

Research To Improve Photosynthesis For Increased Food And Fuel Production

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Five new research projects announced today (27 September) by the Biotechnology and Biological Sciences Research Council (BBSRC) aim to overcome some of the fundamental limitations of photosynthesis - the process by which plants harvest energy from the sun. This research could lead to major increases in crop yields for food, bioenergy and the production of renewable chemicals.

Just over £2M has been provided for these projects which complement four funded last year via an 'Ideas Lab' in collaboration with the National Science Foundation in the USA.

Together, the nine research projects span the whole photosynthetic pathway, from the shape of the crop canopy and the structure of individual leaves through to light capture at the molecular level and the production and storage of sugars.

The world faces significant challenges in the coming decades, and chief among these are producing enough sustainable and affordable food for a growing population and replacing diminishing fossil fuels. Even a small change to the efficiency of photosynthesis - the process by which plants, algae and some bacteria use the sun's energy to make sugars - could allow for considerably increased yields for food and bioenergy crops and so could make a huge impact on these problems.

Science Minister David Willetts said: "Food security is an important issue for governments and researchers worldwide, and it's great to see UK scientists contributing to such a valuable body of international research. If we can gain a better understanding of the scientific processes underlying food production, we are a significant step closer to being able to support an increasing global population in future."

Biochemist Professor Richard Cogdell FRS from the University of Glasgow acted as a mentor for the Ideas Lab and was a member of the assessment panel for this call for applications. He said "Trying to improve photosynthesis is challenging both scientifically in itself and because it requires the coming together of engineers, physicists, chemists as well as more traditional biologists. The new targeted programme in this area has allowed real innovative, 'out of the box' projects to be explored in a very exciting way."

In one of the projects being funded by this round of grants, Professor Nicholas Smirnov from the University of Exeter is trying to improve a reaction driven by the enzyme Rubisco - widely recognised as a bottleneck in the photosynthetic pathway. He wants to see whether making the cell environment richer in carbon dioxide will allow Rubisco to work more efficiently, in a complementary approach to the Ideas

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Lab projects on the same topic. Working with the photosynthetic bacterium *Synechocystis*, the team plan to test this hypothesis by linking Rubisco to another enzyme that concentrates CO₂. If successful, the idea is to improve Rubisco activity in a similar manner in a range of crops including rice, wheat, potatoes and pulses.

In another project, at the University of Manchester, Dr Giles Johnson is investigating the role of fumaric acid as a temporary carbon store (in addition to starch) in order to prevent the build up of sugar molecules in the leaf that would otherwise inhibit photosynthesis.

Professor Janet Allen, BBSRC Director of Research, said "Improving photosynthesis is a considerable challenge so it is essential that we make the most of expertise in both the UK and the USA. We are encouraging a collaborative approach by holding regular workshops with researchers from all nine projects, in both the UK and US, so that they work together from an early stage.

"This research is ambitious, but if the scientists we are supporting can achieve their aims it will be a profound achievement."

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