



ENGINEERING **The FARM**

**Ethical and Social Aspects of
Agricultural Biotechnology**

**Edited by
Britt Bailey and Marc Lappé**

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For Melissa, naturally!

—B.B.

To Jacqueline and our children's safe future.

—M.L.

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Preface

Britt Bailey

The transformation of agriculture from the hybridized conventional food crops to types that are now genetically engineered literally happened overnight. Before the mid-1990s, virtually no acreage was planted with genetically altered plants. In 1996, there were suddenly 500,000 acres planted. By the end of 2001, there were nearly 100 million acres planted globally.

According to the environmental community, we were witnessing a complete revolution in farming. To the industry creating genetically modified crops, the scale and rate of conversion merely represented the switch of a “tool.” Just as hybrid seeds, the tractor, and chemical inputs were considered tools, so too was the tweaking of seed genetics. The biotech industry had been hard at work for more than a decade developing plants that would permit technological advances in weed control and pest protection. First onto the market were herbicide-tolerant plants (plants made to withstand the company’s weed-killing brew) and plants with built-in insecticides. For industry, the resulting products were barely worth regulatory hubbub, and certainly did not require the heat of worldwide debate they kindled. But to consumers and environmentalists, debate, battle, and counterrevolution were precisely what was demanded by the new technology.

In a sense, I was one of the foot soldiers in this counterrevolt. In 1998, for the second time in two years, I found myself in the Netherlands discussing agricultural biotechnology with colleagues from around the world. I took a seat for my afternoon panel discussion next to an agronomist from Canada. He leaned toward me and said, “There

is nothing wrong with biotechnology per se, it has just become a flashpoint for all that is wrong with agriculture.”

I leaned back in my chair and, to my surprise, agreed. Maybe agricultural biotechnology *was* simply taking the heat for a quarter century of environmental insults and economic dislocations thought to be caused by monoculture-style cropping systems and the overuse and dependence on chemicals and synthetic fertilizers. Biotechnology could be easily seen as a perpetuation of an earlier tool, a style of farming that had begun with the introduction of the tractor. Maybe agricultural biotechnology was simply the next step in the Green Revolution’s utilization of chemical-demanding hybrid seeds. Either way you looked at it, at the close of the twentieth century, farming was suddenly in a state of siege.

But I disagreed with the flashpoint conclusion. I pondered the short discussion with the agronomist. There was something wholly different about biotechnology. Beyond the perpetuation of existing intensive farming practices, albeit with a biological twist, agricultural biotechnology presented a technological development requiring social discourse and thought. The public, however, was being asked to greet this new technology with open arms. One could almost see a billboard with an attached spotlight shining down on the words, “Hey world, look at the twenty-first-century way we are growing our food! How do you like them engineered apples?”

Before coming to the Netherlands, I had held daily discussions about agriculture and biotechnology with Marc Lappé. We did not find ourselves talking about the scientific data per se, although we found new studies fascinating and scrutinized them thoroughly. Instead, we traced the histories of our earliest memories of gardening (neither of us are farmers) and our memories surrounding food. I heard stories about his Grandma Hench’s meals and his Grandpa Phillip’s fresh-baked bread. And I responded with colorful recollections of summers spent with my grandmother in the coal-mining region of West Virginia. She taught me how to pull carrots and collect eggs from the chickens, and encouraged my game of leaping into haystacks. These were some of our memories of food and farming, and they were making their way into our attempts to understand the fuel of the arguments surrounding genetic engineering.

I was fortunate to grow up in Memphis, a city surrounded by fields of soybeans, cotton, and rice. By the time I was in high school, however, the downtown cotton warehouses were being turned into luxury

condominiums, though the names of the businesses that depicted the bustling history of the city were still faintly readable on the sides of the brick buildings. One of the main financial institutions in Memphis is still called Union Planters. The farmers in the area had witnessed every step of technological progress over the years. On one trip home, I spoke with a local farmer who said he could not stay competitive unless he adopted the use of biotechnology. Bioengineered seeds were responsible for driving down the prices of final products. The biotechnology industry believes that its technology makes life easier for the farmer as well as decreases the overall price of inputs. But is it simply pushing farmers into a technology in order to stay competitive?

