Todd Kim Plays Offense on Environmental Defense

NOVEMBER/DECEMBER 2022

THE Environmental FORUM

Advancing Environmental Protection Through Analysis | Opinion | Debate

Cut the Red Tape

Success
Biotech Provides Gains in Wellbeing

Uncertainty
Court Case Raises Major Questions

Ambition
Saving the Climate Requires Tradeoffs

The Environmental Law Institute's Policy Magazine for the Environmental Profession

A Bounty of Benefits

Under intensive regulatory, commercial, and academic oversight, and notwithstanding its widespread and rapid rate of adoption, biotechnology has produced huge gains in well-being that have flowed to society without any evidence of adverse health or environmental effects

Stanley Abramson is a counsel at the ArentFox Schiff law firm in Washington, D.C., where he co-chairs the firm's Life Sciences Group. His practice focuses on biotechnology and other emerging technologies.

Karen Carr is a partner in the D.C. office of ArentFox Schiff. She counsels, advocates, and litigates on behalf of food and agriculture companies and trade groups.

NEARLY 70 years have passed since the world was introduced to DNA, the molecule that encodes heredity. And it is 35 years since the first experiment with a genetically engineered organism in a strawberry patch in California. Since then, field tests with GE plants have been conducted 20,000 times in the United States, under the watchful eye of agencies acting under the Coordinated Framework for Regulation of Biotechnology. Over 200 GE food and agricultural products have been cleared for commercialization following review by one or more of the three agencies involved in the framework—the U.S. Department of Agriculture, the Food and Drug Administration, and the Environmental Protection Agency.

In contrast to most new technologies, opposition to the use of genetic engineering and calls for regulation developed well before any products were on the market or even tested in the open. Some in the expert community, including academics and NGO scientists, demanded to know more about the potential ecological effects of growing GE crops and potential health effects of consuming food from those crops. Even after science-based protocols were put in place, and premarket review regulations adopted under USDA, FDA, and EPA statutes to ensure GE products would be as safe to grow and eat as their conventionally bred counterparts, a number of public interest groups and European governments were still opposed. Some remain so still.

In the meantime, with GE crops grown and consumed globally since 1996 on 7 billion acres in up to 29 countries, there are unprecedented amounts of peer-reviewed safety data—and no evidence that GE crops or foods have caused any adverse health or environmental effects, nor has any court ever found that to be the case in spite of dozens of legal challenges. GE crops have allowed farmers to realize such benefits as higher yields (growing more food per acre), a significant reduction in pesticide application using insect-resistant crops coupled with a corresponding reduction in worker exposure in the field, and the ability to fight weeds well into the growing season with herbicide-tolerant crops. Newer plants with consumer and health benefits have begun to further diversify this mix. As a result, GE crops support sustainable development in numerous ways, including food security—providing a safe, nutritious, and affordable supply for all consumers—while contributing to a reduction in food waste and minimization of agriculture's environmental footprint, importantly its climate impacts.

Under intensive regulatory, commercial, and aca-

demic oversight, and notwithstanding its widespread and rapid rate of adoption, biotechnology has produced benefits that have flowed to society without any evidence of adverse health or environmental effects. It is a fair question to ask how many other new technologies can point to such an enviable track record. However, biotechnology has not been without its skeptics.

The fears and concerns initially raised with genetic engineering were based largely on uncertainty and lack of experience at a point at which any GE products were still in the R&D stage and there was an absence of any significant educational effort regarding the underlying science. This was particularly true with respect to the novel use of recombinant DNA techniques, which allow genetic material to be joined from organisms that would not share their genes in nature. Unlike the well-recognized risks associated with certain existing products that gave rise to many of our health and environmental regulatory programs in the 20th century, any risks that might be associated with biotechnology were purely speculative and hypothetical.

Did the Coordinated Framework and the health and environmental statutes at its core help facilitate the unprecedented adoption of products of this new technology by the food and agriculture sectors? Without question. Was the lack of any evidence that these products have caused adverse health or environmental effects a key factor as well? Absolutely. Is it time to take a close look at the science and the experience gained over the past 35 years and adjust our regulatory oversight accordingly? Positively.

