

# ARE GMOs GOOD FOR US?

## WHAT ANTHROPOLOGISTS CAN CONTRIBUTE TO THE DEBATE.

FRANCESCA BRAY

University of California, Santa Barbara

### Resumo:

Cerca de 70% dos productos nos supermercados americanos contêm GMO (Organismos Geneticamente Modificados). A introdução desta técnica alastra-se ao resto do mundo interferindo com as práticas de agricultura e de produção animal. A Antropologia pode contribuir para esta problemática analisando a ideologia do conhecimento científico e as suas práticas. Este trabalho demonstra as dimensões sociais e políticas desta introdução.

### Abstrat:

About 70% of the food products on American supermarkets contain GMO (Genetic Modified Organisms). This introduction is spreading to the rest of the world changing the agricultural and animal production tecnics. Anthropology can contribute to this matter by analyzing the ideology and actions of the cientific knowledge. This work shows the social and politic dimensions of the introduction of this kind of alimentar production.

Genetically modified organisms (GMOs) are produced by transferring genes from one species to another. Whereas traditional plant and animal breeding involves the crossing of individuals with desirable traits within a single species, genetic engineering (GE) allows the grafting of genes from an Arctic halibut into a strawberry to confer frost resistance, or of bacteria into corn to protect it from pests.

Apart from GMOs designed for biomedical purposes, which I will not discuss here, the main impact of genetic engineering on our everyday lives has been through the GM crops and other GMOs that enter our food system. GM crops are new life-forms that promise great benefits: some may yield more than conventional varieties, resist disease or pests, require less water or pesticide, or incorporate extra vitamins. However GMOs also entail complex risks that may not only affect our health and environment, but also have social and political implications. Like nuclear power and DDT, GM crops and the foods made from them constitute what Beck (1999) calls a "manufactured uncertainty", a new technology whose long-term global effects are impossible to predict.

The first GM crop released to the public, the Flavr-Savr tomato, was approved by the FDA (Food and Drug Administration) for release in the United States in 1994. Since then dozens of GM crops and foods have been approved in the US, including varieties of corn, soy, canola, tomatoes, broccoli and papaya, as well as pigs, poultry and salmon. The US area under GM crops rose from 3 to 63 million acres just between 1996 and 1999; in 2001, 24% of the corn and 63% of the soy planted in the US were GM varieties. GM and conventional varieties are mixed together by the grain companies, so GM corn starch, corn oil and corn syrup, soy flour, soy oil and soy protein are ingredients in almost every form of processed food sold in the US today. GM yeast and rennet substitutes are also in common use, and most dairy products contain milk from cows injected with the GM growth hormone rBST. Although one in three US consumers is apparently still unaware of the fact, about 70% of the food products on American supermarket shelves contain GM ingredients.

In Europe, Japan, Asia, Africa and Latin America, although most governments initially favored the adoption of GMOs, strong objections were raised by scientists, farmer and consumer groups, and by NGOs concerned with the environment, poverty and social justice. The media presented arguments for and against GMOs, leading to vigorous public debate.

Opposition crystallised into a heterogeneous yet astonishingly effective global anti-GMO coalition, which has achieved bans on GM crops and technologies, obligatory labeling of GM foods, and a significant collapse of markets for GM products. Some dramatic battles have been won by the anti-GMO coalition, but the global war over GM crops and foods still rages.

In the United States the situation is quite different. Successive administrations have enthusiastically supported the biotechnology industry and approved GM crops and foods. The biotech industry has closely controlled the flow of information about GMOs, generating almost all the available scientific data, lobbying legislators, hiring PR companies and funding journalists to mold public opinion (Rosset 2001). No serious objections to GMOs have been raised in the mainstream media, and the public has remained largely unaware or indifferent.

Currently, however, a crisis looms. Recent US surveys show that 80 to 90% of respondents are in favour of the mandatory labelling of biotech foods; they declare themselves astonished and outraged when informed how many GM products they are consuming unawares. Yet few people here know very much about GMOs. Big biotech companies like Monsanto promise that GM crops will heal the environment, feed the hungry and cure disease. Greenpeace retorts that Frankenfoods spell doom. How is the layperson to judge where to stand on such a complex issue?

Anthropology is well placed to contribute important critical perspectives on GM crops and foods. It trains us to analyse the ideology of scientific knowledge and practices, and to parse the rhetoric used to justify such systems of power. It highlights the social and political dimensions of technological artifacts like GMOs. And it is concerned to link global processes to local effects, in this case the intersection of corporate capitalism, food chains, consumer-citizen activism, and the realities of peasant existence and rural poverty.

