

Gene Giants Seek “Philanthrogopoly”

Ag monopoly makes mergers suspect – Big Six create “charity” cartel instead, conning regulators and public breeders

Issue: The Gene Giants know their market dominance looks conspicuously like an anticompetitive oligopoly, so they’re launching a series of initiatives – including the false promise of cheap, post-patent GE seeds – to mollify antitrust regulators and soften opposition to transgenics while advancing their collective market control. Meanwhile, the world’s two richest men – Bill Gates and Mexico’s Carlos Slim – are working with CIMMYT (the International Maize and Wheat Improvement Center) to get bargain GE seeds and traits in the hands of farmers in the global South. The notion that farmers will benefit from a post-patent regulatory regime and Gene Giant charity is patently absurd.

Actors: The six Gene Giants (Monsanto, DuPont, Syngenta, Dow, Bayer and BASF) are constructing a paper tiger while outmaneuvering US and European anti-combines/antitrust regulators. These companies account for 76% of total private R&D expenditures in both the seed and agrochemical sectors. Since the global introduction of genetically engineered seeds and the first World Food Summit in 1996, the market share of the world’s 3 largest seed companies has more than doubled to 53.4% of commercial seed sales; the market share of the world’s top 3 crop chemical companies has grown from one third in 1996 to more than one half.

At Stake: Anti-combines rules assume an oligopoly if *four* firms have 40%+ of the market. The world’s *three* leading seed and agrochemical companies have already blown past this milestone. EU and US regulators are getting nervous. Accordingly, the “Big Six” are constructing agreements that aim to scare off competitors, confound regulators and pass off oligopolistic practices as acts of charity – à la cartel.

Policies & Fora: Antitrust regulators cannot allow an oligopoly to control global agricultural inputs. The world needs agricultural biodiversity to achieve the Right to Food and to respond to the uncertainties of climate change. National governments and UN agencies need to respond. The UN Committee on World Food Security (CFS) must address the issue when it meets in Rome, October 2013. UNCTAD should undertake a special investigation of the economic implications for developing countries. The Special Rapporteur on the Right to Food has just warned that the increasing role of agribusiness in the policy work of FAO could risk its credibility.¹ The Special Rapporteur should be invited to explore the private sector’s role in other multilateral agencies related to food and agriculture – including CGIAR, which should also invite the Special Rapporteur to undertake a study of how the CG system is addressing the Right to Food. The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) should examine the impact of seed cartels on germplasm exchange and benefit-sharing when it meets this September.

Seed & Agrochemical Industry Concentration

Despite a staggering level of corporate control over the world's commercial seed supply, the vast majority of the world's farmers – the peasant farmers who feed at least 70% of the world's population – are not tied to the corporate seed chain.² Though the situation varies by crop and region, 80% - 90% of the seed planted by farmers in the global South comes from the “informal sector” – that is, farm-saved seeds (including seed exchange with neighboring farms and seed sales from local markets or seed fairs).³ That means just 10% - 20% of seed requirements in developing countries is met by the “formal sector” – that is, seed companies, government seed sources or other institutions.⁴ Recent studies confirm what farming communities already know: the formal seed sector does not have the capacity to supply the diversity needed in sustainable farming systems or to meet the need for locally adapted varieties, especially in the face of climate change.⁵

Oligopoly?

Competition regulators pay closest attention to the share held by the top four companies in any market. For some decades now, ETC Group has monitored the market share of the leading 10 companies in seeds and agrochemicals. Today, it may make more sense to track the control exercised by the six major seed and agrochemical Gene Giants (who consistently cross-license each other) and – within that – the extraordinary concentration among the three leaders. During 2013, ETC Group will release a series of reports looking at corporate concentration across major economic sectors – including seeds and crop chemicals. Here is a quick summary of the essential figures:

