

## **GOLDEN RICE: A COMPLEX TANGLE OF UNANSWERED QUESTIONS**

in

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SUMMARY: "Advocates of Golden Rice - a GMO rice that produces Vitamin A - present the debate over its use a clear moral choice with only one possible conclusion. But as Clare Westwood writes, the reality is very different"

'Golden Rice' (GR) is rice genetically modified (GM) to produce beta carotene, the precursor of Vitamin A.

Its advocates claim that it provides the solution to Vitamin A deficiency, which affects some 190 million people worldwide with effects that can include blindness.

It has been the subject of fierce argument about whether it really is a viable solution to Vitamin A deficiency (VAD) - or a 'Trojan horse' public relations tool used by industry to gain regulatory and market acceptance of GE crops.

A \$100 million drop

Called 'Golden Rice' because of its orange-yellow color, the first version of Golden Rice - GR1 - was developed by Dr. Ingo Potrykus of the Swiss Federal Institute of Technology in Zurich, and Dr. Peter Beyer from the University of Freiburg, Germany, from 1991 to 2000 with an expenditure of about \$100 million.

This was funded by four donors including the Rockefeller Foundation, one of the founding donors of the International Rice Research Institute (IRRI) that is housing the Golden Rice Project and managing the Golden Rice Network for the continued development of GR.

The level of carotenoids (including beta-carotene) in GR1 was minimal at 1.6 micrograms per gram, and critique of this led to the subsequent creation of GR2 with a maximum of 31 micrograms per gram of beta-carotene.

The intellectual property rights tangle

One of the world's top pesticide and seed companies, Syngenta, acquired exclusive rights to the GR1 technology from its inventors but went on to develop GR2 itself. On World Food Day in 2004, it announced the donation of GR2 to the Golden Rice Humanitarian Board.

The Golden Rice Humanitarian Board, chaired by Dr. Potrykus, is a public-private partnership responsible for the global development, introduction and promotion of GE GR in target countries. It provides governance to the Golden Rice Project.

In 2000, the Rockefeller Foundation commissioned an intellectual property rights audit through the International Service for the Acquisition of Agri-biotech Applications for IRRI.

70 separate patents and other IPRs

The audit found that there were 70 IPRs and technical property rights (TPRs) belonging to 32 different companies and universities, which had to be navigated before the inventors could donate the technology as a 'gift' to resource-poor farmers through international agricultural research centres to national partners.

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The patented key technology to create GR1 involved a package of ancillary proprietary technologies needed to engineer the trait into rice belonging to Syngenta, Bayer AG, Monsanto Co, Orynova BV, and Zeneca Mogen BV.

Syngenta Seeds AG negotiated access to all these technologies and provided the GR Humanitarian Board with the right to sub-license the GR technology to breeding institutions in developing countries, free of charge. It is not known if a similar audit has been carried out for GR2.

It has also provided a "humanitarian use" licence that ensures that the use of GR seeds is free of royalty or similar charges to small farmers.

Syngenta reserves its rights to commercial exclusivity over GR1 and GR2, including commercial rights over improvements to the technology - but the "humanitarian use" of such improvements is guaranteed.

Syngenta announced several years ago that it will not commercialize GR, however there is no legal obstacle should it choose to do so.

GR - used to campaign for lower GMO risk assessment standards

A necessary condition attached to the agreement with GR licensees is that no field releases may take place in the absence of a national biosafety regulatory framework. The decision to adopt the technology is a country's prerogative.

To fast track market approval, however, the proponents of GR are campaigning for lower risk assessment standards for GE crops, including not only GR but all GM crop varieties.

Data from ongoing field trials in the Philippines and in Bangladesh will, in all likelihood, be used to support bio-safety clearances for the commercialization of GR in these countries soon.

It will be interesting to see what Syngenta does with its exclusive commercial rights then. Will larger Asian farmers, not covered by the "humanitarian use" licence be subject to the same legal harassment that US farmers are facing from Monsanto for so-called infringements of the latter's IPRs over their GM seeds to the tune of millions of dollars?

What exactly is 'humanitarian use'?

In the sub-licensing agreement, "humanitarian use" has been defined as (including research leading to) use in developing countries (low-income, food-deficit countries as defined by the UN FAO) by resource-poor farmers (earning less than US\$ 10,000 per year from farming).

Other terms include the following:

the technology must be introduced into public germplasm only;

no surcharge may be charged for the technology - the seed may cost only as much as a seed without the trait;

national sales are allowed by low-income farmers - so urban needs are also covered;

reusing the harvested grain as seed for the following season is allowed;

no export of GR is allowed, except for research purposes to other licensees.

These terms appear to be straightforward, but they give rise to a multitude of concerns, especially over hidden costs that are likely to emerge in practice like the costs of seed distribution and contamination if it occurs.

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### Difficult questions

What, for example, of the stipulation that "no export is allowed"? In the event that Golden Rice is exported for non-research purposes, this would be outwith the terms (and protection) of the humanitarian licence.