To clarify what is at stake, it is useful to distinguish public and corporate GMOs. By public GMOs I mean those developed in the public interest, usually in public research institutions, and which are not intended to be sold for profit (e.g. improved subsistence crops for peasant farmers). By corporate GMOs I mean those developed by corporations for commercial use. In practice the boundaries are often blurred: corporations develop and patent information or techniques initiated in public laboratories; public projects negotiate free or low-charge use of data generated by corporate research;

corporations fund research in public laboratories. But the categorical distinction is useful when considering the risks that a specific GMO might present.

As new life-forms, all GMOs present environmental and health risks which should be rigorously investigated. And as anyone familiar with the Green Revolution knows, new farming technologies, even when distributed free, do not necessarily help the poor. But corporate GMOs present greater and more diverse risks than public GMOs, precisely because they are a corporatist technology. What do I mean by this term? Corporate GMOs are specifically designed as tools to increase corporate profits, extend corporate monopolies, and consolidate corporate control. The policies governing risk and responsibility which corporations have successfully imposed on the US government, and are urgently pressing for elsewhere, embody the corporatist ideology that insists that businesses have a legislated right to an efficient return (as large, as rapid and as monopolistic as possible) on their investments, and to the ownership of any knowledge they produce or even merely process, but bear only limited liability for any adverse effects (Crook 2000). The political and social risks associated with corporate GMOs are very high, and the environmental and health risks are likely to be much higher than for public GMOs because the drive for quick profits molds the science used to validate them.

## A CORPORATIST TECHNOLOGY

In the 1980s bright young bioscientists began abandoning university labs for the independence, creativity and wealth promised by biotech start-ups. The patenting of life-forms was made legal in the US in the mid-1980s, and biotech corporations began to register intellectual property rights not only over technical processes but over gene sequences they had mapped, as well as patenting the GMOs they produced. In January 2001, for instance, Syngenta completed its mapping of the rice genome, which it now "owns". One reason for the high cost of GM research is that it requires access to patented plant materials and privately owned genetic data-bases. Also GMOs have to be tested before they can be approved, and the more thorough the tests, the higher the costs. It can cost tens or even hundreds of millions of dollars to perfect a new GM crop. Not surprisingly, almost all GM crops currently released are produced by biotech corporations, and are varieties of premier commodity crops.

Although GE might offer significant scope for improving subsistence crops around the world - breeding virus-resistant or drought-resistant varieties, or crops that give higher yields without requiring additional fertilizers - few public labs can afford such research, and if they are able to do so, they must obtain many corporate patent clearances before they can distribute a new crop free to poor farmers. The European Community Biotechnology Programme, the Swiss Federal Institute for Technology and the Rockefeller Foundation have together contributed over \$100 million to one such venture that recently hit the news. "Golden rice" contains daffodil genes to generate beta-carotene; this rice might help reduce vitamin-A deficiency among poor people unable to afford a varied diet. Syngenta, Monsanto and other biotech corporations have donated several dozen intellectual property licenses to public research institutions so that they can develop and test golden rice and distribute it free to subsistence farmers. However the companies retain all their rights over golden rice if it is used by commercial farmers.

Most research on GM crops is carried out by corporations on major commodity crops. Large-scale commercial farmers who invest heavily in capital inputs are the main target market. After a series of mergers and buy-outs, seven corporations (some based in the US, some in Europe) now dominate the industry, each with annual sales of over \$2 billion. The biggest, Syngenta (based in Switzerland), was formed by the merger of Novartis (Switzerland) and AstraZeneca (UK) in November 2000; then comes Monsanto (US), followed by Aventis (France), DuPont (US), Dow (US), Bayer (Germany) and BASF (Germany). Biotech corporations also produce agrochemicals (fertilizers, herbicides and pesticides) and sell seeds. It is no exaggeration to say that the GM varieties they produce are deliberately designed as a technology to increase corporate profits and control. Monsanto has developed varieties of corn, cotton and soy that are resistant to Roundup herbicide, another Monsanto product. Because the herbicide can be sprayed directly on the field without killing the crop, there is no need to weed mechanically. But Roundup-Ready varieties will die if treated with any other herbicide, so Monsanto can count on selling its herbicide to any farmer who adopts the seed. Monsanto hopes that the global market for Roundup-Ready corn will soon expand from 3 million to 200 million acres worldwide. Some other crop modifications that the biotech industry has been working on to increase corporate sales and control include what opponents have dubbed "Terminator" technology (initially pursued by Monsanto, ostensibly abandoned in 1999 in the face of widespread public objection, but still being researched), which renders grain sterile at maturation so that it cannot be used for seed; and

"Traitor" technology, which makes the expression of a crop's desirable traits dependent on the application of an additional chemical - naturally, one produced by the same company.

