

Announcement
by the Federal Ministry of Education and Research
of Guidelines for the Funding of
Research Projects in the Field of

"Soil as a Sustainable Resource for the Bioeconomy – BonaRes"

as part of the National Research Strategy BioEconomy 2030

of 17 July 2013

Funding purpose, legal basis

Funding purpose

The Earth is currently home to approximately seven billion people. This figure is likely to rise by at least two billion over the next 30 to 40 years. There is no indication at present of any significant reversal of trend in the predicted population growth. An area of approximately 5 billion hectares of agricultural land is currently available for the production of food, both vegetable and animal. Because the proportion of land available for conversion to agricultural use is very small, it is vital that land-use productivity is increased to safeguard world food supplies. The problem will be compounded by the expected increase in extreme weather patterns due to climate change and increasing competition between different uses of vegetable biomass (e.g. for food, animal feed, raw materials and energy).

Productive ("fertile") soils are the central resource for the production of vegetable biomass and thus of food. Soils are formed in lengthy processes (pedogenesis) and thus cannot be recreated or replaced quickly. At the same time, land that is used for agriculture is a bioeconomic production factor whose long-term economic productivity must be safeguarded. This is the only way to ensure security of supply for all the uses of vegetable biomass. Agricultural land not only produces marketable biomass yields but also so-called ecosystem services which until now were difficult to assess in financial terms. These services include for example the capacity to store water and the function of soils as carbon stores, which both have a direct impact on climate change. Against this background, it is necessary to permanently protect and improve the productivity of agricultural land. This means performing, supplementing and validating the necessary basic scientific research in order to develop measures that are adapted to the specific location and will have a sustainable impact.

The funding measure "**Soil as a Sustainable Resource for the Bioeconomy – BonaRes**" is an initiative of the Federal Ministry of Education and Research (BMBF) under the "National Research Strategy BioEconomy 2030". The goal of sustainable soil use is firmly established in a variety of ways in the National Research Strategy BioEconomy 2030, which was launched by the Federal Government in 2010. The strategy attaches special importance to an integrated approach in which the various environmental compartments (water bodies, atmosphere, soil and bedrock as well as surface and subterranean biocoenosis) are regarded as a single system. Greater emphasis is to be placed on this systemic approach in future research activities. BonaRes will focus mainly on national research in the expectation that promising new solutions can increasingly also be adapted to meet the needs of other parts of the world.

In the context of producing sustainable supplies of food and animal feed as well as raw materials for energy and industrial uses, the BonaRes research funding is intended to

provide a decisive contribution to increasing knowledge about the functionality of those soils that are used for agricultural production. One major focus is to be on understanding the significance of biotic soil factors because there is a considerable shortfall in knowledge in this area. The aim is to use interdisciplinary research approaches and the application or development of modern methodologies to arrive at valid conclusions about the complex functioning of soil. The results gained should make it possible to formulate reliable options for action to achieve sustainable soil use. These must include clear requirements for the management of the soil specific to a given location, whose implementation can be expected to improve or at least retain soil fertility in the long-term.

However, when viewing the soil as a system one must also consider its interaction in the social and economic context. On the one hand, soil use is determined by natural framework conditions. On the other hand, the social and economic context of farming has an impact on the natural environment. In view of this linking of biological, societal and economic systems, research funded under BonaRes must take account of both scientific-technical and socio-economic aspects.

The focus is therefore on a systemic research approach in which various perspectives of soil sciences, which explicitly also involve the social sciences, are brought together to form an overall picture of the system. Economic activities aimed at utilizing natural soils will be viewed with regard to their complementarity and potential conflicts, and these findings will be integrated in the process of innovation. In this way, one can expect an important contribution to the sustainable balancing of interests between economy and ecology. It will only be possible to ensure the security of vegetable biomass supply for all usages on a lasting basis by reaching the broadest possible consensus of all stakeholder groups, both in Germany and around the world, on the goal of the sustainable management of soils and on the processes of bio-economic farming.

Object of funding

Scientific objectives and thematic demarcation

The research to be funded under BonaRes will pursue the aim of permanently safeguarding or if possible increasing the productivity and yields of the soil as a natural resource. Research projects will be initiated for soils that are used intensively or extensively for agricultural or horticultural purposes. Soils that are used for permanent grassland can also be considered. Forestry land, moors and all other land types will not be considered.