While farmers were trying to stay solvent, the public outcry surrounding bioengineered foods was getting louder. Marc and I believed that many of the reasons for public dismay and distress concerning agricultural biotechnology could be tracked to romanticized and likely more ecologically sustainable ideals about our food and farming. It was obvious to us that Europeans were in the throes of a new food scare, notably mad cow disease and dioxin-contaminated soda. Yet underneath their anxiety, Europeans were leading the advance for a cultural return to products that had not traveled halfway around the globe before finding their place on a Sainsbury shelf. In Europe, increasing numbers of people desire meat from animals that have not been raised under horrendous conditions requiring the widespread use of antibiotics or hormones. There has been an increasing demand for foods grown organically, or biodynamically. Being able to trace food on a supermarket shelf to its original soil is ever important to Europeans.

In the United States, the public, or consumers as they are now called, also appeared upset by the introduction of genetically engineered foods, but for different reasons than Europeans. The concerns were much more culturally oriented. Americans did not like discovering overnight that their food had been genetically engineered, leaving genetic by-products infused into their morning cereal and evening garden burger. They focused on the lack of democratic discussion prior to the food transformation, and questioned the corporate monopolies forming with each engineered commercialization.

In time, challenges to the introduction of genetically engineered seeds stretched into concerns of public health and environmental safety. What were the health effects, if any, from eating a gene from the germlike *Bacillus thuringiensis*? What ecological changes could we expect from the extensive shift in farming? I believe that scientific ques-

tions will continue to be asked, answered, argued, and answered again. Much of the polarization inherent in the topic is being staged on the results of scientific studies. Does *Bt* affect the immune system? Are monarch butterflies harmed by *Bt*-containing pollen? Will traditional weedy relatives of our domesticated cultivars become superweeds or extinct? Or will the impacts of biotechnology be more subtle?

In addition, Marc and I continue to believe the uproar surrounding biotechnology is fraught with fundamental social, cultural, and ethical issues not entering enough public discussions. Collective deliberations are necessary when entire systems, particularly those involving food production, shift and change. Questions about how we can protect and support indigenous farmers during the genetic shift, whether we should buffer centers of biodiversity, and whether we should be introducing a biotech farming style at all are but a few of the ones left out of industry's marketing equation. It was the recognition of this collective void that moved us to develop a grant that would fund a discussion among activists, scholars, and lawyers. It is our belief that much of the political and scientific pandemonium has occurred because the societal issues were shoved under the industrial carpet, rarely seeing the public light of day.

The Richard and Rhoda Goldman Fund has supported and graciously encouraged our work. In September 2000, at our office in Gualala, California, we convened a meeting of a dozen colleagues with varied perspectives and backgrounds who could pinpoint the most important social issues associated with biotechnology. The result of that meeting and hours of discussion and writing is contained in this book.

We hope these essays will shed light on topics that have not made the magazines or been demarcated by thirty-second news clips showing yelling activists in butterfly costumes and gas masks. Protesters seeking the media spotlight, yet knowing that regular folks in dungarees and T-shirts talking about their convictions is hardly news, are taking to the streets in full costume holding cleverly worded signs. In the fast and furious world of news stories, the necessarily complex understanding of social issues often loses out when a life-size glowing orange monarch butterfly or Greenpeace's monstrous green Franken-Tony the Tiger provides a better visual cue.

