Even Greenpeace (Washington, DC) does not endorse the recent activity, according to its GMO expert Charles Margullis. He sees the activity as "an expression of growing concern and frustration. . .with the way this technology was introduced," but says it remains to be seen whether this approach is effective. While Greenpeace UK executive director Peter Melchett reportedly said in October that farm-sale trials of GM crops in the UK will continue to be the target of 'direct action' attacks by UK environmental groups, Margullis wouldn't say crop damage events in the US represent a copying of similar events in Europe, but acknowledges that they may be "some of the inspiration."

Meanwhile, some of the transgenic corn that was damaged in Minnesota was growing as part of a demonstration plot. Although damage at the Novartis site in that state was "significant and costly," the disruption and time spent investigating the incident are proving to be perhaps more aggravating and embittering, with little lasting damage to research programs, according to a company spokesperson. The attack on the corn plants was "criminal and stupid," he says. "I have a real concern with glorifying this."

These incidents epitomize the "intellectual incoherence, insincerity, or both" of some protesters who seem to claim that not enough is known about the safety of GM products but who also are uprooting plants being grown in field trials that could address some of those questions, says Giddings. But he adds that although the impact on specific projects could be significant, the overall effect on companies, universities, and federal agricultural biotechnology research is "minimal."

Nevertheless, Novartis and several universities are countering these incidents with stepped-up security and intensified community educational programs. For instance, Novartis launched an educational effort in September to develop a "Farm to Plate" exhibit at the popular Museum of Science and Industry (Chicago, IL).

Jeffrey L. Fox

Terminator technology temporarily terminated

In early October, the agricultural–chemical giant Monsanto (St Louis, MO) announced that it would drop plans to market "terminator" seeds that produce infertile crops. Although the technology could prevent the spread of genetic modifications to other plants, biotechnology foes cheer the decision, which is seen as a wise move on Monsanto's part to improve its deteriorating public image.

While still in the early stages of development, the "terminator" technology would have allowed agricultural firms to sell farmers seeds that have been genetically modified (GM) without allowing farmers to propagate the crops. This would have forced farmers to buy new seed for each growing season, giving producers such as Monsanto greater control over use of their seed.

However, the technology would also have prevented any crossbreeding of the GM plants' traits into the wild—a scenario feared by anti-biotechnology activists—because the crops would be infertile and produce no pollen.

The first set of sterile seeds are being developed in a joint project between the USDA (Washington, DC) and Delta & PineLand (Oxford, MS), a cotton company that Monsanto has been trying to acquire since 1998 (*Nat. Biotechnol.* **16**, 497). The USDA has developed test "terminator" seeds in tobacco and is working on cotton. And the technology is only being used on plants that self-pollinate, such as cotton, rice, wheat, and soybeans, and not plants that are open pollinators, such as corn—thus preventing genetic modifications from spreading to other plants.

The technology could even make economic sense for farmers in developing countries. According to Rochelle Dreyfuss, law professor at New York University and an expert in intellectual property rights, seeds that produce sterile crops give Monsanto or other agricultural firms the same kind of copyright protection found in computer software or unrecordable CDs, for example. "It wouldn't be bad for farmers," she says. "Farmers would have a chance to experiment with the crops without having to lay out money for generations."

Yet cash-strapped farmers in developing nations are different from cash-strapped CD buyers, argues Rebecca Goldburg, a senior scientist at the US Environmental Defense Fund (Washington, DC). "If you end up lacking cash to copy a CD, perhaps illegally, it doesn't matter for your existence," says Goldburg. "But if the seed you save can't germinate, it's a serious problem."

Monsanto Chairman Robert Shapiro announced the decision not to market the sterile-crop seeds in an October 4 letter to Gordon Conway, president of the Rockefeller Foundation, which is a leading sponsor of agricultural research in developing nations. Shapiro says Monsanto had completed a six-month review of the technology after hearing concerns about the impact of the GM technology from international experts, farmers, environmental groups, and development leaders.

The decision could be seen as a victory for Canadian anti-biotech group, Rural Advancement Foundation International, which coined the term "terminator" technology from the film and robot character played by Arnold Schwarzenegger, lobbied farmers, and was eventually successful in persuading Monsanto to change its policy. "The public rejected terminator because it's bad for farmers, food security, and the environment," maintains Pat Mooney, RAFI's president.

Monsanto appears to be bearing the brunt of the consumer backlash against GM crops in Europe (*Nat. Biotechnol.* **17**, 837), while anti-GM crop sentiment is increasing in the US (see p. 1053). It is in this context of public opinion that Shapiro decided to drop plans for commercialization, although he says Monsanto will continue research internally. He also notes that the US National Research Council of the US National Academy of Sciences is planning to study many of these same issues. "We will not make any decision to commercialize a gene protection technology until a full airing of the issues is complete and we have responded publicly to the concerns that are raised," stated Shapiro.

According to Val Giddings, vice president for food and agriculture at BIO (Biotechnology Industry Organization; Washington DC), a more advanced technology is being developed that will allow farmers to activate an encoded resistance or other trait in a plant by applying a chemical to the field—in effect, "turning on" the plant's genetic protection only if pests attack.

Giddings thinks Monsanto's decision will help it in the long run. "Some will see it as a win for anti-biotech, I see it as a draw," he says. "Here is a club that had been dishonestly used by opponents to raise the specter of negative consequences that were never contemplated. Now they no longer have it. It leaves the image of a company that has listened carefully and acted prudently."

Eric Niiler

Eric Niiler is a freelance science writer working in San Diego, CA.