IN 1990, FDA completed premarket review for the first GE food product under the Coordinated Framework. It cleared the path to commercialization for the first GE food ingredient, the chymosin enzyme, for use in cheese and other dairy products. Fast forward to 2019, when GE crops were grown commercially on over 176 million acres in the United States, with soybeans, corn, and cotton making up the bulk of these acres, followed by canola, sugar beets, alfalfa, potatoes, papaya, squash, and apples. In the same year, an estimated 17 million farmers planted GE crops on a total of 470.5 million acres. From 1996 to 2019, GE crops were grown worldwide on an aggregate 6.7 billion acres, providing food, feed, fuel, and shelter to a global population that reached 7.7 billion, with estimated economic benefits of over $225 billion.

Nobel Laureate Norman Borlaug believed that genetic engineering was the only way to increase food production in a world with rapidly growing population and disappearing arable land, and that GE organisms were not inherently dangerous because society has been genetically modifying organisms for a long time. The use of yeast microbes in baking and brewing as early as 6000 B.C. was the earliest practical use of genetics that we know of, followed by the centuries-old crossbreeding of plants and animals for desirable traits. But as Borlaug knew from his own research, crossbreeding could take decades before a useful new

variety was created. Other breeding methods, used successfully since the 1950s to develop new crop varieties with chemicals and irradiation, also require multiple generations of plant selection and backcrossing. From the relative randomness of those techniques, many of which are still in use today, researchers have added the more recently developed molecular biology methods, referred to here as genetic engineering, which are far more precise and sophisticated, allowing scientists to develop and test new products safely and expeditiously.

To the extent that the regulatory processes put in place for GE products were able to allay the fears of the

general public and scientific community by identifying and avoiding any potential hazards associated with the technology, the pre-implementation vantage point has been an advantage. But it has simultaneously been a burden because it requires decisionmaking in the early years in the face of a significant degree of uncertainty about both risks and benefits. Fortunately, that uncertainty motivated scientists and regulators to develop and utilize risk assessment techniques for evaluating the safety of GE products and risk management methods to address any concerns that may be identified, all of this prior to commercialization.

Looking back, it is easy to question the need for rigorous premarket review of many food and agricultural biotechnology products. At the outset, however, considerable political pressure was brought to bear on the government to do just that for all biotechnology products and particularly for microbes and other products that would be tested and ultimately put to work in the open environment. With the near unanimous support of the scientific community, the National Institutes of Health issued "Guidelines for Research Involving Recombinant DNA Molecules" in 1976, which rapidly established the de facto standard for recombinant DNA research in the public and private sectors.

Acting under those guidelines, NIH approved what would have been the first "deliberate release" experiment of a GE microbe in the open environment. The approval was challenged in federal court by the Foundation on Economic Trends, a nonprofit established by Jeremy Rifkin, an American economic and social theorist, writer, and activist, who took an early interest in biotechnology and was its primary, self-appointed watchdog for many years. The suit against NIH was the first of many to be brought by FOET and others.

Based on his finding that NIH had failed to meet its obligations under the new National Environmental Policy Act, Judge John Sirica enjoined both the experiment and NIH approval of any future deliberate-release experiments. On appeal, the injunction was affirmed as to the proposed experiment, but vacated as to NIH approval of future experiments. In an insightful concurring opinion with respect to scientific experimentation, public interest, and government oversight, Senior Circuit Judge George MacKinnon stated that he could understand how scientists knowledgeable in the field would approve the experiment, particularly when, in his view, "It would seem an experiment that releases into the environment organisms substantially the same as some already living there, and subject to the same naturally occurring controls, would present no risk." He went on to say, however, that "the general public and those who have to pass on this action are not knowledgeable in this field and they are easily frightened by new scientific experiments and their possible consequences. It is such lay concerns that must here be satisfied by Environmental Assessments and Environmental Impact Statements," under NEPA.

The injunction against NIH approval of this experiment on procedural grounds and subsequent challenges against EPA, albeit unsuccessful, signaled an abrupt end to any perceived honeymoon period for experiments in the environment, sent shockwaves through the burgeoning agricultural biotechnology research community, and caught the interest of many in the public-interest field as well. A report on the environmental implications of genetic engineering issued in 1984 by a House oversight subcommittee concluded that "the current regulatory framework does not guarantee that adequate consideration will be given to the potential environmental effects of a deliberate release" and recommended a moratorium. The Congressional Office of Technology Assessment warned of threats to the initial preeminence of U.S. biotechnology companies. Right on cue, draft biotechnology oversight legislation began to surface on Capitol Hill.