The proposals for research projects should aim for the sustainable retention or increase in bio-economic productivity, i.e. they should focus on the crop-specific quality of the location of cultivated soils while taking account of future challenges associated with global changes. Interdisciplinary competences need to be pooled or networked in order to achieve this goal. A medium-term aim is to employ modelling approaches to provide a system that will offer various options for action to farmers and other users of the soil, taking account of sustainability requirements. This primary goal will comprise the following subsidiary goals within the framework of this announcement:

- **Optimization of soil functions**

The precondition for the comprehensive assessment of soils and their productivity is a well-founded understanding of complex biotic and abiotic soil processes as well as of changes that they undergo over time. Work carried out under BonaRes is expected to significantly increase the understanding of how soil functions, paying special attention to soil biocoenosis and its interaction with crops and their environment. This is to be done with a view to identifying starting points for measures and products that

will lead to the optimization of soil functions and an associated increase in sustainable productivity.

- **Efficient management of water and nutrient utilization**

In addition to the soil, water and mineral nutrients such as phosphate are resources with limited availability. The aim of future agricultural production must therefore be to use water and nutrients in a way that is efficient for the particular location as well as if possible, to close small and large-scale nutrient cycles. At the same time, it must be ensured that the soil functions are preserved in all parameters. Research activities under BonaRes will be expected to provide substantial contributions (procedures, technologies, products) to achieving this goal.

- **Optimizing farming strategies and soil use management**

Soil productivity strongly depends on farming strategies and soil use management. In future, priority is to be given to preserving and improving soil fertility. This is now in the public interest more ever before. In addition to scientific and technical developments to optimize systems of cultivation, solutions are to be developed that will reconcile this priority with the profitability of farming as well as with a broad public acceptance of the measures proposed.

The BonaRes funding measure is divided into modules A and B.

Module A comprises targeted contributions to the listed thematic fields within the framework of **interdisciplinary research collaborations**. Support will be provided for collaborative research projects that can be expected to provide substantial contributions to the stated scientific aims. Individual projects will not be considered for funding. With regard to the development of solutions, special importance is attached to the consideration and re-evaluation of results from long-term agronomic field experiments. It is therefore desired that institutions which run long-term field experiments are integrated into collaborative research alliances. The test areas should be integrated into the research activity and long-term monitoring developed methodically.

The development of models and expert systems requires the establishment of a central institution for BonaRes ("**BonaRes-Zentrum** "). This will be undertaken within the framework of **Module B**. The main task here is the implementation of a central database for soil sciences, where soil research data will be collated. Coordination tasks for BonaRes will also be undertaken within Module B. Proposals for Module B will be admitted from both individual entities and collaborations.

BonaRes aims to provide medium to long-term funding. The overall project plan for Module A can involve a duration of up to nine years. Successful project applications will be awarded an initial grant for a period of three years. Where a project is planned for a longer duration funding may be extended by up to three years on up to two occasions. For this reason, project milestones must be clearly defined. The renewal of funding will require, among other things, a positive expert opinion following evaluations at each funding stage. After three or six years, it will be examined whether further research collaborations should be called upon to submit project proposals in Module A. The latter's overall duration may not, however, exceed six or three years respectively.

For Module B, the overall project plan must cover nine years. As with Module A, an initial grant will be awarded for a period of three years. The funding may be extended by up to three years on up to two occasions. Again like in Module A, the renewal of funding will also require, among other things, a positive expert opinion following the intermediate evaluation.

Further details are given in section 2.2. below.

In order to achieve the above-mentioned BonaRes goals, **computer-aided models** are to be developed to formulate knowledge-based **options** for soil management. These models will focus on the description and prognosis of functional processes in soils. The task for socio-economic research is in particular to assess the soil management options derived from the computer-assisted models in the socio-economic context specific to the location. This means that the social processes and interactions between ecological, economic and social systems that can be modelled will be integrated and the feasibility of the soil management options examined in the respective contexts. A web portal will be available at the end of the BonaRes funding to provide support for sustainable soil management.