Would this constitute grounds for Syngenta to exercise its commercial rights by demanding royalties - or even preventing such exports from taking place at all?

Which raises a further question - what if the GR genes get to widely contaminate the rice seed across an entire country? Then effectively all the rice produced would contain some degree of GR contamination.

Could Syngenta then levy royalties on an entire country's commercial rice production and rice exports?

Is it effective? And why all the butter?

The bioavailability of GR's Vitamin A was examined in a study published in June 2009. It found that in healthy adults GR was indeed an effective source of Vitamin A.

However the experiment did not include children or malnourished individuals - those who are mainly intended to benefit from the Golden Rice.

Also the meals containing the GR were all high in fat. A 'breakfast' meal contained 10g of butter, providing 23% of the dietary energy. A 'lunch' meal contained 15g of corn oil, 60g of meat and 20g of cashew nuts - and the fat provided 40% of dietary energy.

This relatively high fat (and meat) diet is atypical of meals in rice-eating countries, and especially those consumed in poor households where fat of any kind is a luxury.

Beta-carotene is highly fat soluble, and it is known that eating carotene-rich foods in conjunction with fat enhances its dietary availability. So one has to ask - why was so much butter and oil included, if not to produce the desired result?

And why were trials not done of Golden Rice eaten in a low fat diet? Or on children and malnourished people - those that Golden Rice is meant to benefit?

### Findings questioned

As Michael Krawinkel asked in a follow-up letter to the American Journal for Clinical Nutrition, a key question is

"... why the authors did not use a dietary approach more similar to the diets of the individuals who were suggested to benefit from the consumption of this  $\beta$ -carotene-containing rice.

"One of the arguments used for advertising Golden Rice is that the people at risk of vitamin A deficiency have such poor diets that other sources of  $\beta$ -carotene and vitamin A are not accessible to them.

"Because diet definitely has an effect on the bioavailability of  $\beta$ -carotene from any  $\beta$ -carotene-containing food, the choice for a study diet that included meat, oil, and nuts, which does not represent a poor diet, is of concern.

"Therefore, the results of the study do not much help us in preventing vitamin A deficiency in populations at risk."

So - after many years of research and many millions of dollars spent, proponents of GR have failed to prove that it really will cure VAD.

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Threats to health? A dearth of evidence

There is also a possibility that GR poses a threat to people's right to health and safe food. Such fears are only boosted by the fact that not a single feeding study on the health impacts of GR has been published to date.

As Krawinkel states in his letter to the AJCN,

"More research in the prevention of vitamin A deficiency is required, and animal studies in piglets may be an appropriate model to investigate the different approaches of supplementation, fortification, natural  $\beta$ -carotene from the diet, and nutrient-oriented plant breeding before humans are further exposed to studies that obviously do not address potential health risks."

At whose risk?

Then there is the risk of genetic contamination of native and local farmer-bred rice varieties by this GM rice.

The GM Liberty Link Rice (LLRICE601) contamination scandal of 2006 demonstrated the ease with which such contamination can occur and how it resulted in harm to farmers' livelihoods when many countries stopped the import of long-grained rice from the US.

In fact, in February 2013, in the face of expectations riding high that GR would be soon approved for commercialization, IRRI itself had to admit that essential data for a proper risk assessment were still unavailable.

So, who will bear accountability should anything go wrong? The legal situation is that no warranties are being given by the licensor(s) of GR, Syngenta and the Golden Rice Board.

Each party - that is, each country that accepts Golden Rice - is to be responsible for whatever liabilities and costs may ensue from the introduction of Golden Rice. This amounts to a 'use at your own risk' scenario - an apparently high price for a 'free gift'.

The root cause of VAD is poverty

Instead of looking at unnecessary, expensive, potentially risky, high-tech solutions like GR - without any assurance of accountability by its creators - attention and funds would be better spent in alleviating the root causes of VAD.

Chief among these is poverty, but there are also issues of poor access to fresh greens and other vegetables, especially in cities. Efforts to promote Vitamin A rich foods - like raw 'red' palm oil, Vitamin A enhanced (by traditional breeding) varieties of maize and cassava, and mother's milk for babies - are at an early stage in most countries.

Policies aimed at preserving and expanding small-farm biodiverse agro-ecological systems will sustainably provide locally available sources of food for a healthy and balanced diet, including Vitamin A, especially for rural communities.

So why is industry pushing GR so hard when there are far more viable, sustainable, low cost and safe ways to address VAD? There is nothing 'humanitarian' about Golden Rice. Its entire purpose is to serve as a Trojan Horse for the GM industry - and that is how it is being used.

SOURCE: The Ecologist

AUTHOR: Clare Westwood

URL: [http://www.theecologist.org/blogs\\_and\\_comments/commentators/2271735/gold...](http://www.theecologist.org/blogs_and_comments/commentators/2271735/gold...) [2]

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