

Industry exhales as USDA okays glyphosate-resistant alfalfa

US farmers can again plant genetically engineered alfalfa following a decision in January by the US Department of Agriculture (USDA). The ruling, which follows a tumultuous debate and four-year US court-imposed ban, comes as a relief to the agricultural biotech industry. The agency was proposing to place geographic restrictions on planting in response to organic growers' requests. This alternative was only narrowly averted and could have set sweeping regulatory precedents.

"There was probably a collective sigh of relief that the agency stuck with the precedent that it has been relying on since it started reviewing and approving biotech traits," says Jeff Rowe, vice president of biotech affairs and regulatory at Pioneer in Des Moines, Iowa.

But the events that led up to the USDA's decision have left leaders in industry rattled. They are concerned that the agency will begin making non-science-based concessions to the organic community at the expense of biotech crop developers and growers. Some expect litigation delays and longer regulatory timelines for crop approvals.

Alfalfa is a high-protein forage crop for livestock. On one side of the debate are those seeking to sell and grow the biotech variety, genetically engineered to tolerate the herbicide glyphosate through expression of the *Agrobacterium tumefaciens* transgene 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) and brought to market in 2005 by St. Louis-based Monsanto and Nampa, Idaho-based Forage Genetics International. On the other, are those who market organic alfalfa.

Leaders of the organic lobby fear that Monsanto's alfalfa containing the EPSPS transgene will outcross or admix with their organic varieties. One of several reasons why consumers buy organic products is specifically to avoid transgenes in their food; thus, the presence (or 'contamination,' as it is commonly branded) of transgenic material in organic food is viewed as a threat to both the domestic and export markets of organic producers. "This is strik-

ing at the heart of the organic community," says Doug Gurian-Sherman, a senior scientist at the Union of Concerned Scientists in Cambridge, Massachusetts. "The biggest single use for alfalfa is dairy, and organic milk is a premium product." Although there is no validated mechanism in

the literature clarifying how transgenic EPSPS sequences in alfalfa would make their way into cow's milk, the issue is that organic products claim to avoid GM products in any shape or form; thus, transgenic alfalfa presents a problem to organic dairy farmers.

In 2006, a group of organic alfalfa growers and nonprofit organizations, such as the Center for Food Safety in Washington, DC, sued the USDA for approving the GM

alfalfa, arguing that the agency had not fully considered its environmental and economic impacts. A US federal court agreed and in 2007 ordered the agency to conduct a more thorough environmental analysis. In the meantime, crop planting and sales were halted.

USDA worked on the court-ordered environmental impact statement (EIS), for nearly four years. After receiving about 244,000 public comments and holding four public meetings, the agency produced a final EIS on December 16, 2010. The 2,300-page review acknowledged the potential for genes from EPSPS transgenic alfalfa to find their way into nontransgenic varieties but noted that the probability was "low" and depended on several conditions. USDA maintained its conclusion that EPSPS transgenic alfalfa is safe for food and feed purposes and poses no plant pest risk.

On the basis of the EIS, the agency at first proposed one of two actions: either to approve the GM alfalfa fully or approve the crop in part, with restrictions on where it could be planted. For instance, to segregate the transgenic alfalfa from organic alfalfa, farmers would have to set up an exclusion zone of at least 5 miles.

The agency said upon filing the EIS in the Federal Register December 23 it would decide after 30 days which of the two actions it would follow. "This final EIS is a first step toward look-



Planting glyphosate-resistant alfalfa has resumed following the USDA's January decision.

Jason Lugo/istockphoto

IN brief

DuPont swallows Danisco

Early in January, agricultural biotech giant DuPont of Wilmington, Delaware, agreed to purchase Danish enzyme maker Danisco, based in Copenhagen, for \$5.8 billion. The deal has not been finalized, but speculation about the potential consequences of this buyout is rippling through the Danish biotech sector. "We've sold one of our national treasures," says Claus Felby, a professor of wood and biomass technology at the University of Copenhagen. Biotech researchers like Birger Moller, professor of plant biochemistry at the University of Copenhagen, fear that if DuPont decides to move Danisco's manufacturing to the US, this may put an end to an era of fruitful collaboration between industry and basic research in the country. Equally, DuPont's interest in Danisco could send a message about the value of Danish biotech. "It indicates we're sitting on a gold mine here," says Moller. In another recent transaction, Danish enzyme manufacturer Novozymes bought Darmstadt, Germany-based Merck's bioagricultural science unit for \$275 million. Merck's divested Crop Bioscience, which makes inoculants for plant health, is a strong strategic fit for the Danish biotech located in Bagsvaerd. The companies expect to close the deal by May, pending regulatory approval.