The right to patent life-forms is hotly contested. Nations like India or Mexico have expressed outrage that Western corporations can claim to "own" a crop like Basmati rice or corn, developed by their peasant farmers over centuries. Worse still, when seed is defined, through its DNA sequences, as a form of software that cannot be copied without payment, the age-old practices of saving and exchanging seed, and of selecting and breeding on the farm, become illegal. Monsanto has DNA-tested potato fields and sued farmers for replanting its "New Leaf" potatoes, and recently the company successfully sued a Canadian farmer for growing unauthorised GM canola, even though his conventional crop had been contaminated by GM pollen from a nearby farm.

It is often claimed that GM crops are indispensable to prevent world hunger. Suitable forms of GM crop, if they were free and required no additional cultivation expenses, might indeed help improve the lives of the roughly 650 million landless and small farmers who constitute half of the 1.3 billion people around the world classified as poor. Yet, as Margaret Mellon of the Union of Concerned Scientists has observed, the same effects could probably be produced at lower environmental risk through old-fashioned selective breeding, if anyone was willing to found that unprofitable kind of research. To many Westerners living in middle-class comfort and largely ignorant of rural economics and the politics of hunger, GMOs appear to offer a technological solution which it would be sinful to refuse. However corporate GM crops are designed to boost a system of large-scale industrial farming, and to tie farmers into a system of dependency.

Peasant farmers around the world immediately identified corporate GM crops as a threat to their survival. Like the hybrid varieties of the Green Revolution, corporate GMOs require farmers to purchase seed and chemical inputs. Locally, they thus favour richer farmers who sell surpluses for cash and have access to credit through owning land. Poor farmers may not be able to afford the new technology; if they do adopt it and the crop fails or prices collapse, they may be ruined (the poor performance of the GM cotton crop in Andhra Pradesh, India in 1999 drove hundreds of farmers to suicide). For subsistence farmers, the costs of buying GM seed each season could be ruinous in itself; they can no longer use manure from their animals, vary

their seed stocks, or hand-weed instead of using herbicides, but must find the money to pay for chemical inputs. Finally, many poor farmers or landless people depend on the wages they earn hoeing and weeding wealthier farmers' crops, and GM varieties like Roundup-Ready replace such work by chemical processes. The experiences of the Green Revolution of the 1960s and 1970s made it very clear that technologies designed primarily to increase output and reduce labour inputs often exacerbate rural poverty (Bray 1994). At the global level, if the adoption of GM cereals by American, Australian or European commercial farmers increases output and lowers prices, then southern grain markets will be flooded with cheap imports, ruining local farmers. Not surprisingly, then, peasant organizations around the world have militantly opposed corporate GMOs, and the agricultural representatives of many of the world's poor nations have indignantly rejected arguments that such crops will reduce poverty and hunger.

### THE POLITICS OF SCIENCE: RISK DEFINITION

In the current neoliberal climate, most governments are tempted by genetic engineering and its promises of economic growth and progress. Biotech (the re-programming of life-forms) shares the glamorous ultra-modern allure of the high-tech sector. "If information technology comes, can biotechnology be far behind? ... BT spurred by genomics is the fresh young hero of the New Economy," enthuses an editorial in The Times of India (23 March 2001).

Before they can be planted or sold for food, GM crops have to be officially approved. In the United States three regulatory bodies, the FDA, the EPA (Environmental Protection Agency) and the USDA (US Department of Agriculture), are responsible for checking different aspects of GM crops and foods. While proponents of GE imply that having three regulators must mean very strict standards, Pollan (1998) shows how easily one can be played off against another. Furthermore, in biotech the "revolving door" phenomenon of movement between labs, corporate boards, regulatory bodies and politics is quite startling. For example, in the late 1990s Mickey Kantor, former Trade Representative of the US, joined the board of Monsanto while Margaret Miller, Monsanto's chemical lab supervisor, left to join the FDA; this year George W. Bush appointed Linda Fisher, Vice President and corporate office of Monsanto from 1995-2000, to be Deputy Administrator of the EPA.

