



Announcement of Opportunity for the Soil Security research programme: Consortia Awards

Call published: 30 April 2014

Closing date for full proposals: 30 July 2014, 16:00 BST

*This Announcement of Opportunity should be read in conjunction with:
The Soil Security Theme Action Plan*

<http://www.nerc.ac.uk/research/funded/programmes/soilsecurity/tap4-sunr-soil.pdf>

Please note that this Announcement of Opportunity is the basis on which proposals will be assessed.

Summary

On behalf of the Soil Security programme funders, the Natural Environment Research Council (NERC) is inviting proposals for consortia projects typically costing between £1m and £2.5m (80% FEC), and of up to three years' duration, which will address the objectives of the programme as stated in this document. It is expected 2-4 projects will be supported from this call, depending on the size of the projects. Funding of up to £5m (NERC £4m, BBSRC £0.5m, Scottish Government up to £0.5m) is available to support projects submitted to this call, subject to the quality of proposals received. The funding available from the Scottish Government is primarily to support the costs of the participation in joint proposals of its Main Research Providers for rural affairs and the environment, which are not eligible for Research Council funding¹.

The Soil Security programme is a NERC-led five-year research programme funded by NERC, the Biotechnology and Biological Sciences Research Council (BBSRC) and the Scottish Government that aims to secure future soil quality to sustain ecosystems and the services they deliver to people – such as sustainable agriculture, flood and disease regulation, carbon storage and clean water. The Soil Security programme is aligned with the Global Food Security (GFS) Programme, and with Defra activities in this area. The programme is administered by NERC on behalf of the funders.

The overarching aim of the Soil Security programme is to advance understanding of the ability of soils to adapt to perturbations through an integrated and predictive understanding of the multiple functions of soil and through which to deliver improved forecasts of the response of the soil system to changes in climate, vegetation or land management at scales of analysis which match the scale of decision making.

¹ Biomathematics and Statistics Scotland ; The James Hutton Institute and the Moredun Research Institute .

Background

Soil systems are essential to the delivery of many ecosystem services upon which societies depend, including those that are crucial to food security, climate mitigation, water and nutrient cycling. They are highly complex systems that involve multiple physical, chemical, and biological processes; these interact to regulate the soil's functioning, and its ability to resist and recover from perturbations, such as drought.²

These controls on soil functioning, and their response to perturbations, are likely to vary across different spatial and temporal scales,³ and across different soil conditions and land types; in other words they are highly scale and context dependent.

Soils are extremely heterogeneous and not all soils can fulfil the full spectrum of services required for the future of the UK, so there is a need to protect their multifunctional attributes in order to preserve national and international natural capital. Changes in the way we manage the land surface have resulted in widespread degradation of soils and their ability to deliver ecosystem services. For example, it has been estimated that currently 45% of European soils exhibit very low organic matter contents (0-2% organic C)⁴ and degraded soils cover 15-17% of the world's land surface⁵. Once critical functions are lost they can be irrecoverable, potentially for millennia, representing a loss of resources that is potentially highly detrimental to the UK's national livelihood and well-being⁶.

Despite their importance to mankind, our understanding of what regulates the ability of soils to perform these multiple functions in different contexts and at different spatial scales, ranging from the soil profile to the Earth system scale, is very limited, as is our knowledge of the ability of different soils to adapt and respond to changes in climate and land use.

This represents a significant gap in knowledge given the rapid rate at which soils are being degraded worldwide and the urgent need to inform policy makers and land managers on the sustainable management of soils. The European Commission produced a thematic strategy⁷ on soils in 2006, which included proposals for a Soils Framework Directive, but this has not yet been established. In England, the UK Government has committed to safeguarding soils' ability to provide essential ecosystem services and functions by ensuring that all soils are managed sustainably and degradation threats are tackled before 2030, through the 2011 Natural Environment White paper⁸. The Scottish Government (SG) published the Scottish Soils Framework in 2009, and a State of Scottish Soils report in March 2011. Scottish policy recognises soil as a valuable but vulnerable natural asset, which contributes vital economic and environmental functions and requires sustainable and effective management for the long term. As well as being important in their own right, an understanding of soil processes is essential to underpin policy areas ranging from food production, flood alleviation, water quality, greenhouse gas emissions and biodiversity. In delivering policies to protect soils,

2 De Vries, et al. (2012). Land use alters the resistance and resilience of soil food webs to drought. *Nature Climate Change*, 2, 276–280.