Nidhi Subbaraman

Alzheimer's genetic map

Research groups across France, the UK and US are pooling their resources to create the biggest genetic information bank on Alzheimer's disease. Researchers participating in the International Genomics of Alzheimer's Project (IGAP) will compare the genomic data of 20,000 individuals with 30,000 controls. Members of the project include the European Alzheimer's Disease Initiative, led by the Institute Pasteur de Lille and Lille University, the Genetic and Environmental Risk in Alzheimer's Disease group from Cardiff, UK, the Heart and Aging Research in Genomic Epidemiology, Boston University and the Alzheimer's Disease Genetics Consortium at the University of Pennsylvania School of Medicine, Philadelphia. "This is the first time, internationally, we've all gotten together," says Gerard Schellenberg, director of the Philadelphia-based team and professor of pathology and laboratory medicine, University of Pennsylvania Medical School. Each institute will carry out its own association analysis, and those statistics pooled into a meta analysis, says Schellenberg. With almost 50,000 individuals, and drawing on results from the 1000 Genome Project, the IGAP aims to deepen understanding of the molecular basis of rare variants of the disease, Schellenberg says, and identify genetic risk factors for the disease. IGAP's meeting and analysis costs are currently supported by the Alzheimer's Association of Chicago, and Foundation Plan Alzheimer, of Paris.

Nidhi Subbaraman

Table 1 USDA sued for insufficient environmental reviews of GM crops

Crop (event name)	Developer (location)	USDA approval status	Lawsuit	Outcome
GT alfalfa (J101 and J163)	Monsanto and Forage Genetics	Granted: 2005, 2011	USDA was sued in 2006 for failing to fully examine environmental effects of GT alfalfa. Federal court orders USDA to conduct an EIS, and later halts planting.	USDA completes EIS in Dec 2010. USDA again approves GT alfalfa. Activist groups say they will sue again.
GT sugar beets (H7-1)	Monsanto and KWS SAAT AG (Einbeck, Germany)	Granted: 2005, 2011 (partial)	USDA was sued in 2008 for failing to fully examine environmental effects of GT sugar beets. Federal court orders USDA to conduct an EIS and later halts planting.	USDA expects to complete EIS by May 2012. USDA in Feb 2011 partially approves GT sugar beets to allow planting while it completes EIS; growers must meet strict planting conditions.
GT creeping bentgrass (ASR368)	Monsanto and Scotts Co. (Marysville, Ohio)	Pending	USDA was sued in 2003 for allowing field trial planting of GT creeping bentgrass without first properly examining environmental effects. Federal court agrees in part.	USDA voluntarily initiates work on an EIS but has yet to complete it.
Freeze-tolerant eucalyptus (FTE 427, FTE 435)	ArborGen (Summerville, South Carolina)	Pending	USDA was sued in July 2010 for allowing field trial planting of freeze-tolerant eucalyptus without properly examining environmental effects.	Case pending.

EIS, environmental impact statement. GT, glyphosate tolerant.

ing at the ways we can achieve effective coexistence between all sectors of agriculture,” USDA Secretary Tom Vilsack commented upon his announcement of the proposal. “It’s a conversation that needs to happen now and we are not going to shy away from having it” (Box 1).

The reaction from the biotech industry was immediate. USDA had concluded that the transgenic alfalfa was safe with a low probability of gene transmission to other varieties, yet was proposing to restrict planting because of its potential to harm a group of growers’ economic interests. Such a move, the industry feared, would set a precedent where commercial motives would prevail over science-based decisions from the USDA. “By attempting to use the regulatory process...as a mechanism for achieving broader coexistence between growers, USDA is over-reaching its authority and defying legal precedence and the science that has said this product is safe,” Jim Greenwood, president of Biotechnology Industry Organization (BIO) said in a statement.