Behind the costumes and signs, people motivated by deep philosophical concerns have taken to the streets. Could the biotechnology industry ever have believed its innocuous bit of sci-fi tweaking would touch the common nerve? Agricultural biotechnology challenges our

notion of food and the meals we share, its nutrition and our health. For many, genetically engineered foods threaten to uproot our traditional images of family, religion, culture, and society. The surge of the bio-engineered conversion threatens to unseat and override ecologically based methods of farming. Fundamentally, it challenges our relationship with this planet.

This book is intended to help depict the broader, societal story. Ideally, it will help shed light on the underlying convictions many people have about their food and their need to protect the increasingly fragile environment. It will also illuminate the growing monopolistic concentration of food production.

We discovered in the process of compiling and writing this book that the ethical and social issues associated with the technology are vast, complex, and often transcend traditional ethical analysis. Indeed, although there are scholars, philosophers, scientists, and lawyers among the contributors, none claims to be a formal “ethicist” in name or training. For many of us, biotechnological advances trigger ill-defined emotional stirrings. This deeper impact has motivated many of us to read beyond our traditional areas of expertise, to read ecological studies, treatises on biodiversity, patent and labeling laws, and endless policy documents both national and global. For those of us who strove for a foundational understanding of the challenges associated with agricultural biotechnology, nothing short of a deep search into the related annals of philosophy, law, agroecology, and anthropology proved sufficient.

We found the debate surrounding the infusion of new genes into crop seeds and food to be riddled with paradox.

- While some farmers are sold genetically engineered seeds in the name of lessening their costs, others are being bankrupted by the technology.
- Biotech foods are being promoted as a means to feed the burgeoning population, yet acres of genetically engineered seed seem to be yielding fewer bushels than before.
- Bioengineers point to the patenting system as a prime motivator for their inventive energies, but patenting removes the ability of many people to feed themselves with native varieties and cultivars of plants.
- Industry claims biotechnology is better for the environment, while activists and some researchers remain skeptical about its hidden ecological consequences.

- Agronomists point to a growing cornucopia of new seeds, but those trained in biodiversity remain undecided as to whether plant biotechnology threatens to reduce organism or genetic variation, or represents a tool that will rescue threatened landraces.
- Biotechnology companies claim their technology is more precise than conventional breeding and therefore should prove less threatening to public health. Some consumers and medical researchers believe new genes introduced to foods present potential novel allergens and health risks.

While the public has consistently stated its desire to have foods containing genetically engineered by-products labeled under a banner of a right to know, industry has exponentially increased production. Today, eating foods that *do not* contain genetically modified ingredients has become a virtual impossibility. While the public has demanded a right to choose foods free of engineered by-products, as contributor Paul Thompson points out in chapter 2, we have a stronger argument in a right to an exit from the pervasive engineered food system more generally. The only possible escape is the purchase of premium-priced organic foods. In chapter 4, Norman Ellstrand portrays how even organic crops may be tainted by genes flowing from engineered varieties. Genetic modification may herald the loss of entire ecosystems filled with traditional weedy varieties and landraces of plants as they become increasingly contaminated with pollen from new genetically engineered varieties.

Agricultural biotechnology represents a technological progress to some and disaster to others. For example, as Lori Andrews points out in chapter 5, the 1980 decision to allow patenting of genetically engineered organisms opened the door to development and commercialization of corporately owned seeds. Yet, the patent decision is also thought to have contributed to the scale-up of the bioengineered revolution, complete with corporations perceived as monopolistic seed dictators. Biotechnology has concentrated the global seed supply into the hands of a few corporations. For many people uneasy about the complete acceptance of the mix between technology and our food, bioengineered seeds represent a further dislocation from Nature. Carolyn Raffensperger and David Barling eloquently provide their passionate voices on this subject. Peter Rosset contributes a detailed and impassioned essay regarding the ability of bioengineered crops to feed the world.