3 Ettema, C. and D. A. Wardle. 2002. Spatial soil ecology. *Trends in Ecology and Evolution*, 17, 177–183.

4 Jones et al. 2012. State of Soil in Europe. JRC Reference Report 80pp.

5 Staring Centrum Instituut voor Onderzoek van het Landelijk Gebied., Oldeman, L. R., United Nations Environment Programme. & International Soil Reference and Information Centre. (UNEP ;ISRIC, Nairobi, Kenya, Wageningen, Netherlands, 1991).

5 Haygarth P.M., Ritz, K, 2009. The future of soils and land use in the UK: Soil systems for the provision of land-based ecosystem services. *Land Use Policy* 265, 187-197.

De Vries, et al. (2012). Land use alters the resistance and resilience of soil food webs to drought. *Nature Climate Change*, 2, 276-280..

4 Ettema, C. and D. A. Wardle. 2002. Spatial soil ecology. *Trends in Ecology and Evolution*, 17, 177-183.

6 Haygarth P.M., Ritz, K, 2009. The future of soils and land use in the UK: Soil systems for the provision of land-based ecosystem services. *Land Use Policy* 265, 187-197.

7 http://ec.europa.eu/environment/soil/index_en.htm

8 <http://www.official-documents.gov.uk/document/cm80/8082/8082.pdf>

there remains a significant challenge to (a) define suitable metrics of sustainability and (b) identify and prioritise appropriate management interventions.

This call forms part of a wider collaborative partnership on soil security developed under GFS, which includes other activities led by BBSRC and Defra. BBSRC is leading the programme 'Soil and Rhizosphere Interactions for Sustainable Agri-ecosystems' (GFS-SARISA⁹) that focuses on the laboratory to field/landscape scale. This NERC-led Soil Security programme will focus on the landscape to earth systems scale. Defra and SG will aim to build on the research findings of the BBSRC and NERC led programmes through linked activities to translate emerging findings for policy and practice.

Scope

The overarching aim of the Soil Security programme is to advance understanding of the ability of soils to adapt to perturbations through an integrated and predictive understanding of the multiple functions of soil and deliver improved forecasts of the response of the soil system to changes in climate, vegetation or land management at scales of analysis which match the scale of decision making.

Through advancing conceptual and mechanistic understanding of the factors that regulate the ability of soils to perform multiple functions in different contexts, and their ability to adapt and respond to perturbations, this programme seeks to gain an integrated and predictive understanding of:

- (i) the ability of soils to perform multiple functions in different contexts and at different scales and
- (ii) the ability of soils and their functions to resist, recover and ultimately adapt, to perturbations, such as those caused by land use or land management changes, and extreme climatic events.

For these goals we need to develop a new fundamental understanding of what governs soils *in situ*; such principles will be relevant to naturally occurring, as well as managed and agricultural, soils. Significant changes in this understanding will come from a more fundamental understanding of responses to stress and what controls the soil's ability to deal with stress.

In terrestrial systems, soils serve a crucial role, connecting the atmosphere and hydrosphere, and acting as a junction where a plethora of functions occur⁵. These functions include: regulating the flow of, and filtering substances from, water; emitting and removing atmospheric gases; nutrient storage and cycling; providing a medium for plant growth; supporting habitats and biodiversity; and providing raw materials. These functions underpin a wide range of ecosystem goods and services that are essential for life, such as: provisioning services (food and non-food crops, feedstocks and water); regulating services (climate regulation, regulation of water quality and supply); and supporting services (e.g. nutrient cycling). The ability of soils to function and contribute to the delivery of ecosystem services is threatened principally by two key drivers of change – climate change (including extreme weather events) and land use change (for agricultural and other purposes). These drivers will affect the delivery of multiple soil functions and ecosystem services, and understanding the interaction and trade-offs of these is key to understanding soil resilience to these perturbations and therefore its management at local and national scales.

Soils can be an important component of our adaptation response to climate change and the services underpinned by soil functions also provide many social and economic benefits. Land management

⁹ <http://www.bbsrc.ac.uk/funding/opportunities/2013/2013-gfs-sarisa.aspx>

choices affecting soil functions can increase or decrease the value of benefits attributable to soils. Therefore it is important to understand these benefits and their value to inform land management practices, both now and for the future.

