work plan and expected results in brief; max. one A4 page)
- (c) Scientific background and current status of research and technology (also with regard to the patent situation; novelty of the approach; including previous work by the applicant, where applicable with previous work in relevant BMBF funding activities; max. three A4 pages)
- (d) Project goals (overall goals of the project, relevance of the project to the funding objectives or funding topics stated in section 2; scientific and/or technical objectives; max. two A4 pages)
- (e) Project description (description of own research approach with particular focus on novelty and originality (max. two A4 pages)
- (f) Structure of the overall collaboration (diagram; max. one A4 page; does not apply in the case of individual projects)
- (g) Work plan (where applicable, work packages must be assigned to individual collaboration partners and tied to planned personnel and material resources; where applicable, discussion of the risks inherent to the project that could endanger the planned course of the project; in accordance with the principles of risk management, alternative solutions must also be stated together with their advantages and disadvantages; max. three A4 pages per collaboration partner)
- (h) Division of tasks and cooperation with third parties (project organization or project management/coordination; max. one A4 page)
- (i) Gantt chart of the overall collaboration (graphic overview; max. one A4 page; does not apply in the case of individual projects)
- (j) Provisional financial plan of the collaborative or individual project (tabular overview; please note: the costs of basic equipment are not eligible for funding; max. one A4 page)
- (k) Potential for application and plan for possible exploitation (structured in three parts: (i) economic and (ii) scientific prospects of success and (iii) potential for scientific and economic



follow-up, i.e. how and in what ways the results can be utilized after conclusion of the project; max. two A4 pages)

The following must be added as an annex:

- Description of the project partners (max. two A4 pages per partner): participating partners from science and industry together with their areas of expertise (e.g. by means of a brief CV in tabular form of the responsible project leader of each of the co-applicants; up to five important publications by each co-applicant (project leader) of relevance to the proposed project)

A legal claim to funding cannot be derived from the submission of a project outline.

The project outlines received will be evaluated by a panel of experts based on the following criteria:

- Relevance and contribution of the project proposal towards achieving or addressing the above-mentioned funding objectives or funding topics;
- Scientific and technical quality of the project (e.g. topicality, originality, inter- or transdisciplinarity)
- Performance of the project participants (particularly with regard to ideas and implementation potential, infrastructure, national and international competitiveness, etc.)
- Extent, intensity and, above all, quality of the planned cooperation between the individual partners and estimation of the added value of collaboration, also with regard to envisaged synergy effects
- Feasibility of the project (suitability of the methods, the amount of time needed and the envisaged resources; effectiveness and efficiency of the proposed project organization and coordination)
- Significance of the plan for the utilization of the expected results and their potential for application
- Plausibility and suitability of the financial planning (taking into account the distribution of risks among the applicant companies, project partners and the public sector)

Suitable project ideas will be selected for funding on the basis of the above criteria and evaluation. Applicants will be informed in writing of the result of the selection.

#### 7.2.2 Submission of formal applications and decision-making procedure

In the second phase of the procedure, the applicants whose project outlines have been given a positive evaluation will be invited to submit formal proposals. Funding applications for collaborative projects must be submitted in consultation with the envisaged collaboration coordinator.

An application for funding is only considered complete if at least the requirements of Article 6 (2) GBER (cf. Annex to these funding regulations) are fulfilled.

The detailed project description to be submitted with the formal proposal must include the following information which is supplementary to the project outline. Any comments of the evaluation panel must be taken into account:

- Detailed financial plan of the collaborative or individual project (please note: the costs of basic equipment are not eligible for funding)

- Detailed work plan (including planning of resources related to the project, i.e. where applicable, work packages must be assigned to individual collaboration partners and tied to calculated personnel and material resources)
- Milestones including list of envisaged (interim) results (deliverables) and statement of criteria for discontinuation (tabular overview; max. one A4 page)
- Detailed plan for exploitation (structured in three parts: (i) economic prospects of success [short, medium, long-term]; (ii) scientific and/or technical prospects of success [short, medium, long-term]; (iii) potential for scientific and economic follow-up, i.e. how and in what ways the results can be utilized after conclusion of the project; max. two A4 pages]
- Presentation of reasons for the funding requirement (please note: The need for funding must be evident in the work plan and include detailed reasons; in the case of international partnerships, reasons must be included for the necessity of the involvement of the foreign partner and the added value thereof)
- Submission of a concrete timetable for the realization of a cooperation agreement within a short period of time, (including date of: first consortium meeting [prior to the start of the project period]; date of: draft agreement [prior to the start of the project period])

The proposals received will be reviewed and evaluated according to the following criteria:

- Eligibility for funding (including in respect of section 5 of these regulations);
- Necessity and appropriateness of requested funding;
- Plausibility of the explanations regarding the financial plan;
- Quality and meaningfulness of the utilization plan, also with regard to the funding objectives of these regulations;
- Fulfilment of any requirements resulting from the first evaluation phase and compliance with the recommended financial framework.

After final consideration of the application, a funding decision will be taken on the basis of the above criteria and evaluation.

[...]