In a January 5 letter to the White House Office of Science and Technology Policy, farm groups said their international trade efforts would be undermined “if USDA moves forward with injecting non-science-based criteria into the regulatory process.” And a January 18 letter to USDA sent by US Representatives Saxby Chambliss (R-GA), Pat Roberts (R-KS) and Frank Lucas (R-OK) called the proposal “disturbing” because it “politicizes the regulatory process.”

In an attempt to foster better dialog between the biotech and organic communities, USDA on December 20 held a closed meeting for stakeholders to discuss the EIS. “There was a nervous tone” at the meeting “from people trying to understand the process and where it was

leading,” says Rowe at Pioneer, who attended the meeting.

On January 27, USDA announced it would fully deregulate alfalfa without restrictions. But the saga has fomented confusion in the minds of researchers. “I don’t know what to think,” says Bruce Chassy, a food safety professor at the University of Illinois at Urbana-Champaign. “What is mildly encouraging is that after being savaged by the agricultural organizations and congress, [USDA] had the uncommon good sense to drop the issue for now.”

In both the EIS and official deregulation document for GM alfalfa, USDA described co-existence as a goal of the agency—a first for that kind of language in a regulatory document. “We have concerns with that type of language,” says Sharon Bomer Lauritsen, an executive vice president at BIO. “Even though we have a nice clean deregulation of alfalfa, there is obviously some interest on the part of the Department to be looking at coexistence issues.” Those issues, BIO has argued, should be addressed by growers and their neighbors, not the regulatory process.

Until this recent spat involving alfalfa in the US courts, no transgenic crop registered by the USDA had required an EIS in the approval process. Normally, before it deregulates a biotech crop, the USDA must prepare an “environmental assessment” explaining why a crop may or may not significantly affect the “quality of the human environment.” Only if the impacts are “significant,” must the agency conduct a more detailed EIS, according to statutory requirements under the National Environmental Policy Act (NEPA).

In the case of the GM alfalfa, the federal court found USDA’s environmental assessment unconvincing and ordered an EIS. The agency faced a similar legal battle in the US courts with

sugar beets in 2009. After the USDA deregulated glyphosate-tolerant sugar beets the same federal court found the agency’s environmental assessment “ cursory” and ordered an EIS. The agency is still working on that document and announced in February that in the interim, it would allow planting of sugar beets transgenic for EPSPS, as long as they are grown under certain conditions. USDA has faced at least two other lawsuits challenging its environmental reviews of biotech crops (Table 1).

In an attempt to comply with NEPA, and to avoid further litigation and court-ordered EISs, USDA and crop developers have been devoting more time and resources to improve environmental assessments. Both Monsanto and Pioneer, for example, have been providing the USDA with additional information on their products under review. As a result of that additional work, and to account for potential litigation delays and other factors, Pioneer recently increased by “multiple months,” its estimate for the amount of time it will take to get a crop approved, Rowe says. “There were several negative court decisions against the USDA and based on those catalysts, that certainly has changed our strategy,” Rowe says. “It has made us much more sensitive to NEPA exposure and the environmental assessments that come out of the USDA.”

Whether the USDA’s improved environmental assessments will hold up to judicial review has not yet been tested. What is clear is that the industry hasn’t seen the end of litigation over biotech crop approvals. Within hours of USDA’s announced decision to deregulate GM alfalfa, the Center for Food Safety said it would again sue the agency over its alfalfa decision.

Emily Waltz, Nashville, Tennessee

Box 1 Can biotech and organic farming co-exist?

Co-existence—the idea that transgenic and non-GM crops of the same species can be successfully grown near each other—has for years been part of the European regulatory discussion. For instance, EU member states have imposed isolation distances on GM crop growers (*Nat. Biotechnol.* **28**, 133–136, 2010). But it is only in the past 18 months or so that the concept has made headlines in the US with legal tussles at the state and federal level between the organic sector and seed companies or farmers growing biotech crops. In December, as a response to the fierce debate following the USDA's proposals for approving EPSPS transgenic alfalfa, USDA Secretary Tom Vilsack wrote an open letter urging co-existence among biotech, organic and conventional crop stakeholders, suggesting that the agency wants to “forge a new paradigm based on co-existence.”