We recognize the difficulty inherent in reviewing all of the various issues associated with agricultural biotechnology. What we offer here are voices of those concerned about the scale and scope of our newest transformation in farming. In our efforts to present diverse viewpoints, we have solicited essays from those outside academia, such as Brewster Kneen, Peter Rosset, and Carolyn Raffensperger. And, we have essays from those within academia, notably Lori Andrews, Paul Thompson, Sheldon Krimsky, Norman Ellstrand, and David Barling. We have brought together this group of writers because of our desire to broaden the base for understanding our societal response to agricultural biotechnology, and to move the discussion beyond the science and politics into the realm of social and ethical discourse.

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Introduction: GMOs, Luddites, and Concerned Citizens

Marc Lappé and Britt Bailey

In the early 1990s, the newest Green Revolution was heralded by a spate of genetically engineered crops created in the laboratories of major producers such as Monsanto, DuPont, Rhone-Poulenc, and Aventis CropSciences. In spite of its science fiction connotations, the technique of genetic engineering was in truth “borrowed from nature.” The earliest forms of plant crops were modified by capitalizing on the existence of *Agrobacterium tumefaciens*, a plant bacterium that had the capacity to insert its own DNA into a plant cell. The key attribute of the bacterium was its ability to have its own DNA sufficiently well ensconced that the plant itself would be tricked into making more bacteria as well as its own vital foodstuffs.

It was a short step from this realization, known since the 1960s, to using the bacterial insertion system to carry new genes into plants that had been selected by agricultural engineers. Thereafter, scientists conspired to come up with ever more elegant methods of co-opting plant genomes to accept and process human-selected DNA that would confer attributes of commercial or societal interest. It is precisely this tension—between the social and commercial values of newly engineered crop plants—that informs much of the early debate on genetic engineering.

Some key questions surround genetic engineering: To what extent did the pioneers from major chemical companies have an obligation to meet social needs in agriculture compared to assuring the commercial success of their own chemicals? What societal concerns about equity, distribution, and fairness does any new commodity have to serve? And

when a new commodity displaces an entire industry, as may now be the case with engineered food crops such as soybeans, should the producers have some form of societal consent?

From the beginning, the proponents of intentionally gene-modified food crops resisted the use of phrases such as “GMOs,” or genetically modified organisms, to describe their inventions. The term GMO has been challenged by some biotechnology advocates as pejorative, because it implies that previous food crops were somehow not modified. Of course, many such plants were originally selected precisely because of their different genetic characteristics. At least one, the Asian pear, was expressly bred to allow the genes from a virus to enter its genome in order to combat a risk of blight. With these understandings, we nonetheless use the term GMOs in this book to describe gene-inserted plants and animals.

Proponents cite the prospect of these newly modified crops to transform agriculture, increase productivity, and shift our dependency on pesticides as justifying arguments for rapid expansion. One might reasonably ask whether such expectations were realized in the first decade of agricultural biotechnology. To some extent, one can argue that the expectations of agricultural biotechnologists have been fulfilled, as significant percentages of major staples such as soybeans and corn become replaced by engineered varieties, and the use of pesticides in other modified crops, notably cotton, has begun to shrink. But many environmentalists and activists remain concerned that GMOs carry hidden risks and costs to society, and may only serve to sustain our long-term dependency on chemically intensive agricultural systems.

Others decry the absence of a democratic process to guide and direct the use of genetic technologies, and challenge if the dimensions and extent of such use is currently warranted from a societal point of view. Still others question fundamental ethical issues in the dissemination of GMOs: Should any derived benefits of GMDs first be found to outweigh their risk of transforming other organisms in their environment.

The thoughts and writing of some of the most outspoken and insightful analysts and critics of the new revolution in engineered food crops have been assembled in this book. For the reader interested in the historical roots of the anti-biotechnology movement, the essays by Marc Lappé and David Barling provide perspective. The broad ethical issues in deciding where and when to introduce genetically altered crops are explored by Sheldon Krinsky. A related perspective is offered

by naturalist Brewster Kneen, who discusses how agricultural and ecological values can sometimes clash. Norman Ellstrand provides an important essay that explores the risks to the ecosystem from genetic drift. Lori Andrews, a professor of law, offers a perspective on the role of patenting in permitting the explosive development of GMOs. Britt Bailey explores the question of health risks from GMOs, while Peter Rosset provides a critical analysis of the claim that bioengineered foods will feed the world.