Essentially, three levels of action can be derived from these goals:

First level of action

Central compilation of standardized data from all the BonaRes research activities (Modules A and B), from long-term field experiments and, where applicable, from further external sources; including the development and implementation of access hierarchies. This level of action will be assigned to Module B (see 2.2).

Second level of action

Formulation of validated explanatory models for the soil system and its interactions and also for appropriately demarcated sub-systems such as the rhizosphere. The desired modelling is explicitly not restricted to scientific aspects but will also incorporate socio-economic approaches. This level is assigned to both modules. Module B will be responsible for ensuring the necessary compatibility of different developments.

Third level of action

Formulation of reliable, software-based options for practical soil management. This expert software is expected to be available at the end of the project both to the direct users of soils and to political and administrative decision-makers. The options must be offered via a central web portal to be established under Module B

Thematic demarcation of Modules A and B.

Module A - Interdisciplinary research collaborations

Module A will fund collaborative projects which are integrative and based on a division of labour as well as providing an important contribution to the goals stated in 2.1: Optimization of soil functions, efficient management of water and nutrient utilization, and optimization of farming strategies and soil use management. One partner in each of the collaborations must act as the coordinator. Applications for funding may be submitted for projects relating to the following thematic fields within the framework of the primary goals:

- Function and interaction of ecosystems in the soil, particularly in the rhizosphere
- Significance of biodiversity for the functioning of soil ecosystems
- Computer modelling of soil functions, taking particular account of historical data from long-term field experiments
- Wide-scale and preferably minimally invasive monitoring of highly correlated indicators for soil characteristics as a basis for modelling
- Significance of fertilizer types and water balance for the functioning of soil ecosystems
- Nutrient efficiency and microbial nutrients, nutrient cycles
- Organic carbon: Taking stock, optimization, stabilization; socio-economic assessment in the context of competing uses (for example crop residues)

- Assessment of crop cycles and biomass extraction with regard to preserving soil fertility
- Assessment of the soil's services for the ecosystem at the levels of both farms and the overall economy.
- Soil use management: knowledge-based and site-specific lists of measures, particularly with regard to the upgrading of marginal locations
- Analysis of societal acceptance of innovative soil management measures
- Development of strategies to achieve a sustainable balance between divergent interests

Further topics can be proposed provided that they are relevant to the primary scientific objectives of the funding.

A selection of relevant scientific subject areas cover the study of soil or general soil sciences, soil biology, crop cultivation, crop nutrition, the technology of soil processing including soil diagnosis and biometry. As stated above, BonaRes explicitly aims to include socio-economics. The above list is not exhaustive and may be extended in line with the given topics.

Very long field trials have been or are still being conducted at various locations in Germany. The consequences of different agricultural treatments over time have been or are still being studied and documented. These so-called long-term field experiments have a special role to play in connection with BonaRes. Changes in the soil – including changes caused by human action – only take place over long periods of time. Experiments that are currently being conducted to study the influence of different soil treatments can only provide reliable information in the medium to long term. Such long-term changes can already be deduced from the data that is already available from long-term field experiments. However, the scientific questions and thus the structure of the data produced were very different in the past from what they are today. The aim now is to develop innovative ideas that can help overcome this discrepancy. The operators of long-term field experiments are explicitly called upon to contribute their expertise to the collaborations under Module A.

The research collaborations funded under Module A are expected to be of an interdisciplinary and cross-cutting nature. The project proposals should demonstrate a perspective that shows the relevance of the research results for subsequent practical applications. Great significance is placed on the participation of socio-economic institutions and the operators of long-term field experiments in research collaborations. The involvement of commercial enterprises, in particular agricultural enterprises, will also be regarded positively. As part of their applications, all collaboration partners must declare their willingness to provide data that arises in the course of the project to the BonaRes-Zentrum, while retaining their right of first use (cf. Module B). This must be done in a standardized form. Responsibility for the development of standards will be assigned to the BonaRes-Zentrum. In addition, collaborations funded in Module A will be obliged to cooperate with the central secretariat located at the BonaRes-Zentrum.