The clash between biotech crops and organic agriculture has “led to litigation and uncertainty. Such litigation will potentially lead to the courts deciding who gets to farm their way and who will be prevented from doing so.... Surely, there is a better way,” Vilsack wrote. Three months ago, the agency proposed to place European-style isolation distances on EPSPS transgenic alfalfa. It later backed down from that proposal and instead announced in January it would implement nonregulatory measures to address co-existence. For instance, the agency plans to revive its advisory committee on biotech and 21st century agriculture (AC21), which in 2008 produced a report on the issues surrounding co-existence. This time, the committee will be charged with guiding the agency on ways to strengthen co-existence.

But the agency's attempt to address the issue through federal regulations has met resistance from the biotech community. “Farmers have always had disputes and farmers have always been able to work things out without getting a great deal of government involvement in the middle of it,” says Alan McHughen, a plant biotechnologist at the University of California at Riverside. Left to the growers, disputes tend to get settled “with a compromise on both sides,” he says. EW

IN their words

“In defense of the coffee and doughnuts, I would say there are probably some areas you can cut but I am not sure we should be inviting the most knowledgeable scientists in the world to talk about a cure for cancer and not offer them coffee.” Democratic lawmaker Chaka Fattah echoed calls to cut overblown budgets but drew the line at food. (*AFP*, 11 February 2011)

“What disturbs me a little is that a more-than-vivid imagination is needed to think that genealogy research in Iceland is being spied on if there is

nothing behind it.” Kari Stefánsson, executive chairman and president of research at deCODE, comments on last year's WikiLeaks disclosure that Chinese authorities may be spying on the company's genealogy and medical research database. (*Iceland Review Online*, 6 December 2010)

“In recent years, big pharma, through a combination of internal research and acquisitions, has accumulated as much biotechnology capabilities as any biotech. What is left to differentiate big pharma from big biotech?” Columnist Jason Chew highlights the blurring line between pharma and biotech. (*Seeking Alpha*, 20 January 2011)

“It took us 30 years to get to where we are. So it will take some time to understand the next step, to understand the dynamics and the value.” Genzyme CEO Henri Termeer comments on takeover talks between the biotech and Sanofi-aventis. (*Boston Globe*, 20 January 2011)

“You have to ask yourself why are physicians involved with these organizations at all? What's the benefit to society and medicine? In my mind, the answer is little or none.” Jerome Kassirer, Tufts University Medical School professor and former editor-in-chief of the *New England Journal of Medicine*, supports a proposal from over a dozen medical journals to require authors of submissions to disclose payments from hedge funds or other investors. (*Bloomberg*, 19 January 2011)

“As a politician, I tend to listen to the emotions of the people. And yet as an engineer, I also have to listen to the scientific results.” Emmanuel Pinol, vice governor of North Cotabato, Philippines, after the local government uprooted *Bt* eggplant field trials. (*Crop Biotech Update*, 14 January 2011).

“We need new tools. Nothing we've done in the past 40 years has had an impact.” Duane Gubler, professor in infectious diseases at Singapore's Duke-NUS Graduate Medical School, comments on the release of about 6,000 sterile Oxitec OX513A male mosquitoes into an uninhabited forest area in eastern Malaysia, part of a trial aimed at controlling dengue fever. (*Associated Press*, 26 January 2011).

**Video games played with live organisms**

‘Biotic games’ that mimic classic video games have been devised by Ingmar Riedel-Kruse and his team at Stanford. Single-celled organisms are placed in a microfluidics chamber with a microscope camera to track their movements. The image is overlaid on a game board. In PAC-mecium (pictured) the player guides paramecia up and down by changing the chamber's electrical field with a joystick. Paramecia gain points for gobbling yeast cells, and avoiding a computer-animated fish. There's Biotic Pinball, POND PONG and Ciliaball. Riedel-Kruse hopes these biotech games could become part of biology studies and contribute to crowd-sourcing and research. <http://news.stanford.edu/news/2011/january/biotic-video-games-011211.html>