The growing public and political uneasiness with biotechnology research, including field tests of recombinant DNA organisms, and the inherent delays, costs, and unpredictability of litigation, were particularly concerning at a time when the R&D landscape had changed dramatically. Now, in addition to experiments being conducted in laboratories and greenhouses at numerous public and private research institutes, significant investments were being made by major corporations in the development of new biotechnology-derived products to be tested in the field. Fears of stifled innovation and a loss of the competitiveness of U.S. producers were raised at the highest levels of government and, in April 1984, the Reagan White House established an interagency working group to study and coordinate development of a regulatory policy.

WHEN developers produce a new technology with applications in multiple different areas, it should come as no surprise that the authority to regulate products of that technology will rest with several overlapping government units. In the case of biotechnology, nine departments and eight agencies were tasked to undertake a top-to-bottom review and then develop recommendations for additional regulatory oversight, if warranted, while maintaining flexibility to accommodate new developments. Although both administrative and legislative actions were nominally on the table, there was a strong incentive to avoid any new law that might end up limiting progress rather than promoting it.

Continued on page 28

SIDEBAR

A Valuable Tool—If It Is Used Carefully

Gregory Jaffe
Senior Director
Center for Science
in the Public Interest

"Advantageous traits such as drought tolerance, nitrogen fixation, and nutritional enhancement could impact the major food and agricultural challenges our country and world face"

Agricultural biotechnologies are important tools that can help mitigate and adapt to climate change, and improve nutrition security. However, the products of those technologies must be safe for humans and the environment and be utilized sustainably.

The first generation of engineered products—soybeans, corn, cotton, and canola resistant to herbicides or that produce their own pesticides—have been regulated by a system that can be described as "case by case." Depending on the organism and the introduced trait, one, two, or three agencies (USDA, FDA, or EPA) review each individual product using existing laws to ensure it does not have an adverse impact on food safety and nutrition, agricultural interests, or the environment. Some federal oversight is mandatory (registration at EPA for pesticide-producing plants) while other procedures are voluntary (FDA's oversight of biotech plants). Some procedures are transparent and allow for public input (USDA deregulation of engineered plants) while others are not (FDA's approval of engineered animals as new animal drugs).

More importantly, the regulatory system focuses more on the requirements of the law being applied than the potential risks and impacts of the product. Recent changes to USDA's oversight now remove large categories of products from oversight, but without the necessary scientific evidence to justify those exemptions.

The federal government needs to institute science-based and proportionate oversight that ensures biotech plants and animals are safe and do not adversely affect the environment. FDA's oversight for biotech plants should be mandatory, and the agency needs to confirm that products are safe. USDA should not allow developers to self-determine whether their products meet one of the agency's exempt categories and it should base any exemptions on the organism and introduced trait, not solely on the type of genetic change. FDA should establish proportionate regulatory procedures for animals with genomic changes so that it does not require the same degree of oversight for a gene-edited animal that introduces an existing gene from the same species (a dehorned cow) as it does for adding a gene from an unrelated species (salmon engineered to grow faster).

Engineered and edited products need to be used sustainably and provide benefits, both of which only can be determined case by case. While insect-resistant crops have been associated with significant reductions in chemical insecticidal sprays, overuse of Bt corn has led to resistant pest populations. Crops engineered to withstand herbicides (glyphosate-tolerant corn, cotton, and soybeans) have increased use of certain herbicides but also replaced others—for other examples, see the CSPI Report, "In the Weeds." Depending on the crop and chemical, the net result of such substitutions can be increases in different herbicides but not necessarily increased toxicity.

Overall, glyphosate use has increased significantly, but the net result is lower acute toxicity for corn, cotton, and soybeans and increases in chronic toxicity for corn and cotton (with a reduction for soybeans). As has Bt corn, glyphosate overuse with herbicide-tolerant crops has led to resistant weeds, requiring farmers to go back to spraying chemicals that those crops were designed to eliminate.