Module B – BonaRes-Zentrum

The BonaRes-Zentrum will fulfil tasks in two main areas:

1. Administrative:
Coordination and communication
2. Scientific:
Central database, modelling and creation of a web portal for soil management options

Coordination and communication

The BonaRes-Zentrum will perform coordination tasks to achieve considerable visibility in the scientific and public domains with the aim of promoting the understanding of the soil as an essential resource for the bio-economy. In addition, it must also perform internal coordination tasks for BonaRes. The project outline must therefore include the following:

- Establishment and operation of a **central secretariat** for BonaRes with the following duties:
 - a) Public relations work with the goal of highlighting the importance of the soil for the bio-economy.
 - b) Development and operation of a website (www.bonares.de) for the presentation of BonaRes
 - c) Development and servicing the needs of an advisory board at project leader level for scientific coordination within BonaRes activities (Modules A and B)
 - d) Organization of annual state of scientific progress seminars.
 - e) Establishment of a national platform for national and international networking activities of BonaRes; in particular, this should also depict the planned inclusion of complementary activities.

Specialist partners (including companies) may be proposed as sub-contractors to perform specialized services such as the creation and operation of websites.

Central database and modelling

The following sub-tasks are assigned to this task area:

- Implementation and maintenance of a **database** with three areas of content:
 - a) Collation of existing data from long-term field experiments in a up-to-date form
 - b) Storage of the data produced under BonaRes
 - c) Integration of other external data (national and international)
- Lead responsibility for the formulation of **data standards** within BonaRes. This involves the recruitment of an international body of scientists with an advisory function to ensure the broad acceptance and high degree of international compatibility of the chosen conventions.
- Establishment of a "**modelling group**":
 - a) Development of functional soil models on the basis of the available data taking account of existing models.
 - b) Coordination of modelling activities assigned to Module A in order to avoid problems of compatibility
- Development of a **web-based portal** for knowledge-based options for farming strategies and soil use management on the basis of models

It will be the task of the operators of the database in the BonaRes-Zentrum to file and store the data that arises under BonaRes in Modules A and B on a long-term basis and to ensure access. The database will also have to ensure first-use rights for the authors of data via appropriate access hierarchies. All the collaborative partners who receive funding in the course of BonaRes will be required to make processed data available. Furthermore, it is intended that additional data from a variety of national and international sources be integrated into the database. Module B also includes responsibility for agreeing and setting standards for the collection of the data and its filing in the database that will enjoy the broadest possible international acceptance.

As already mentioned, great importance is attached to data from the long-term field experiments. It will therefore be the task of the BonaRes-Zentrum to process the available historical data and – where this has not yet happened – to undertake its conversion to an up-

to-date electronic form. The data collections are to be integrated into the database. Here too appropriate consideration must also be given to the holders of the rights to these collections. Where necessary, any costs to the operators of long-term field experiments can be defrayed via sub-contracts.

Outline proposals for Module B may be submitted by individual research institutions or by collaborations. An overall concept must be submitted setting out how the applicant intends to fulfil the requirements mentioned over the course of nine years. As with Module A, an initial three-year funding phase is envisaged for Module B, which can be extended on two occasions by three years each, following interim evaluations. The interim evaluations will serve to identify any need for modifications that may arise. The overall concept must, however, contain a convincing long-term perspective for the implementation of the described tasks right from the outset. The need for BonaRes to enjoy lasting public visibility and for the central database to be continuously available has already been stated several times. Institutions submitting applications must therefore provide a plausible description within their written overall concept of how the operation of the database can be sustained beyond the end of the funding phase. Ideally, this should be in the form of a business plan which explains how the existence of the BonaRes-Zentrum is to be ensured beyond the end of the funding phase.

Communication and formation of collaborative alliances

One of the goals of BonaRes is to trigger completely new forms of collaboration between very diverse actors. An internet platform will be established and an information event will be held to help potential collaborative partners come together and to thus facilitate the formation of new interdisciplinary research collaborations. These instruments are intended to help bring about agreement on the content of a research proposal prior to submission and to ensure the most effective pooling of research activities in order to achieve the best possible use of the available funding across the range of thematic fields that have been set out.

