New, higher-yielding rice plant could ease threat of hunger for poor

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An ambitious project to re-engineer photosynthesis in rice, led by the International Rice Research Institute (IRRI) through a global consortium of scientists, has received a grant of US$11 million over 3 years from the Bill & Melinda Gates Foundation. As a result of research being conducted by this group, rice plants that can produce 50% more grain using less fertilizer and less water are a step closer to reality.

Currently, more than a billion people worldwide live on less than a dollar a day and nearly one billion live in hunger. Over the next 50 years, the population of the world will increase by about 50% and water scarcity will grow. About half of the world's population consumes rice as a staple cereal, so boosting its productivity is crucial to achieving long-term food security. IRRI is leading the effort to achieve a major increase in global rice production by using modern molecular tools to develop a more efficient and higher-yielding form of rice.

Photosynthesis, the process by which plants use solar energy to capture carbon dioxide and convert it into the carbohydrates required for growth, is not the same for all plants. Some species, including rice, have a mode of photosynthesis (known as C3) in which the capture of carbon dioxide is relatively inefficient. Other plants, such as maize and sorghum, have evolved a much more efficient form of photosynthesis known as C4.

According to IRRI scientist and project leader John Sheehy, in tropical climates the efficiency of solar energy conversion of crops using so-called C4 photosynthesis is about 50% higher than that of C3 crops.

Given the demands from an increasing population, combined with less available land and water, adequate future supplies of rice will need to come in large part through substantial yield boosts and more efficient use of crop inputs.

"Converting the photosynthesis of rice from the less-efficient C3 form to the C4 form would increase yields by 50%," said Dr. Sheehy, adding that C4 rice would also use water twice as efficiently. In developing tropical countries, where billions of poor people rely on rice as their staple food, "The benefits of such an improvement in the face of increasing world population, increasing food prices, and decreasing natural resources would be immense," he said.

"This is a long-term, complex project that will take a decade or more to complete," said Dr. Sheehy. "The result of this strategic research has the potential to benefit billions of poor people."

The C4 Rice Consortium combines the strengths of a range of partners, including molecular biologists, geneticists, physiologists, biochemists, and mathematicians, representing leading research organizations worldwide. Members include Yale, Cornell, Florida, and Washington State universities in the United States; Oxford, Cambridge, Dundee, Nottingham, and Sheffield universities in Britain; the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australian National University, and James Cook University in Australia; Heinrich Heine University and the Institute for Biology in Germany; Jiangsu Academy in China; the University of Toronto in Canada; and the Food and Agriculture Organization of the United Nations.

Source: International Rice Research Institute