Such connections smooth the path for official support of corporate GMOs. Successive US administrations have worked closely with the biotech

corporations to devise regulatory systems that essentially leave responsibility for policing GMOs to the industry itself. The corporations define the risks to be investigated, and conduct the research on which approvals are based.

As we know from our emerging understanding of the environmental and health effects of nuclear power, pesticides or BSE ("mad cow disease"), products and processes initially declared completely safe often prove to have complex long-term environmental and health effects. An alternative paradigm of risk-assessment, increasingly prevalent in European institutions, is the precautionary principle: wherever long-term or complex effects are likely, all kinds of risk should be thoroughly explored before a process or product is declared safe and adopted. This better-safe-than-sorry approach is time-consuming and conflicts directly with the way that free-marketeers and corporations prefer to define risk. In international discussions on food safety issues, including GM crops, the American representatives have consistently argued that the precautionary principle, and the kind of science it represents, are obstacles to trade.

The biotech industry has successfully convinced US regulatory bodies that GM crops and foods can adequately be tested in a few experiments, on small samples, over just a few weeks or months. As biologist Michelle Marvier puts it in a careful analysis, "[their] methodology strongly favors finding no effects even if a true effect exists. Essentially, this method resembles throwing out data - although somewhat less blatantly - unless it yields the desired answer" (Marvier 2001).

Independent research might test according to different criteria. But as almost all research is done within the corporate ambit, published scientific results are overwhelmingly favourable to GM crops. When a Thai molecular biologist questioned the methodology of a report produced by the National Centre for Genetic Engineering and Biotechnology (Biotec) that affirmed the safety of a Monsanto transgenic soybean, the Biotec spokesperson admitted that many documents on which his research was based were actually supplied by Monsanto. "We have limited capacity, financial and technical, to conduct research of our own and it's necessary that we depend upon available documents," he said. Adverse results, however preliminary and tentative, are not welcome, as Dr Arnad Pusztai discovered when his government-funded Scottish team found data suggesting that eating GM potatoes might harm rats. Pusztai mentioned this in a TV interview and went on to query whether current research was adequate to assess the kinds of

risk GM foods might carry. Within three days Pusztai was suspended and placed under a gagging order; his data were confiscated and his work trashed by an anonymous panel convened by the Royal Society.

Most public scientists who do research on GM crops (including Pusztai) support them in principle, but they tend to be much more cautious about the risks than their corporate colleagues, and to argue for careful long-term testing. Many scientists who contributed to the initial FDA investigation of GM crops opposed their approval without further testing, though their opinions were not reflected in the final report. And while the biotech lobby thunders that just a month's delay in marketing golden rice will leave 50,000 children blind, the International Rice Research Institute in the Philippines believes five more years of work on golden rice in the lab are necessary before field trials can safely begin.

## FRANKENFOODS: CONSUMERS OUT OF CONTROL

When the first GM crops were approved in the US in 1994, the biotech lobby launched a publicity campaign minimising the risks and stressing the benefits of GE to the consuming public and to farmers. The campaign to convince US farmers was relatively simple and very successful. GM crops were said to require fewer dangerous chemicals and would guarantee higher yields: they would reduce the risks to farmers' health and to their bank accounts. In fact yields are not always higher, costs may increase, and markets may collapse, but many American farmers still prefer the convenience of GM varieties (Anderson 1999; Bray 2002).

The campaign to convince the general public was somewhat more complex. At first the GE lobby feared that people might worry about the "naturalness" or even the moral implications of what elsewhere are called transgenic foods. When genes from Arctic halibut are spliced into tomatoes, it could be that vegetarians would hesitate to eat them; if human genes are spliced into pigs, does it become cannibalism to eat bacon? Information was circulated in the press and on the web, situating biotech as the logical next step in the historical evolution of farming. Like seasoned anthropologists, GE proponents pointed out both the naturalness of the artificial and the unnaturalness of nature. As one op-ed writer put it, "There's nothing natural about bread, or wine or beagles. In fact there's nothing "natural" about ourselves."

As for possible health hazards, we were assured that GM foods had been rigorously and exhaustively tested, albeit very fast. They must be safe because the FDA had approved them. Better still, a "second generation" of GM foods would soon offer positive health benefits to consumers: potatoes that absorb less fat when fried, vegetables with added vitamins, cereals without gluten. Facing a collapse of confidence in GM crops in 1999, DuPont tried to regain consumer support by putting out commercials showing that the company was conducting GE research to "find food that helps prevent breast cancer."