EPA rightly requires farmers growing Bt crops to take steps to delay the development of resistant pests, but the agency should strengthen those requirements to address resistant insects that have developed. In addition, if a chemical will be sprayed on a herbicide-tolerant crop, EPA should impose conditions that delay development of resistant weeds.

With a regulatory system that is science-based, proportionate, transparent, and timely, genetically engineered and gene-edited products could more easily reach the market in the United States. Then advantageous traits such as drought tolerance, nitrogen fixation, and nutritional enhancement could impact the major food and agricultural challenges our country and world face.

One of the key tasks in drafting what became the Coordinated Framework was to identify an existing statute that was best suited for regulation of each category of products for which biotechnology was being or could be applied. While acknowledging that the then-existing, product-based statutes were not drafted with biotechnology in mind, legal support for relying on those laws was based, at least in part, on *Diamond v. Chakrabarty,* a 1980 Supreme Court decision which upheld the patentability of a GE microorganism under the Patent Act—a law originally drafted by inventor Thomas Jefferson. The framework incorporated statutes that could address virtually every conceivable product category, although none had the pedigree of the Patent Act. The wisdom of using existing risk assessment statutes to review the safety of GE organisms would be recognized in 1987 when the National Academy of Sciences issued the first of several reports finding that any risks posed by such organisms were the "same in kind" as those associated with unmodified organisms and organisms modified by conventional means and, further, that the properties of a GE organism should be the focus of risk assessments, not the process used to produce the organism.

The government needs to meet several challenging health and environmental concerns that can be addressed using the techniques of modern biotechnology

As the federal government wrestled with the challenge of how best to regulate biotechnology, it was confronted with two opposing schools of thought. Some promoted what would come to be associated with the Precautionary Principle, arguing that unless and until all questions and doubts about a new technology have been satisfactorily answered, it could not be trusted and had to be held in abeyance. Others argued for no new regulation based on the fact that GE techniques were simply an extension of conventional breeding. It was also argued that, even without new legislation, regulation could inhibit research and innovation, delay realization of significant societal benefits, and adversely impact American competitiveness.

In the end, the working group established by President Reagan took a middle ground. Products of biotechnology would be regulated based on existing safety standards and would be expected to be just as safe as their conventional counterparts. The public could be assured that a new fruit or vegetable product would be as safe to grow and produce and as safe and nutritious to eat as its conventional counterpart. This approach to regulation was applied regardless of the type of product (chemical, microbial, plant, or animal) or its intended use (agriculture, food, feed, fuel, forestry, medical, industrial, or consumer). With one notable exception, GE products intended for food and agricultural use would be subject to premarket review to the same extent and under the same standards as their conventional counterparts. The exception was USDA's decision to review all GE organisms premarket based on a determination that they posed a potential "plant pest" risk. These fundamental concepts were incorporated when the White House issued the Coordinated Framework.

Regulation, of course, cannot remain static and, as a 2000 NAS report made clear, "Regulations should be considered flexible and open to change so that agencies can adapt readily to new information and improved understanding of the science that underlies regulatory decisions." In this area, EPA, FDA, and USDA have each issued new or amended regulations, policy statements, or guidance documents when deemed appropriate. The agencies have also taken steps to identify individual products or categories of products that either no longer warrant premarket review or qualify for a reduced level of oversight based on experience. The key elements that allow agencies to make these determinations are familiarity with the product category and a history of safe use. Agencies have also moved to increase their oversight of certain product categories when warranted based on a review of product characteristics, exposure scenarios, and other data.

Regulation also has to be able to respond to new scientific developments and, for biotechnology, regulators must now address relatively new genome-editing techniques such as CRISPR-Cas9 that can be used to modify an organism's DNA by insertion, deletion, or substitution of nucleotides at a specific site in the genome. EPA, FDA, and USDA have each taken preliminary steps to engage with the public and various stakeholders as part of the evaluation process for these new techniques. Just as recombinant DNA technology allows for valuable new traits such as disease resistance and enhanced yield to be added to a variety of plants and animals more rapidly and with greater precision than with conventional techniques, there is strong evidence that genome editing will dramatically improve breeding.