Paul Thompson, a philosopher, argues forcefully about the minimum ethical condition for permitting GMOs to be marketed as consumer products. He argues that the consumer must have an “exit” from a system increasingly dominated by a single type of commodity that may not, for a variety of reasons, be acceptable. Carolyn Raffensperger, known mainly for her work in popularizing the precautionary principle, explores how a person might construct ethical arguments about GMOs that in part recognize Thompson’s position.

Among the arguments in this book is the claim that many of these new genetically modified plants, such as Roundup Ready™ soybeans and their by-products, swept into the agricultural sector before the public—and the scientific community—had an adequate opportunity to debate their utility and safety. The industry counterpoint, that sufficient field tests and regulatory submissions were made to satisfy those federal agencies assigned the task of vouchsafing new products and pesticides, has defined the present status quo. We acknowledge that the agencies charged with overseeing the evaluation, field tests, or pesticidal properties of GMOs—respectively, the Food and Drug Administration (FDA), the U.S. Department of Agriculture (USDA) (especially the so-called APHIS program, which oversees field testing of crops), and the Environmental Protection Agency (EPA)—have never found sufficient public health or environmental concerns to suspend introduction, to require labeling or other disclaimers, or to restrict the presence of gene-directed pesticides in field crops except in one instance where a pest-protected plant was deemed fit for animal fodder but not for human food. This case, known as the StarLink episode, later gave regulators pause as the first example of widespread contamination of non-GMO crops with an unapproved gene product.

The current situation is a uniquely American status quo, one that permits market forces both here and abroad to shape the success or failure of GMO food crops. In Europe and Japan, in particular, governments have been loath to take at face value the equivalence of

GMOs to their traditional counterparts. They have introduced import restrictions and labeling requirements. Other countries, notably Canada, Australia, and New Zealand, have been urged by the United States to “go slow” and have delayed their labeling decisions until 2002 or later. However noble the concerns or opposition, U.S. governmental forces have encouraged these countries to accept GMO-based American produce on the strength of our indigenous experience and the assurance that we have done our part in reviewing the safety and non-invasiveness of the newly introduced genetic information. In part because of the overwhelming predominance of what is perceived by activists as a uniquely American-driven, pro-biotechnology position emerging among conservative world governments, the editors of this book believed it would prove useful to provide an array of critiques that question the present system.

In preparing this book, we have carefully selected contributors from a broad spectrum of political and activist persuasions. Not everyone has a blanket opposition to GMOs, nor do all of the writers come from the same political position or environmental perspective. In presenting this full range of opinions about GMOs, we hope to provide a litmus test for the cogency of the activist community’s arguments. At a minimum, we hope to demonstrate that further debate of the ethical implications of GMOs is worthwhile and valuable.

A key factor in our decision to write this book is that consumers have had little opportunity to understand the full spate of potential environmental and public health consequences of new genetically engineered crops before being faced with the flood of GMOs now found on grocery store shelves. We also recognize that the reasons for the gulf between the two (or more) sides contesting genetically engineered foods are complex. Some critics believe that regulatory agencies such as the FDA, EPA, and USDA gave agricultural biotechnology a premature approval based on company assertions of safety and the “equivalence” of their products to preexisting food crops, before those claims could be fully scrutinized. To the activist community, the promotion of the belief in the absolute equivalency of GMOs to traditional foods, generally recognized as being safe, was seen as a corporate decision to expedite marketing rather than one based on sound science. From the corporate point of view, the testing and scale-up of production was fully lawful and reasonable, and was nothing more than business as usual.