In fact the US public at first manifested no qualms about GM foods, perhaps because few people were even aware they were eating them. Anti-defamation laws (of the kind that condemned Oprah Winfrey for expressing doubts about the healthfulness of hamburgers) effectively muzzled investigative journalists who wanted to probe into the possible negative effects of GE technology. In Europe, Japan, India and Africa, however, it was a very different story. What the British were quick to dub "Frankenfoods" were considered neither safe nor healthy; however the definitions of risk invoked by protesters went far beyond the narrow scope which the biotech industry had tried to impose. GMOs were not just a form of food that was or was not safe for individual bodies, nor just an environmental threat whose long-term risks were poorly understood, but an emblem and agent of emerging global configurations of corporatist power and control.

Whereas governments and big farmers initially favoured the adoption of GM varieties, public opinion quickly rallied against them and the media ensured that GE issues were brought dramatically and repeatedly to everyone's attention. When the biotech lobby pressed for quick approval of GMOs, in Europe this was widely construed as a bullying corporatist attack on national sovereignty in the domain of health, safety and environment. When governments approved secret experimental plots, or bulldozed through approvals despite public opposition, protesters were quick to label this a democratic deficit. Pat, a twenty-seven-year old teacher from Leicester, UK, who took part in a crop-trampling outside Oxford in July 1999, said: "I am furious about the companies and government who are pushing the technology. They're not listening to people; they don't know the risks. It was very liberating trampling the crop down. It was like saying to government: 'Listen to us. How dare you side with those companies rather than your electorate'" (Vidal 1999, italics added).

Using e-mail, the Web, and international rallies at Seattle and its successors, anti-GMO activists have forged a coalition of consumer groups and radical Greens, old-age pensioners and teenagers, Karnataka rice-farmers, Brazilian landless peasants, French sheep farmers and Japanese housewives, whose forms of action include political protest, the destruction of GM crops, demands for long-term research, and simply refusing to consume. The alliance with prosperous Northern consumers gives clout to the protests of peasant farmers who previously had few means of effective action even at national, let alone at global level. Japan and the European Community together form 36% of the market for US agricultural exports. Concerted resistance by consumers to foods containing GMOs, and their active insistence that they be informed which products contained them, led supermarket chains, food industries and governments to a radical change in policy, with dramatic impact on the biotech companies and on US farmers, some of whom subsequently brought suit against Monsanto for misrepresenting the risks of growing GM crops.

In response to this determined opposition, governments banned GMOs for cultivation as well as consumption; thirty-five countries worldwide now have, or are developing, mandatory GM labelling laws. Almost all supermarket chains in Britain, France and Germany refuse to stock products containing transgenics, and many have now also banned GM-fed animal products, including eggs and dairy products as well as fish and meat. Japanese soy-product manufacturers have switched from US to Brazilian sources to satisfy customers who insist on non-GM beancurd. In 1999 the export markets for US maize and soy collapsed and the biotech industry nearly went under. Since then it has rallied, and is currently engaged in a huge publicity battle to win the support of the US public.

### **GMOs IN THE USA TODAY: WILL WE SHUT UP AND EAT OUR GM SPINACH?**

In the last year or so the US public has started to become uneasily aware of GM foods. In September 2000 news broke that StarLink corn, an Aventis GM variety approved only for animal and not for human consumption, was found in Taco Bell shells. Subsequent tests found StarLink in a vast range of corn products, and as several people suffered severe allergic reactions which they believed were brought on by eating StarLink, the FDA was obliged to initiate tests. Attack being the best form of defence, Aventis, which so far has

had to spend about \$1 billion recalling contaminated stocks, quickly put in a request for StarLink to be approved for human consumption. Despite survey results which show most Americans now favour the labelling of GM foods, the FDA continues to declare that labelling is neither scientifically necessary nor legally possible. The US too has its "democratic deficit" with regard to GM crops.

Anti-GMO organisers have invoked European resistance to raise the consciousness of US consumers: "Kelloggs now has to label its GM cornflakes in Europe - why doesn't it label them here?," as a California Political Interest Research Group (CalPIRG) e-mail campaign of summer 2000 put it. Fearing a consumer backlash, some US food companies have already banned the use of GM crops in their products. McDonalds will not use GM potatoes for its french fries, and Gerber's have eliminated GM ingredients from their baby-foods.