Soil is a complex matrix of interacting biological, chemical and physical properties. Understanding the multiple functions of soil and its interactions with the wider environment is key to protecting and maintaining our terrestrial ecosystems (including agri-ecosystems) and delivering solutions to the global food security challenge and climate mitigation. Traditionally, however, soil science research has operated largely within the boundaries of biological, chemical and physical disciplines. A key challenge for this programme is therefore to deliver a new multi-disciplinary approach to the study of soil that will need to develop a more holistic understanding of how soils function and their responses to stress.

Understanding the relative importance of soil biology, chemistry and physics at different spatial and temporal scales, and in different contexts (including the natural and managed/farmed environments) will require expertise from the ecological, biological, atmospheric, biogeochemical, hydrological and geological sciences. Adopting a more holistic view will also require an appreciation of the wider value of soil, such as economic value beyond that of food production, and values relevant to society as a whole. Whilst this wider consideration is important to understand the security of our soil, the research focus of this programme should be on the natural sciences.

The programme will also require a multi-scale approach, whereby local field scale understanding of soils functioning is linked to predictive models of soil functions (e.g. nutrient cycling), at the landscape, and potentially Earth systems scale. It will require novel approaches and tools for quantifying the dynamics of soil functions at different spatial scales. Examples could include: molecular tools for studying taxonomic and functional diversity; high temporal resolution measurements of carbon and nutrient fluxes via sensors and stable isotopes; improved soil gas sampling; and in situ visualization of soil structures, roots and soil organisms. Such tools will improve understanding of soil functions and their response to perturbations across a hierarchy of scales and contexts. The programme will require a combination of experimental manipulations, at the field and laboratory scale, established along relevant environmental gradients of management, soil conditions, and climates, combined with modelling in order to fully interrogate soil functions and their controls at different scales and contexts.

Programme requirements

Science

In order to meet the goals of the programme the successful research consortia will be expected to:

- Inform on a suite of soil functions (**excluding** the protection of cultural heritage and archaeology and providing a platform for civil engineering) in an integrated and holistic manner;
- Seek to understand the ability of the soil system to resist and recover from perturbations, thereby defining the limits of their resilience to stress;
- Undertake research at a range of scales, both temporal and spatial (upscaling and downscaling modelling approaches) in order to deliver improved forecasts of soils' response to change, at the scale of decision making;
- Utilise interdisciplinary and multidisciplinary approaches, encompassing expertise from, soil scientists, ecologists, biologists, chemists and physicists, with wider disciplines as appropriate;
- Use and/or develop appropriate novel tools and technologies;

- Build on existing research and infrastructure.

Knowledge exchange and impact

Excellence with impact is a central goal for NERC and all the Research Councils. NERC aims to deliver maximum economic and societal benefits from its investments, to support UK economic competitiveness, to make public services and policy more effective, and to improve people's health and wellbeing. To achieve this we need excellent impact activities, which anticipate and deliver the needs of the ultimate users of our science, whether they are in business, policy, the third-sector, the wider public or other groups. The Research Councils' policy is that grant applicants are responsible for considering how their research can achieve excellence with impact.

An understanding of soil function and response to perturbations has a bearing on a wide range of environmental, economic and societal outcomes (e.g. agriculture, forestry, flood alleviation, water quality, greenhouse gas emissions etc). This programme is likely to generate significant interest from policy and industry audiences. Applicants should consider how they will engage these audiences and translate the outputs of their work to make it relevant to them, for example by informing new soil management interventions, or the development of metrics as indicators of soils functions and health.

Whilst NERC does not expect applicants to be able to predict the economic and societal impact of their research, NERC does expect applicants to have explored the following from the outset:

1. Who could potentially benefit from the proposed research over different timescales?
2. How might the potential beneficiaries benefit?
3. What will be done during and after the project to increase the likelihood of the research reaching the identified beneficiaries and maximise the likelihood of the identified benefits being achieved?

Pathways to Impact activities do not have to be cost-incurring; it is not a requirement to include funded activities. However funds requested to carry out any proposed, outcome-driven activities identified within the Pathways to Impact statement **must** be fully justified within the Justification of Resources statement.

