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Saline Agriculture for Food & Fuel

Waste Heat into Electricity

Darwin's Pangenesis & Dangers of GMOs

Corporate Monopoly of Science & Life



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Editor & Art Director: Mae-Wan Ho
 Deputy Editor: Peter Saunders
 Production Editor: Julian Haffegge
 Production Assistant: Andrew Watton
 Commissioning Editor: Sam Burcher
 Associate Editors: Joe Cummins, Peter Bunyard
 Cover painting: *Metamorphosis* by Li Poon, Canada,
<http://lipoon.wordpress.com>
 Other Contributors: Kathy Haffegge, Brett Cherry

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 The Institute of Science in Society
 Omnibus Business Centre,
 39-41 North Road,
 London N7 9DP
www.i-sis.org.uk
 tel: 44-20-7700-5948

Advertising, and events:
 Sam Burcher sam@i-sis.org.uk
 tel: 44-20-8452-2729

Other enquiries:
 Brett Cherry enquiries@i-sis.org.uk
 tel: 44-20-7700-5948

ISIS Director:
 Mae-Wan Ho m.w.ho@i-sis.org.uk

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The Golden Rice Scandal Unfolds. clinical trials on children have been conducted with unapproved experimental GM rice. Pages 4-7



Cooperative for Health, Food Security & Environment. Biodiverse fields where weeds and crops co-exist for mutual benefit. Pages 28-33



Darwin's Pangenesis. A fascinating page in the history of genetics expurgated from the mainstream account. Pages 42-45

More than Banking Needs to Change

Banking for bankers and corporations

The events of the past year have led to many hard questions being asked about our financial system and 'free market economy'. Commentators are finally starting to challenge the assumption on which so much has depended, that the market is always right - the invisible hand will guide the economy to make the most effective use of resources - and if there is ever a deviation from this optimal state, the market will correct itself. That is why the bankers and their allies insist governments must not interfere with the operation of the market. In practice, however, it means that all important decisions are taken by the people who run the banks and the big corporations. This is a very convenient theory for bankers, whose telephone number salaries are one of the things we are not to interfere with. But the theory is simply wrong.

To be sure, the market is generally able to correct small disturbances from the optimum. If there are too few pizza restaurants to satisfy the demand, more will open; if there are too many then some will go out of business. As a result, we should end up with about the right number. For that sort of thing, the market generally works a lot better than having some bureaucrat in charge.

Unfortunately, how a complex nonlinear system reacts to small perturbations is not in general a good indicator of how it will react to large ones, and that is certainly the case with economies. Markets frequently go to extremes and show no signs of returning to normal on their own, in complete contradiction of what the theory predicts. As George Soros points out in his book *The Crash of 2008 and What it Means*, in recent years alone governments have had to intervene in the international banking crisis in 1982, the bankruptcy of Continental Illinois in 1984, the emerging markets crisis of 1997, the failure of Long Term Capital Management in 1998, and more besides, including of course the current credit crunch. The same bankers who demand free rein when times are good are quick to run to the government for help when their excesses get them into trouble.

The first priority of governments is clearly to get the economy moving again and people back into work. Now that the myth of the market has been so obviously demolished, however, they should ignore what Soros calls the "market fundamentalists" and put in place measures designed to stop it going wrong in the first place. To a large extent, this would mean simply bringing back rules that were abolished in the 1980s and 1990s, when the neo-liberals dominated economics both in theory and in practice.

Light touch regulation failed to protect savings and pensions

It is now argued that there should be strict regulations governing what banks can do. They would not be obliged by law to comply, but those that did not could not expect to be bailed out by the taxpayer if they ran into trouble. We would also include a rule that because of the extra risk, pension funds and public bodies should not be permitted to invest in banks that have not signed up to the code. If we cannot prevent some people gambling, at least we can stop them doing it with our money.

As the advocates of *laissez-faire* keep reminding us, however, our whole economy, not just the financial sector, is based on the market. If there are lessons to be learned, they apply to other areas as well.

One of the chief causes of the crisis was the so-called light touch regulation that was begun by Reagan and Thatcher and continued by their successors. One by one, restrictions were lifted. Regulators have tended to take the banks' word that all was well. They were not given the resources to do their job thoroughly, so that when a truckload of paper documents arrived, there was no way they could find the toxic needles hidden in the haystack of very ordinary material. The regulators were checking only the details of what the banks were doing, not their overall



Photo Sam Burcher

strategies, which turned out to be where the real dangers lay. The whole ethos of regulation was above all, not to kill the goose that was laying the golden eggs nor tempt it to fly away to a tax haven.

Light touch regulation fails to protect our health

Light touch regulation has also been the rule in other sectors, including the pharmaceutical and biotech industries. Regulators depend on the companies not only to carry out the tests but to analyse and interpret the results, and then take their word for it.

