The Great Twist in the GM Food Debate

by Jeremy Rifkin

The global debate over the introduction of genetically modified (GM) food has erupted again. But this time, the tables have suddenly turned. For years, the life science companies—Monsanto, Syngenta, Bayer, Pioneer, etc.—have argued that GM food is the next great scientific and technological revolution in agriculture, and the only efficient and cheap way to feed a growing population in a shrinking world. Non-governmental organizations (NGO's) have been cast as the villains in this unfolding agricultural drama, and often categorized as modern versions of the English Luddites, accused of continually blocking scientific and technological progress because of their opposition to GM food.

Now, in an ironic twist, with far reaching implications for the future of agriculture and global trade, the combatants have reversed roles with the NGO's arguing that new cutting edge developments in agricultural biotechnology— which they favor—have made gene-splicing technology and GM food obsolete and even a dangerous impediment to scientific progress.

The new frontier in biotech is called genomics and the new agricultural biotechnology is called Marker Assisted Selection, or MAS. A growing number of scientists believe that this second generation of biotech agriculture—which is already being introduced into the market— will eventually replace GM food.

Scientists are mapping and sequencing plant species and using the findings to create a new approach to advancing agricultural biotechnology. Instead of using gene

splicing techniques to transfer a gene from an unrelated species into the genome of a food crop to increase yield, resist pests, or improve nutrition, scientists are now using Marker Assisted Selection to locate desired traits that already exist in the various varieties or even wild relatives of a particular food crop, then cross breeding those plants with the already existing commercial strains to improve the crop. The point to emphasize is that with MAS, the breeding of new varieties always remain within a species, thus, greatly reducing the risk of environmental harm and potential adverse health effects associated with GM crops. Using MAS, researchers can upgrade classical breeding and reduce by 50% or more the time devoted to developing new plant varieties in the laboratory by pinpointing genetic markers at the gametes or seedling stage.

An increasing number of researchers around the world in academic, government, and commercial laboratories are switching to MAS as an alternative to gene splicing technology in the development and enhancement of existing food crops.

Using MAS, researchers in the Netherlands have developed a new lettuce variety resistant to an aphid that causes reduced and abnormal growth in lettuce fields in California and Europe. Researchers at the US Department of Agriculture have used MAS to develop a strain of rice that is soft on the outside but remains firm on the inside after processing. Scientists in the UK and India have used MAS to develop pearl millet that is tolerant of drought and resistant to mildew. The crop was introduced into the market in India in 2005. Even Syngenta, one of the world's leading agribusiness companies, has begun to turn its attention away from GM and toward MAS. Syngenta researchers have developed a wheat variety with increased resistance to Fusarium blight.

Wally Beversdorf, former vice president of plant science research at Syngenta, candidly admitted that while the company was still engaged in GM technology, “marker assisted selection is the first choice” now in the company’s research priorities. Pioneer Hi-Bred International, a subsidiary of Dupont, is using MAS to develop new soybean varieties with enhanced disease and pest tolerance. John Soper, director of soybean research at the company says, “We have seen only the tip of the iceberg when it comes to the benefits MAS technologies will provide”. MAS, or soft path bio, is in the early stages of development but has vast potential as an alternative to hard path genetically modified crops using gene splicing in and between species. Organic farmers and processors are particularly keen on MAS because of its potential to radically reduce the costs of bringing organic produce to market.

The wrinkle is that the continued introduction of GM crops could contaminate existing plant varieties, making the new “soft path” MAS technology virtually useless. Cross contamination of GMOs with conventional and organic crops is occurring in regions where large swaths of farmland have been planted with GMO crops. The danger is that conventional plant varieties and wild relatives of all major crop varieties will be contaminated with spliced genetic material from GM crops. In the US, where so much farmland is already planted with GM crops, the contamination is now widespread, threatening both conventional and organic food crops.

A landmark 2004 survey conducted by the venerable scientific organization, the Union of Concerned Scientists, found that non-GM seeds from three of America’s major agricultural crops—corn, soybeans, and canola—were already “pervasively contaminated with low levels of DNA sequences originating in genetically engineered varieties of these

crops". This sobering report concluded that "heedlessly allowing the contamination of traditional plant varieties with genetically engineered sequences amounts to a huge wager on our ability to understand a complicated technology that manipulates life at the elemental level". The authors of the study warn that "unless some part of our seed supply is preserved, free of genetically engineered sequences, our ability to change course if genetic engineering goes awry will be severely hampered".

Even the US Biotech Industry Association—BIO—now acknowledges that there is widespread GM contamination of a number of American food crops, dispelling the myth that GMO can coexist with conventional and organic food crops. There is no procedure that will ensure against pollen flow across fields. The result is that the American government is engaged in discussion about how much GMO cross-contamination is acceptable to still certify as non-GMO.

European Environmental Commissioner Stavros Dimas raised the question of contamination of plant varieties and loss of biodiversity in a speech to environmental ministers of the 25 EU member states on April 5, 2006. Dimas told his colleagues that "GMO products raise a whole new series of possible risks to the environment, notably potential long term effects that could impact on biodiversity." Dimas said he was particularly concerned about loss of biodiversity because of the vast potential afforded by the new MAS technology. MAS requires preserving heirloom varieties and protecting wild relatives of food crops to ensure that a diverse pool of valuable traits is available for research. Dimas noted that "MAS technology is attracting considerable attention" and said that the European Union "should not ignore the use of 'upgraded' conventional varieties as an alternative to GM crops".

Equally important, as MAS technology becomes cheaper and easier to use, and as knowledge in genomics becomes more dispersed and easily available over the next decade, plant breeders around the world will be able to exchange information about "best practices" and democratize the technology. Already, plant breeders are talking about "open source" genomics, envisioning the sharing of wetware just as Linux and other open source IT organizations currently share software. The struggle between a younger generation of sustainable agriculture enthusiasts anxious to share genetic information and older, entrenched life scientists determined to maintain control over the world's seed stocks through patent protection, is likely to be hard fought, especially in the developing world.

Given these rapid new developments in agricultural biotechnology, the prudent course of action now is to put GM food and feed crops on hold around the world, pending a thorough review of the recent breakthroughs in MAS technology. Governments need to solicit studies, hold hearings, and evaluate the potential negative impacts that widespread GM plantings might have on crippling the prospects for introducing the next generation of MAS biotech food crops.

If ever there was an appropriate moment to invoke the "precautionary principle" in agriculture, it is now. Introducing an out of date GMO technology could seriously undermine the vast possibilities that the new MAS technology holds for the future of agriculture, both in the EU and around the world. If properly used as part of a much larger systemic and holistic approach to sustainable agricultural development, MAS technology could be the right technology at the right time in history.

Dr. Robert Goodman, dean of Cook College of Rutgers University, and formerly head of research at Calgene, a small biotech company that introduced the world's first GM food crop, the infamous Flavr-Savr tomato—the product failed in the market—summed up the great transition now taking place in agricultural biotechnology. Several years ago, Goodman, in an extraordinary change of mind, said "from a scientific perspective, the public argument about genetically modified organisms, I think, will soon be a thing of the past… The science has moved on, and we're now in the genomics era". Amen.