Genetically modified foods may be greener than organic ones.

BY LEE SILVER

WHY GM IS GOOD FOR US

FARM-RAISED PIGS ARE DIRTY, SMELLY ANIMALS that get no respect. They're also an environmental hazard. Their manure contains phosphorus, which, when it rains, runs off into lakes and estuaries, depleting oxygen, killing fish, stimulating algae overgrowth and emitting greenhouse gases. During the 1980s, phosphorus pollution killed all aquatic life in the 42km-long Mariager Fjord of Denmark—an ecological disaster that prompted European governments to impose strict regulations on pig farming. It didn't solve the problem.

Doing away with the pig is not an option. Pigs provide more dietary protein, more cheaply, to more people than any other animal. Northern Europe still maintains the highest pig-to-human ratio in the world (2-1 in Denmark), but East Asia is catching up. During the 1990s, pork production doubled in Vietnam and grew by 70 percent in China—along densely populated coastlines, pig density exceeds 100 animals per square kilometer. The resulting pollution is "threatening fragile coastal marine habitats including mangroves, coral reefs and sea grasses," according to a report released in February by the Food and Agriculture Organization of the United Nations.

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As it turns out, there is a solution to the pig problem, but it requires a change of mind-set among environmentalists and the public. Two Canadian scientists have created a pig whose manure doesn't contain very much phosphorus at all. If this variety of pig were adopted widely, it could greatly reduce a major source of pollution. But the Enviropig, as they call it, is the product of genetic modification—which is anathema to many Westerners.

The Enviropig is one of many new technologies that are putting environmentalists and organic-food proponents in a quandary: should they remain categorically opposed to genetically modified (GM) foods even at the expense of the environment? Pigs can also be modified to digest grasses and hay (as cows and sheep do), reducing the energy-intensive use of corn as pig feed. Elsewhere, trees grown for paper could be made amenable to much more efficient processing, reducing both energy usage and toxic chemical bleach in effluents from paper mills. The most significant GM applications will be ones that help alleviate the problem of agriculture, which accounts for 38 percent of the world's landmass and is crowding out natural ecosystems and species habitats. GM crops that can be produced more efficiently would allow us to return land to nature.

Standing in opposition to these advances are advocates of an organic food philosophy that holds to the simplistic notion that "natural" is good and "synthetic" is bad. Genetic modification is unacceptable to organic farmers merely because it is performed in a laboratory. Says Charles Margulis, a spokesman for Greenpeace USA, "We think the Enviropig is a Frankenpig in disguise."

Technically, however, all domesticated plants and animals were created by human selection of random mutations that occur in nature. High-energy cosmic rays break chromosomes into pieces that reattach randomly; in this way, nature sometimes creates genes that didn't previously exist. Lab work, however, is more nuanced than nature: scientists can make subtle and precise changes to an organism's DNA. Canadian biologists Cecil Forsberg and John Phillips, for instance, have constructed a novel DNA molecule that, when planted in a pig embryo, imbues the Enviropig with the ability to secrete a phosphorus-extracting enzyme in its saliva. The results so far are dramatic—the new pigs can extract all the phosphorus they need from grain alone, without the phosphorus supplements that farmers now use. This reduces the phosphorus content of their manure by up to 75 percent.

Of course, stringent testing is needed to show that a genetic modification works and that the product is not harmful to humans. Scientists can do both of these things with techniques that allow them to examine and compare the structure and activity of every one of an animal's genes. An added advantage with the Enviropig, in particular, is that the single extra enzyme in its saliva is also present naturally in billions of bacteria inhabiting the digestive tract of every normal human being, which suggests that the Enviropig will be as safe for human consumption as non-GM pigs.

Organic farmers have always boasted that their approach to agriculture is, by its very nature, better for the environment than so-called conventional farming. The European Commission states that "organic farmers use a range of techniques that help sustain ecosystems and reduce pollution." But if you think that concern for the environment will ever persuade organic farmers to accept the Enviropig or any other animal modified to reduce

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pollution, you'd be wrong. According to self-imposed organic rules, precision genetic modification of any kind for any purpose is strictly forbidden. If conventional farmers begin to grow Enviropigs, organic pig farms will cause much more pollution per animal—unless environmental protection agencies step in and shut them down.

Even in the realm of health, organic food doesn't measure up to the hype. Consumers tend to assume that all organic crops are grown as advertised without chemical pesticides. This is false. Organic farmers can spray their crops with many chemicals including pyrethrin, a highly toxic pesticide, and rotenone, a potent neurotoxin recently linked to Parkinson's disease. Because these substances occur in nature—pyrethrin is produced by chrysanthemums and rotenone comes from a native Indian vine—they are deemed acceptable for use on organic farms.

In fact, although all commonly used pesticides dissipate so quickly that they pose a miniscule health risk to consumers, allergic food reactions to natural products kill hundreds of children each year. Genetically modified foods could greatly reduce this risk. U.S. Department of Agriculture scientist Eliot Herman has already created a less-allergenic soybean—an important crop for baby foods. Through genetic surgery, Herman turned off the soy gene responsible for 65 percent of allergic reactions. Not only was the modified soy less allergenic in tests but, as Herman explained, "the yield looks perfectly normal, plants develop and grow at a normal rate and they seem to have the same kinds of protein, oil and other good stuff in them." Other scientists have reported promising results in shutting off allergy-causing genes in peanuts and shrimp. Should these advances be turned into products, organic soy or peanut products will be certifiably more dangerous to human health than comparable nonorganic products.

Unfortunately, this won't happen any time soon. Because no society has ever banned allergenic foods, conventional farmers have no incentive to plant reduced-allergy seeds. And many members of the public have been led to believe that all genetic modifications create health risks. In this climate, much of the needed research isn't being pursued. Chances are, farmers will continue to grow their polluting organic pork, their allergenic organic soy and their neurotoxin-sprayed organic apples. Worse still, they will make sure that no one else gets a choice in the matter of improving the conditions of life on earth—unless, that is, others rise up and demand an alternative. ■