In retaliation the biotech industry has mounted a huge campaign to saturate the media with positive images of GMOs. The publicity is put out by PR consortia with carefully chosen names like the Council for Biotechnology Information, which sound like public-interest organisations disseminating objective information, but are actually industry propaganda tools. The CBI alone has a five-year budget of \$25 million. The campaign involves advertisements, web-sites, and the free distribution of brochures and teaching materials on biotechnology, all of which depict GM crops as unequivocally marvellous, and take the opportunity to tar organic farming and Greenpeace with the brush of social irresponsibility.

A key tactic of the biotech lobby has been to dismiss their opponents' claims as rooted in "emotion" or "politics" rather than science. Anthropologists will relish the clumsily paternalist deployment of popular science ("Dad, are there genes on my plate?", SDCMA 2001: 13) and the naked emotionality of the images deployed in their current PR blitz. The media are full of glossy pictures of rugged ranchers and cute Asian moppets whose lives will (or, if we read the small print carefully, may) be transformed by GM crops.

One or two mildly critical newspaper articles have recently argued that current GMOs benefit farmers but not consumers; to gain their support, the biotech industry must work harder on crops that will be more nutritious or help prevent disease. (Curiously, these writers never mention that those who really profit from current GM crops are the biotech corporations.) This kind

of GE is more complicated and uncertain, takes longer, and is more expensive, which is why the glossy advertisements refer to such benefits in the future conditional. Golden rice, the first such product to reach the stage of a reasonable bet, is an invaluable asset for the biotech industry: for the price of a few gene sequences and patents, and by carefully glossing over the political and economic distinctions between corporate and public-sector GMOs, the biotech corporations present themselves as technical wizards and humanitarian benefactors. The association with golden rice bathes their own GM crops in a golden glow of disinterestedness. In fact, while the technical contributions and patent donations from Syngenta were an indispensable foundation for its creation, if golden rice does eventually improve nutritional standards among the Asian poor, it will be precisely because it is not a corporate GMO, but was developed, tested, and distributed to farmers through public institutions and at public expense.

To conclude, the biotech lobby represents GM crops as produced by disinterested scientific experts who have responsibly identified and rigorously tested all the risks that GMOs might entail - this, they say, is why these products have been endorsed by regulatory bodies like the FDA. The connection between the design of GMOs and corporate goals is glossed over, though the corporations' rights to claim ownership of lifeforms or genetic sequences, and to recoup their investment costs, are frequently invoked if anyone raises objections to the iron control they exercise over users, or to the legal privileges they claim.

To opponents like me it seems clear that the science the biotechnology lobby produces is highly biased, and that most GM crops are deliberately designed to increase the power and profits of corporations at the expense of citizen's rights, national sovereignty, and the survival of poor farmers. We see the potential hazards of GMOs as multidimensional and complex, current testing as inadequate, and US regulation as a joke. Obviously we would like to convince the US public to look more critically at GM foods and crops. "But what about golden rice?" my students ask. "Don't we need GM crops to save the world from disease and starvation?" To frame a convincing reply, it seems to me that we must make the crucial distinction between public and corporate control of genetic engineering, and insist upon addressing the social and political dimensions of this new technology.

## BIBLIOGRAPHY

- ANDERSON, Luke  
1999 *Genetic Engineering, Food, and our Environment*. Vermont: Chelsea Green.
- BECK, Ulrich  
1999 *World Risk Society*. Cambridge: Polity Press.
- BRAY, Francesca  
1994 *The Rice Economies: Technology and Development in Asian Societies*. Berkeley, University of California Press (1st ed. Oxford, Blackwell, 1986).
- BRAY, Francesca  
2002 "How wholesome is that soup? The political contents of the refrigerator", in Roger T. Ames (ed), *Technology and Human Values on the Edge of the New Millennium*. Honolulu: University of Hawaii Press.
- CROOK, Tony  
2000 "Length matters: a note on the GM debate", *Anthropology Today* 16, 1: 8-11.
- MARVIER, Michelle.  
2001 "Ecology of transgenic crops", *American Scientist* 89 (March-April): 160-167.
- POLLAN, Michael  
1998 "Playing God in the garden", *New York Times Magazine* (25 October 1998).
- ROSSET, Peter M.  
2000 ward a political economy of opinion formation on genetically modified foods", *Medical Anthropology Quarterly* 15, 1 (special issue on GM foods): 22-25.
- SDCMA (San Diego Center for Molecular Agriculture)  
2001 Foods from Genetically Modified Crops (brochure).
- VIDAL, John  
1999 "Grim reapers", *The Guardian*. (17 August 1999).