

Innovations in soil science will grow the solutions to global food security

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A report published by the RSC says that innovative research in soil science will be fundamental in overcoming the growing threat of global food and fuel crop shortages as the world's population continues to increase.

Food security is one of the great global challenges of the 21st century. The [global population](#) grew to seven billion in 2009. By 2050 it is expected to reach over nine billion.

But the world's resources to feed all these people are limited. In 1960, one hectare of land produced enough food to feed two people. By 2050, we will require the same amount of land to feed six people.

One answer to meeting these demands lies on the Earth's surface. Soils will play a central and critical role in delivering enough food and [fuel crops](#) to sustain the increasing global population.

Soils are also critical for ensuring the quality of our food, particularly in the face of inclement weather. A recent report on BBC Farming Today said that nutrients available to plants are reduced during periods of heavy rainfall such as those the UK has experienced recently, because they are leached from the soil.

Securing soils for [sustainable agriculture](#) - a science led strategy - a joint report by the RSC, the University of Sheffield, the Natural Environment Research Council (NERC) and the [Environmental Sustainability](#)

Knowledge Transfer Network (ESKTN) - highlights a number of actions that must be taken to ensure that the UK soil research is at the forefront of technological advances in this area.

The report is the outcome of a research strategy workshop that drew on the collective input of experts from universities, national research centres, industry and government. The event was held as part of a NERC-funded soils research project led by the University of Sheffield, with the University of Leeds and the University of Bristol.

Professor Steve Banwart of the University of Sheffield, who co-authored the report, said: "Our [research consortium](#) has shown how plants and [soil fungi](#) work together to direct the solar energy captured by photosynthesis into the root zone to target and extract specific nutrients from soil minerals.

"Advances like this are paving the way for precision agriculture, where crops and soil are managed together to gain a much more targeted and efficient uptake of nutrients. It's exactly the type of science that the UK can utilise for new agricultural technology that increases production and reduces the demand for energy and chemical inputs to fields."

UK research is well-positioned to support the development of new soil technologies to enable this. The UK has a strong international reputation in [soil science](#) and an unrivalled catalogue of soils data. It is also an important location for research and development and production for a number of multinational agricultural technology companies.

In his speech on science at the Royal Society in November, Chancellor George Osborne highlighted agricultural research as one of eight areas in which he sees the UK as a world leader. In line with the Chancellor's vision, the RSC report makes a number of key recommendations to support and enhance UK soil research.

The report calls for long-term, sustained funding for soil science, and recommends four priority areas around which clear interdisciplinary research can be developed in the near-term to generate new technologies that will increase crop production and reduce resource use:

- biosignalling and sensors for precision monitoring and control of crop conditions
- closed-loop systems for recovering plant nutrients such as phosphorus from waste
- integrated computational models of plant-soil-water to design new crop technologies
- innovation in plant nutrient and water use efficiency to reduce resource demands.

The report also warns against problems that UK soil science may face in the future.

Given the age profile of many of the current research leaders in soil science, the UK could very soon be losing a generation of global experts. This shortage in the skills pipeline could have a significant economic effect, with the possibility that the UK agricultural sector will lose out on opportunities for innovative products and services with the potential to generate revenue in the international market.

Dr Mindy Dulai, RSC Programme Manager for Environmental Science said: "Soil science is fundamental to the global food supply, sustaining the entire food and agriculture sector from farm to fork.

"But it is a difficult discipline and - as the government identified in their 2011 The Future of Food and Farming report - it tends to be neglected with respect to research.

"We need to face this head-on in the UK to make soil science one of our national strengths."

Dr Dulai added: "To achieve this we need more broadly-educated graduate researchers and professionals who will lead innovations in soil science and agricultural technology.

"We need to improve the recognition and reputation of soils security, and promote global agricultural sustainability as a career specialism for highly-talented science students who are currently in further and higher education."

Other recommendations include the need for improved interdisciplinary working between the industrial agricultural sector, higher education institutions, environmental NGOs and government, as well as across the disciplines of chemistry, biology, physics and engineering.

Dr Murray Gardner, NERC's Knowledge & Innovation Manager, said, "With the growing concern for the state of the UK soils for agriculture this comprehensive report adds to a growing body of evidence calling for investment in soil sciences. NERC will continue to work with the research community and appropriate stakeholders to consider how best to address the issues and opportunities raised in this report."

Dr Anne Miller, Associate Director at the ESKTN said: "The ESKTN have been working extensively with the research and business communities to promote wider recognition of the importance of healthy soils as a vital supporting service for human well-being. So we are very pleased that this authoritative report clearly identifies definite actions and projects for funders to take forward and glad to have worked in such an effective partnership with the RSC, NERC and the University of Sheffield and its consortium partners to deliver this."

More information: www.rsc.org/images/081203%20OSCAR%20web_tcm18-222767.pdf

Provided by Royal Society of Chemistry

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