Recipients of funding

The following are eligible for funding in Module A: Universities, non-university research institutions, *Land* and federal institutions with research responsibilities as well as commercial companies based in Germany, particularly small and medium-sized enterprises (in accordance with the EU definition of SMEs¹). Agricultural enterprises are expressly called upon to participate in research collaborations, including as sub-contractors, so that the practical relevance of the research can be documented right from the start.

The same types of research institutions are eligible for funding in Module B as under Module A. However, commercial enterprises are excluded from eligibility for this module.

Research institutions which receive joint basic funding from the Federal Government and the *Länder* can only be granted project funding for their additional expenditure under certain conditions.

Collaborations involving foreign academic institutions and companies are possible. Project partners that are based outside of Germany can only participate in research and development projects under the following conditions:

¹ http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm

- The commercial exploitation of the results of the German collaboration partners must occur primarily in Germany.
- The foreign project partners finance their part of the project from their own funds or receive funding for the project in their own country.

Sub-contracts may be awarded abroad. In such cases, however, evidence must be provided that no suitable German partner is available and that the majority of the research and development work will be performed by the German funding recipient.

Procedure

Involvement of a project management organization and required documents

The Federal Ministry of Education and Research has commissioned the following project management organization with implementing the funding activity:

Projekträger Jülich (PtJ)
Geschäftsbereich Biologische Innovation und Ökonomie (BIO)
Fachbereich Agrarforschung & Ernährung (BIO 6)
Forschungszentrum Jülich GmbH
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Submission and selection of project outlines

In the first stage, project outlines must be submitted in electronic form **in English** to the project management organization (Projekträger Jülich) using the "easy-Online" electronic form system for applications and bids (<https://foerderportal.bund.de/easyonline>).

The deadline for the submission of project outlines is **31 January 2014**. The deadline for submissions is not a cut-off deadline. However, it may not be possible to consider project outlines received belatedly.

Project outlines for Module A are to be submitted by the relevant coordinator for the whole collaboration alliance. They are to be formatted using "Arial" 10, 1.5 line spacing with the following structure where there are no input screens.

- Summary (general aims, work plan and expected results in brief; max. one A4 page)
- Structure of the overall collaboration alliance (in tabular or graphic form)

- Financial plan of the overall collaboration (tabular overview)
- Scientific background and current status of research and technology (max. three A4 pages)
- Description of own research approach with particular focus on new and original aspects (max. two A4 pages)
- Work aims (max. one A4 page)
- Detailed work plan (work packages must be assigned to individual partners and tied to calculated personnel and material resources, max. 8 A4 pages)
- Bar chart of the overall collaboration with milestones and list of intended results (deliverables), each in the form of a summary table
- Utilization plan: Forecasts about the practical applicability of the results and market potential (where applicable) and the joint utilization of the results both inside and outside the collaboration (max. two A4 pages)
- Brief description of the collaboration partners: In the case of companies, a description of their planned contributions to the project (max. half an A4 page per partner)
- Brief CVs of the project leaders of the collaboration partners including list of five recent publications (max. one A4 page per project leader)
- Where applicable, brief description of current projects being carried out by each collaboration partner in the thematic area (names of the relevant funding providers, funding amounts and possible thematic links with the project outline; max. half an A4 page per collaboration partner)

Project outlines for Module B must also follow this structure and are additionally expected to pay suitable attention to the requirements set out under 2.2. The total length must not exceed 60 A4 pages.

Applications must be self-explanatory and allow evaluation without further information or inquiry.

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

The evaluation of the project outlines received will involve external experts and will be based on the following criteria:

- Scientific quality (topicality, originality), innovativeness and solidity of the project.
- Feasibility of the project (suitability of the methods, the timetable and the resources and funding applied for)
- Significance for the research policy goals of the funding regulations with regard to:
 - Sustainability of agriculture / bio-economy
 - Relevance to the thematic fields
 - Expected contribution to achieving the stated aims
 - Potential for a sustainable increase in the productivity of utilized soils
 - Potential to formulate knowledge-based options
 - Contribution to the networking of science and applications
 - Contribution to increasing the interdisciplinarity of soil research
- Significance of the expected results for future practical applications (economic innovative potential, general market potential, quality of the exploitation plan)

Project ideas which are suitable for funding will be selected on the basis of the evaluation. Applicants will be informed in writing of the results of the selection procedure.