Pathways to Impact submissions will be assessed but they are not used in proposal ranking; however research grants will not be allowed to start without an acceptable Pathways to Impact statement. Applicants are advised to read the guidance on the NERC website for further information <http://www.nerc.ac.uk/funding/application/howtoapply/pathwaystoimpact/>

A programme-wide Impact Strategy will be developed, and applicants will be expected to work with the Programme Coordinator and Programme Executive Board, to maximise the impact of the programme as a whole.

Data management

NERC believes that data generated from the research it funds are a valuable long-term public-good resource. To ensure the data can be fully exploited in support of the activities that they were collected for, and to enable them to be available for effective, longer-term post-programme exploitation, it is NERC's policy that data must be managed effectively from the time of generation onwards. NERC grant-holders must offer to lodge a copy of the data resulting from the supported

research with the relevant NERC Data Centre (in this case most likely the EIDC Data Centre) when it is completed, together with documentation/metadata describing these data.

Applicants are required to submit an outline data management plan as part of the case for support, to identify the data sets likely to be made available to NERC Data Centres for archiving and reuse at the end of the grant. Guidance on completing this is available at:

<http://www.nerc.ac.uk/research/sites/data/dmp/>

There will be no charge to the project for a NERC Data Centre to accept and manage the agreed data sets at the end of the grant. Any in-project data management activities should, however, be costed and clearly identified within the proposal.

There will be a programme-wide Data Management Plan developed, with which the projects will be expected to comply.

Programme governance and reporting

NERC Swindon Office, on behalf of the funders, retains the overall executive authority for the governance and management of the programme. It will be responsible for:

- the overall Research Programme budget, including the high-level budget management and allocation of resources, e.g. profiling of funds within the programme budget and awards for research and funds for procurement of services
- commissioning, delivery and management of key funding opportunities, including authorisation of funding decisions, issuance of awards, post-award administration and payments, and award completion.

The Programme Executive Board (PEB) is chaired by the NERC Head of Terrestrial Sciences, and will include representatives from the other programme funders and relevant users/stakeholders as required. The PEB will provide the strategic direction for the programme and will be the ultimate decision-making authority.

The Programme Coordinator will: lead and coordinate activities within the Soil Security programme and link and develop synergies with SARISA and other relevant initiatives of the funders; facilitate two-way knowledge exchange between researchers and policy/practitioner audiences; and maintain an oversight of the funded research activities, ensuring progress in delivery against the programme objectives. The successful projects will be expected to cooperate and work with the Programme Coordinator in order to ensure a successful programme outcome and maximise its impact.

In order for NERC to manage performance against its Strategic Objectives and Delivery Plan and report to the Department for Business, Innovation and Skills (BIS) and NERC Council, suppliers of strategic research are required to report regularly on the outputs and outcomes they have been commissioned to deliver. The Principal Investigator (PI) will be required to submit the following:

- regular reporting on the outputs, outcomes and impacts of the project using the Research Outcomes System (ROS); and

- other reporting as required by the Programme Coordinator and Executive Board, in order to enable them to monitor progress against the programmes objectives, and meet their own institutional reporting responsibilities.

Eligibility and funding

Applicants from organisations eligible for RCUK funding (i.e. UK Higher Education Institutions (HEIs), RCUK Research Institutes and Collaborative Centres, and Independent Research Organisations (IROs) that are eligible to receive NERC or BBSRC Managed Mode funding) may apply for the NERC and BBSRC funding. Please refer to the RCUK website for more information on RCUK eligibility <http://www.rcuk.ac.uk/funding/eligibilityforrcs/>.

Applicants are also referred to the NERC Research Grants Handbook <http://www.nerc.ac.uk/funding/application/howtoapply/forms/> and [the](http://www.bbsrc.ac.uk/funding/apply/grants-guide.aspx) BBSRC Research Grants Guide <http://www.bbsrc.ac.uk/funding/apply/grants-guide.aspx> for details.

Applicants from the following three organisations –Biomathematics and Statistics Scotland; The James Hutton Institute and the Moredun Research Institute are eligible only for the Scottish Government funding and may apply for support up to the £0.5m (80% FEC) provided. Applicants to whom this applies are encouraged to contact Scottish Government to discuss this, prior to submitting their proposal.