Given the anticipated benefits of genome editing in enabling scientists to tackle the spread of new pathogens, the need to feed a growing world population, and the adverse effects of climate change, the pressure to establish a clear, science-based path to commercialization will surely continue to mount. Once again, cautionary arguments have been made and voices have been raised in opposition. This time around, however, we are no longer at the dawn of the genetic engineering age. Scientists and regulators have a wealth of studies—and experience—to draw on in charting a path forward.

SO what have we learned in over 45 years operating under the NIH Guidelines and over 35 years under the Coordinated Framework? Researchers developing GE food and agricultural products have carried out many thousands of controlled laboratory and greenhouse experiments and thousands more of controlled field trials without any reported harm to health, safety, or the environment. Hundreds of beneficial new GE products have successfully completed premarket review and are in widespread use, again without any evidence of having caused adverse effects. Notwithstanding the advanced state of the science and the enviable safety record for these products, court challenges against the regulatory agencies have continued over the past 35 years. Even in those few cases that succeeded, no court has ever found that a GE food or agricultural product was harmful.

Certainly, a legitimate argument can be made that, based on the science alone, there has been no demonstrated need for premarket review of most categories of biotechnology products. So, for example, the closer a GE product comes to its conventionally bred counterpart, the stronger that argument becomes. If the conventional product is regulated solely post-market, then the same should apply to a GE product that meets specified criteria. Like products should be treated the same under the law. This is particularly relevant for gene-editing applications where the resultant products are similar or indistinguishable from conventional counterparts.

Exemptions from premarket review will likely trigger public and political pushback given the puzzling persistence of anti-biotechnology sentiment in some quarters, which is all the more reason for transparency in the risk assessment process. The regulatory agencies have managed to thread this needle for decades and can be expected to continue to find a path forward that respects both the science and the nature of our democratic system of government—including the desire for transparency. Thus, as in the past, each agency should remain open to the identification of individual products or categories of products, regardless of the method of production, that either no longer warrant premarket review or qualify for a reduced level of oversight. While some have called for totally new models and types of regulation for biotechnology, that would almost certainly require authorizing legislation with its inherent risks to future scientific advances.

Perhaps the most persuasive remaining justification for continued premarket oversight is the need to increase public acceptance, particularly with regard to food safety, where some still harbor unfounded fears of effects on nutrition and health. Concerned citizens have not hesitated over the years to demonstrate against the technology, boycott producers, retailers, and restaurants that sell GE food products, and campaign for consumer choice. The message to the regulatory agencies from the continued legal challenges and public opposition seems clear. As Judge MacKinnon advised in 1985, there are "lay concerns that must here be satisfied." Continued emphasis on public education and outreach through all available means with respect to biotechnology, including genome editing, may ultimately help turn the tide.

An encouraging step was recently taken to facilitate consumer choice by food and biotechnology industries and virtually all other stakeholders when agreement was reached on legislation to create a National Bioengineered Food Disclosure Standard. The statute, which had bipartisan support on Capitol Hill, was signed into law by President Obama in 2016, and directs USDA to establish a mandatory, uniform national disclosure standard for human food that is or may be bioengineered. USDA promulgated establishing regulations in 2018. Disclosure of bioengineered content in covered food products became mandatory through labeling or other approved means just this year, adding a useful counterpart to labeling standards under USDA's National Organic Program.

A transparent, science-based regulatory process that recognizes the need for flexibility and the willingness to use it would best meet this objective

While consumers acquaint themselves with disclosure under the new standard, one can certainly argue that it is time for USDA, EPA, and FDA to revisit their current premarket review programs with an eye toward using the extensive experience gained over the past 35 years and the enviable safety record of existing biotechnology products to identify appropriate, science-based opportunities for product exemptions and reduced premarket oversight. There is no need for new legislation. Each of the programs that cover food and agricultural products is science-based, and the governing statutes provide the authority to update policies, guidelines, and regulations, as needed, to reflect current scientific understanding and real-world experience.

Regulation exists to meet government's responsibility toward society. At this time the federal government is faced with the need to meet several challenging health and environmental concerns that can be addressed using the techniques of modern biotechnology to develop valuable and, in some cases, desperately needed new products. A transparent, science-based regulatory process that recognizes the need for flexibility and the willingness to use it would best meet this objective. **TEF**