A revolving door policy means that regulators often come from industry and then go back once they have served their terms. Regulation is largely about details rather than the strategic issues: when an application is being discussed it is considered enough for the person with a connection to that firm to leave the room, even though other corporations' nominees may be just as anxious as the applicant to see permission granted because of the precedent it will set. The UK government has given its regulators a very strong steer that they are to favour GM not because the farmers and consumers want it - they don't - but because they see it as one of our industrial golden geese. Here, of course, they are blatantly ignoring the market, which even the most committed neo-liberals seem willing to do when it suits them.

The positive opinion given to Monsanto's GM maize MON 863 by the European Food Safety Authority (EFSA) was a case in point. The EFSA not only allowed the company to claim commercial confidentiality for raw data; but also agreed with the company that significant results suggesting kidney and liver toxicities were not "biologically meaningful". No wonder the EU Council of Ministers have unanimously agreed that the current legislation on GMOs requires a thorough revision with respect to risk assessment.

What this means for the whole world

Now that the neo-liberal model has been thoroughly discredited, the rich nations should stop imposing it on the rest of the world, which many commentators have blamed for creating poverty and global warming by encouraging over-exploitation of people and the planet (see *Financing Poverty*, *SiS* 40).

At the same time, the recent multi-stakeholder International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) (see *GM-Free Organic Agriculture to Feed the World*, *SiS* 38) has also declared industrial monoculture obsolete. Its major finding is that small farmers practicing agroecology are the way forward to feed the world, eradicate poverty and save the climate (see also *Food Futures Now *Organic *Sustainable *Fossil Fuel Free*, *ISIS/TWN Report*).

The credit crunch occurred because governments took the advice of the bankers on how a banking system should be run. The result was a system specifically designed to make profits for the bankers rather than to play a useful role in the real economy. They should now learn from their mistake and pay heed to the words of Hans Herren, co-chair of the IAASTD: speaking at the 5th European Conference of GMO Free Regions in Lucerne, Switzerland: "It is for governments to implement the recommendations of the IAASTD, not following what Monsanto is telling them."



The Golden

Phase II clinical trials on children have been conducted with unapproved experimental GM rice enhanced in pro-Vitamin A that has the potential to cause birth defects and developmental abnormalities
Dr. Mae-Wan Ho and Prof. Joe Cummins

Clinical trials of unapproved, uncharacterized GM rice on children

More than 30 senior scientists and academics signed an open letter condemning researchers at Tufts University (Boston) in the United States for carrying out clinical trials of genetically modified (GM) 'Golden Rice' on children (Scientists Protest Unethical Clinical Trials of GM Golden Rice). The scientists claimed that the trials were in breach of the Nuremberg Code of Ethics brought in at the end of the Second World War to prevent any repetition of the experiments conducted by Nazi scientists including many on children.

Eat your dinner. Greenpeace said more than 3 kilos of golden rice daily were needed to meet dietary standards for vitamin A.

The 'Golden Rice' in the trials appears to be an experimental *collection* of transgenic events still in the laboratory, uncharacterised in terms of basic molecular genetics or biological and biochemical properties, not tested pre-clinically on animals, or subjected to any other safety assessment.

Of the three studies listed on the US Clinical Trials website, two involved children. The first, "Retinol Equivalence of Plant Carotenoids in Children" - a phase II trial to compare the vitamin A value of β -carotene in oil capsule, spinach and Golden Rice - recruited 72 children 7 to 9 years of age, and the start and finish dates were September 2004 and November 2005 respectively. The second study, with the same title and also a phase II trial, recruited 72 children 6 to 8 years of age and registered start and finish dates July 2008 and January 2009 respectively. No results are available for either of the studies (as of 17 March 2009).

The third study, "Bioavailability of Golden Rice Carotenoids in Humans", listed as "ongoing, but not recruiting participants", was a phase I trial on 6 adults 40 to 70 years of age. The start date was August 2004, and estimated completion date August 2008. Again, no results are available; though an article in *Science* (25 April 2008) mentioned "a recent, soon-to-be-published study among healthy volunteers who ate cooked golden rice, led by Robert Russell of Tufts University in Boston."

All the studies were done in the United States, though it appears that trials were also carried out and/or intended elsewhere.

The Golden Rice Project website (accessed 17 March 2009), stated that "Golden Rice has gone through many tests since it was first obtained" Nine items are listed; but no feeding trial on animals among them. The final two items are:

"8. Tests for beta-carotene bioavailability and bioconversion to retinol....with deuterium-labelled *Golden Rice* fed to adults in USA and a small group of children in China have been conducted. The former were highly successful and the latter are being evaluated at present.

9. Feeding trials with human adults in China were carried out to measure the effect of fat in the diet, on bioconversion and bioavailability."