All applicants need to be registered or be able to register on RCUK’s Joint Electronic Submission system (Je-S) to be directly named as an applicant on a proposal. In particular, Organisations that are supported by Scottish Government and not normally eligible for RCUK funding, will need to ensure that they start the Je-S registration process as soon as possible, as this can take some time.

Potential applicants should contact NERC Swindon Office using the contact details provided in this document well in advance of the closing date if they have queries concerning their eligibility.

Funding of up to **£5million** (NERC £4m, BBSRC £0.5m, SG £0.5m) (80% FEC) is available for grants of up to 3 years duration, costing between £1m–£2.5m (80% FEC). It is expected that between 2 and 4 grants will be funded from this call.

Application procedure

Submission of proposals

Individuals are limited to involvement in no more than two proposals submitted to this call; only one of these may be as lead Principal Investigator.

Submission of proposals will be via Je-S.¹⁰ The call will be listed under Scheme 'Directed' and Call 'Soil Security Consortia' and will utilise the standard Je-S pro forma. Guidance on the application process, including details of eligible costs, is available in the Research Grants Handbook

¹⁰Grant applications must be submitted using the Research Councils' Joint electronic-Submission system (Je-S). To use this system, the applicant's research organisation must be Je-S registered, see <http://www.nerc.ac.uk/funding/application/> for further details.

(<http://www.nerc.ac.uk/funding/application/howtoapply/forms/>). NERC's normal grant terms and conditions will apply as outlined in the handbook.

The closing date for proposals is 4 pm (BST) 30 July 2014.

Applicants should leave enough time for their proposal to pass through their organisation's Je-S submission route before this date. Any proposal that is received after the closing date, is incomplete, or does not meet the eligibility criteria of this call, will be returned to the applicant and will not be considered.

In addition to the standard Je-S pro forma, applicants will also be expected to provide the following documents:

*All documents should be completed in single-spaced typescript of minimum font size 11 point Arial font, with margins of at least 2 cm. **References must now also be presented in minimum font size 11 point.** Applicants referring to websites should note that referees may choose not to use them.*

1. Case for Support

- a. A common Previous **Track Record** incorporating all the Research Organisations involved (up to **3 sides of A4**).
- b. A common **Description of the Proposed Project** (up to **16 sides of A4**), to include:
 - Underlying rationale, scientific and technological issues to be addressed
 - Specific objectives of the project, including their relevance to the Soil Security programme goals, and anticipated achievements and outputs, including datasets
 - Methodology and approach
 - Risks and mitigation strategies
 - Programme and/or plan of research, evidence of access to required facilities, data, collections
- c. Description of the proposed **Management Structure** and plans, participant responsibilities, and scheduling chart (up to **2 sides of A4**).

2. Outline Data Management Plan (up to 1 side of A4).

The outline data management plan should identify data sets likely to be made available to NERC Environmental Data Centres for archiving and reuse at the end of the grant (guidance available on <http://www.nerc.ac.uk/research/sites/data/dmp/>). Any costs associated with preparation of the data by the investigator's team should be included and clearly identifiable in the grant proposal. The Case for Support for successful proposals will be made available to the appropriate NERC Environmental Data Centre, and where appropriate, used by them to draft, in collaboration with the PI (and consultation with the Programme Coordinator), a full Data Management Plan (DMP) within three months of the start date of the grant.

3. Justification of Resources (up to 4 sides of A4).

This should include justification for all Directly Incurred Costs, Investigator effort, use of pool staff resources, any access to shared facilities and equipment (excluding HPC) being sought. No justification for Directly Allocated Estates and Indirect Costs is required. For HPC no cost estimates are required, but an estimate of the use of HECTOR in Million Allocation Units (MAUs) should be included an application must be attached when use of HECTOR exceeds 100MAU (in any one year).

For all items of equipment costing between £10k (including VAT) and the OJEU threshold value¹¹, but excluding those used for instrument development, the applicants of the proposal will need to provide evidence of an evaluation of the use of existing relevant capital assets.

Additional information will be required for capital equipment costing more than £25k (quotations and involvement of RCUK procurement services) or the OJEU threshold (full business case required); both cost thresholds include VAT. For details of these requirements see http://www.rcuk.ac.uk/RCUK-prod/assets/documents/publications/Equipment_Guidance.pdf

NERC will make best endeavours, but does not expect to be able to fund more than a fraction of any capital equipment. In most cases, the maximum NERC support will be 50%, thus applicants will need to provide evidence of co-support for at least half of capital costs.

