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## **On Development of New Golden Rice Strain with Higher Levels of Beta-Carotene**

The Golden Rice Humanitarian Board welcomes the peer reviewed study published in the April issue of *Nature Biotechnology* detailing the development of a new variety of Golden Rice that contains approximately 23 times more beta-carotene or "pro-vitamin A" than the original Golden Rice variety. The human body converts beta-carotene to Vitamin A.

The Board encourages further research to determine how the new variety may play a part in the ongoing global effort to fight vitamin A deficiency in poor countries. Vitamin A deficiency is the leading cause of preventable blindness in children.

According to the World Health Organization, dietary vitamin A deficiency (VAD) causes some 250,000 to 500,000 children to go blind each year. More than half those who lose their sight die within a year. VAD compromises the immune systems of approximately 40 percent of children under five in the developing world, greatly increasing the risk of severe illnesses from common childhood infections. VAD is most severe in Southeast Asia and Africa.

While the large beta-carotene increase in Golden Rice is an exciting advance, it is important to keep in mind that even with elevated levels of vitamin A, Golden Rice is not by itself a solution to malnutrition in developing countries. Malnutrition is rooted in political, economic and cultural issues that cannot be magically resolved by a single agricultural technology. Golden Rice offers developing countries another choice in the broader campaign against malnutrition.

This new development is further evidence that Golden Rice could complement existing efforts that seek to end blindness and other diseases caused by vitamin A deficiency. These other efforts include fortifying basic foodstuff with vitamin A, distributing vitamin A supplements, and increasing consumption of other foods rich in vitamin A. Golden Rice is but one tool in a larger toolbox from which country health officials, farmers and consumers could choose in their efforts to fight vitamin A deficiency.

No new or previous varieties of Golden Rice should be introduced for large-scale planting until independent scientific evaluations and government regulatory

reviews have been conducted in countries where it might be cultivated. .

The new development increases the amount of beta-carotene, a substance found naturally in orange and yellow fruits and vegetables, in the new rice variety by incorporating a gene that produces a safe, naturally occurring enzyme found in corn.

In Asia, the average person eats rice two or three times a day. Three of the world's four most populous countries-China, India and Indonesia, which together have about 2.5 billion people-are considered "rice based societies." Rice also has become a staple food in many African countries. Globally, rice grain is the world's most important source of human food-feeding more than half of the world's population. Rice is a good provider of calories and protein, but rice scientists have long recognized its micronutrient deficiencies. Milled white rice contains essentially no beta-carotene and unmilled brown rice contains a very small amount.

Public rice research institutions in the Philippines, Vietnam, India, Bangladesh, China and Indonesia are in various stages of leading efforts to develop locally adapted Golden Rice varieties.\*

Once locally developed varieties containing the Golden trait have been cleared at the national level for biosafety, they will be made available to subsistence farmers free of charge. The seed will become their property and they will also be able to use part of their harvest for the next sowing, free of cost. Golden Rice is compatible with farmers using traditional farming systems, without the need for additional agronomic inputs. Therefore, no new dependencies will be created. Furthermore, the Golden trait does not pose any known risk to the environment. The Humanitarian Board believes that social acceptance of Golden Rice is an important issue and must be addressed with and by partners in developing countries.

The Humanitarian Board is aware that as a genetically modified organism, Golden Rice will and should be given intensive scrutiny and that it also could be the subject of some controversy. Countries where Golden Rice could provide health benefits should be provided with the opportunity and information to pursue their own independent decision-making process and should not be pressured to either accept or reject Golden Rice.

Reaching the needy in target countries requires a highly professional and interdisciplinary team. For this purpose an honorary Humanitarian Board, composed of internationally recognised experts drawn from reputed institutions, is working closely with local groups in rice-based societies to help provide counsel on the continued discussions about and development of Golden Rice. The Humanitarian Board is chaired by Professor Ingo Potrykus, Professor emeritus, Swiss Federal Institute of Technology, and co-inventor of Golden Rice,

together with Professor Peter Beyer, University of Freiburg.

The Humanitarian Board is further composed of: Dr. Gurdev Khush, who was the principal rice breeder at the International Rice Research Institute in the Philippines for 23 years and is now affiliated with University of California Davis; Prof. Robert Russell, Director, Jean Mayer Human Nutrition Research Center on Aging, Tufts University, Boston; Dr. Howarth Bouis, Director of the HarvestPlus Challenge Program under the auspices of the International Center for Tropical Agriculture (CIAT), Colombia, and the International Food Policy Research Institute (IFPRI), Washington DC; Dr. Gary Toenniessen, Director of Food Security, The Rockefeller Foundation; Dr Robert Bertram, Chief, Multilateral Programs Division, Center for Economic Growth and Agricultural Development, Global Bureau, US Agency for International Development; Dr. Katharina Jenny, Senior Advisor Natural Resources and Environment Division, Swiss Agency for Development and Cooperation; Dr. Adrian Dubock, Biotechnology Ventures and Humanitarian Technology Donations, Syngenta; Dr. Ren Wang, Deputy Director General Research, and Dr. William Padolina, Deputy Director General Partnerships, both International Rice Research Institute, the Philippines.

#### **\*The Golden Rice Network**

The Golden Rice Network, coordinated by Dr. Gerard Barry (IRRI), will be the primary beneficiaries of the technology. The institutions involved are breeding the Golden trait into local varieties for smallholder farmers.

#### **Philippines**

International Rice Research Institute (IRRI) (Management)  
National Rice Research Institute (PhilRice)

#### **Vietnam**

Cuu Long Delta Rice Research Institute

#### **India**

Department of Biotechnology, India  
Directorate of Rice Research  
Indian Agricultural Research Institute  
University of Delhi South Campus  
Tamil Nadu Agricultural University  
Agricultural University, Patnagar  
University of Agricultural Sciences, Bangalore  
Chinsurah Rice Research Station

#### **Bangladesh**

Bangladesh Rice Research Institute

#### **China**

Huazhong Agricultural University  
Chinese Academy of Science  
Yunnan Academy of Agricultural Sciences

#### **Indonesia**

Agency for Agricultural Research & Development, Jakarta