Rice Scandal Unfolds

There is now a string of evidence that exposure of many species of animals to a variety of genetically modified crops, and food and feed derived from them, can cause illnesses and death, raising the distinct possibility that genetic modification is inherently dangerous

An Indian newspaper reported that a clinical trial was cut short in China in July 2008, when the government found that 24 children 6-8 years of age at a primary school in Henyan, Hunan, were to be used as guinea pigs for a trial with Golden Rice. The trial was sponsored by Tufts University and obtained approval from the US National Institutes of Health, though not from the Chinese government, which was alerted by Greenpeace. Greenpeace has also warned the governments of Bangladesh, India, Indonesia, Philippines and Vietnam against the risky trials. But at least three state-owned labs in India are conducting research into Golden Rice: the Indian Agricultural Research Institute in New Delhi, Tamil Nadu Agricultural University, and the Hyderabad-based Directorate of Rice Research.

Although Golden Rice was created by Ingo Potrykus at the Institute of Plant Sciences in the Swiss Federal Institute of Technology and Peter Beyer at the University of Freiburg some ten years ago, it has remained in the laboratory since. Speaking to *Science* journal in April 2008, Potrykus bitterly blamed "Two decades of fear-mongering by organizations such as Greenpeace" that has created a regulatory climate so burdensome that only big companies can afford to get any GM products approved. Closer to the truth may be that the product was never ready for official approval.

According to a recent report, a sample of the Golden Rice grains was sent to Germany in 2001 for a feeding trial with mice. But when the grains were tested for carotenoid content, the scientists were "surprised to find it contained less than one percent of the amount expected." After the rice was cooked, this was reduced by another 50 percent, so the trial was abandoned.

In 2005, Syngenta made Golden Rice 2 (GR2) using the maize version of the enzyme phytoene synthase that was transferred from daffodil in the original Golden Rice (GR1). GR2 produced up to 23 times the amount of carotenoids in GR1.

But GR2 was *not* a transgenic variety based on a single transformation event. On the contrary, it was explicitly stated that: "The reported transgenic rice events [emphasis added] are experimental." There is no telling whether all the children or adults taking part in any of the trials were given Golden Rice from the same GR2 event. The results of the trials, as yet unreleased, could well be utterly worthless.

Syngenta was donating these GR2 events, via the Humanitarian Project for Golden Rice, for further research and development (to institutes across China, India, Philippines, Indonesia, Bangladesh and Vietnam) "through license under certain conditions", which include "being governed by the strategic direction of the Golden Rice Humanitarian Board" Requests were to be directed to Adrian Dubock, a previous employee of Syngenta.

Dubock helped Potrykus and Beyer work out a deal in which Syngenta could develop Golden Rice commercially, but farmers in developing countries who make less than US\$10 000 a year could get it for free. Dubock retired from Syngenta in 2007, but remains a member of the Golden Rice Humanitarian Board, chaired by Potrykus.

Golden Rice, an exercise in how *not* to do science

Golden Rice, genetically modified to make pro-vitamin A in the endosperm (the grain remaining after polishing), was announced with great fanfare in 2000 as a cure for widespread vitamin A deficiency in developing countries.

The project had already cost US\$100 million, funded by the Rockefeller Foundation, the Swiss Federal Institute of Technology, the European Community Biotech Programme and the Swiss Federal Office for Education and Science, and could cost as much again to develop. It was tied up in at least 70 patent claims on genes, DNA sequences and constructs, a problem only partly solved in the "ground-breaking deal" worked out by Dubock (see above)..

Condemnation was swift and widespread, not least because it was absurd to offer Golden Rice as the cure for vitamin A deficiency when there are plenty of alternative, infinitely cheaper sources of vitamin A or pro-Vitamin A, such as green vegetables and unpolished coloured rice (especially black and purple varieties, which would be rich in other essential vitamins and minerals, and hence much more nutritious). The UN Food and Agricultural Organization (FAO) started a project in 1985 to deal with vitamin A deficiency using a combination of food fortification, food supplements and general improvements in diets by encouraging people to grow and eat a variety of green leafy vegetables. One main discovery from the project was that the absorption of pro-vitamin A depends on the overall nutritional status, which in turn depends on the diversity of the food consumed.

The main cause of hunger and malnutrition in the Third World is the industrial monocultures of the Green Revolution, which obliterated agricultural biodiversity and soil fertility, resulting in ever-worsening mineral and micronutrient deficiencies in our food. Golden Rice, like other GM crops, is industrial monoculture only worse, and will exacerbate this trend, as well as the destruction of agricultural land, and the impoverishment of family farmers that also accompanied the Green Revolution (see Beware the New "Doubly Green Revolution", *SiS* 37).

GR1 was made with the standard 'first generation' genetic modification techniques, using GM constructs that cause uncontrollable mutations and other collateral damage to the host plant genome, with many unintended, uncharacterized effects. In addition, the viral and bacterial sequences, including antibiotic resistance marker genes, in the construct and in the vectors created for gene transfer enhance horizontal gene transfer and recombination, the main route to creating new pathogens and spreading antibiotic resistance.

GR2 represents an improvement in so far as antibiotic resistance markers were no longer used, but still includes a medley combination of sequences from plant pathogens *Agrobacterium* (used in a binary vector system) and *Erwinia uredovor*, and from *E. coli*, inhabitant of the human gut, which also contains pathogenic strains. We have highlighted the special hazards of the