4. **Pathways to Impact** (up to **2 sides of A4**).

This should include an outline of:

- Who could potentially benefit from the proposed research over different timescales?
- How might the potential beneficiaries benefit?
- What will be done during and after the project to increase the likelihood of the research reaching the identified beneficiaries and maximise the likelihood of the identified benefits being achieved?

5. **Project Partner Letters of Support** (up to **2 sides of A4 each**). A Letter of Support is required from each named Project Partner. This letter should confirm that the support and facilities required to enable the associated collaborations will be made available. Note that there is a Je-S validation requiring the same number of attachments as Project Partners.

Each component proposal (including the lead) will additionally require the following attachments, where applicable.

- A **CV** (up to 2 sides of A4 each) for each named PI, Co-I, research staff post and visiting researcher.
- **Price quotations** for equipment costing more than £25k
- Where applicable, a **Business Case** of up to 2 sides A4 per item, for items of equipment above the OJEU threshold. Further guidance regarding capital costs can be found in the NERC Grants Handbook.
- **Facility forms** (including aircraft).
PIs wishing to use a NERC facility will need to submit a mandatory 'technical assessment' with their proposal (including aircraft but excluding ships and HPC). For NERC, this means a quote for the work which the facility will provide. A full list of the Facilities requiring this quote can be found here: <http://www.nerc.ac.uk/research/sites/facilities/apply/> in the section 'NERC grant applications involving NERC facilities'.

Please note that 'Other attachments' do not go out to reviewers and should not be used, except for internal documents for NERC.

¹¹ <http://www.ojeu.eu/Thresholds.aspx>

Assessment procedure

Proposals will be subject to international peer review. Final assessment will be by a Moderating Panel of independent experts. Applicants will be given the opportunity to provide a written response to peer review comments prior to the moderating panel meeting.

All proposals will be assessed against the following criteria:

- **Research Excellence:** a proposal that demonstrates excellence can be characterised by terms such as: novel, ambitious, timely, exciting, at the international forefront, adventurous, elegant or transformative, but need not demonstrate all of them.
- **Fit to Programme Objectives:** proposals will be assessed against the extent to which they address the programme's scope and scientific requirements as detailed in this AO.

Further information on assessment criteria can be found on the NERC website at <http://www.nerc.ac.uk/funding/application/assessment/assesscriteria/>.

Pathways to Impact are no longer scored by reviewers and are no longer used as a secondary criterion for ranking proposals. The moderating panel will discuss any reviewer comments on Pathways to Impact plans and any proposals within the funding frame will **not** be allowed to start unless unacceptable Pathways to Impact plans are enhanced to an acceptable level within 2 months of notification of the panel outcome.

The Moderating Panel will make funding recommendations to the Programme Executive Board (PEB) based on the criteria outlined above and the potential for the projects to deliver a balanced portfolio to address the programme objectives. The PEB reserves the right to withhold programme funding if the full extent of the programme objectives are not covered in this call or the balance of funding across recommended projects does not fit the structure of programme funding and its objectives. The PEB also reserves the right to weight *Fit to Programme Objectives* appropriately to achieve the strategic aims of the programme.

Feedback on the successful and unsuccessful proposals will be provided on request.

Call timetable

Announcement of opportunity:	30 April 2014
Deadline for proposals:	30 July 2014
Panel meeting:	November 2014
Grants awarded:	December 2014
Grants start date:	January/February 2015

Contacts

For further information about the programme please contact:

Until 4th July 2014 – Ann Kemp, Tel: 01793 411762, email: soils@nerc.ac.uk.

From 7th July 2014 – Beth Taylor; email: soils@nerc.ac.uk

Scottish Government contact: Liam Kelly, Tel: 0131 2442300 / 07881 282954; email: liam.kelly@scotland.gsi.gov.uk

Further information on the Je-S system can be found on the Je-S website: <https://je-s.rcuk.ac.uk> or be obtained by contacting the Je-S Helpdesk by email at JeSHelp@rcuk.ac.uk or by telephone on 01793 444164.