Top 6: The Big Six (Syngenta, Bayer, BASF,⁶ Dow, Monsanto, DuPont) control 59.8% of seeds and 76.1% of agrochemicals. The same six companies have 76% of all private sector R&D in these two sectors. In 2007, the Big Six spent 9 times more on crop R&D than the US Department of Agriculture's (USDA) Agricultural Research Service did, and at least 23 times more than the international crop breeding institutes under the umbrella of the Consultative Group on International Agricultural Research (CGIAR).⁷

Top 3: Global market share of the three largest firms shot up from 22% of the proprietary seed market in 1996 to 53.4% in 2011.⁸ (Today, the three largest firms are Monsanto, DuPont and Syngenta.) The top three agrochemical companies (Syngenta, Bayer, BASF) now control 52.5% of the market, up from 33% in 1996.

The cost of oligopoly: From 1994 - 2010, seed prices in the United States shot up more than any other farm input, *more than doubling relative to the price farmers received for their harvested crops.*⁹ According to the USDA: “This increase, was due, in part, to the increase in value-added characteristics developed by private seed and biotech companies...”¹⁰ One industry analyst estimates that between 32% and 74% of the price of seed for maize, soybeans, cotton and sugar beets reflects technology fees or the cost of seed treatments.¹¹

Between 1982 and 2007 the world's three largest seed firms accounted for nearly three quarters of all US patents issued for crop cultivars.¹²

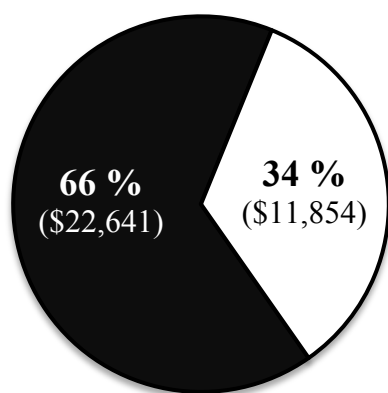
In 2007, Monsanto's GE traits were in 85% of all the land area planted with GE crops in the 13 countries where they are grown.¹³ The Gene Giants accounted for 98% of all biotech acres.¹⁴

The Big Six devote, on average, at least 70% of their seed and crop R&D in pursuit of biotech and genetic engineering. They collectively spent \$2.2 billion per year on average for crop breeding and biotechnology R&D from 2007 - 2010.¹⁵

Global Seed Sales 2011

US\$ Millions

- Total \$34,495 million -

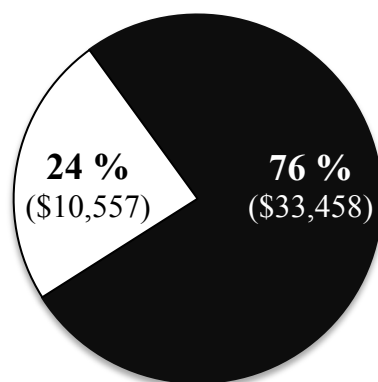


■ Top 6 □ Other companies

Global Agrochemical Sales 2011

US\$ Millions

- Total \$44,015 million -



■ Top 6 □ Other companies

Cause for Cartel: Around two dozen patents on first generation biotech crop traits and technologies are coming off patent in the next 10 years – and the biotech industry insists that it’s a crisis-in-the-making for farmers who grow GE crops and their billion-dollar export markets. The Gene Giants warn that the future benefits of generic biotech crops are jeopardized by the onerous burden of “unjustifiable” regulatory regimes¹⁶ that require periodic re-registration of biotech seeds for commercial cultivation and for food, feed and processing – independent of patent status.

Under the aegis of the Biotechnology Industry Organization (BIO) and the American Seed Trade Association (ASTA), the Gene Giants have been meeting since 2010 to devise contract-based agreements that they claim will prevent a costly disruption of trade and facilitate a “seamless transition” to a post-patent regulatory regime and the benefits of generic biotech crops.

Context: Due to ongoing concerns about the potential impacts of GE crops on the environment, human health and safety, GE seeds must undergo periodic re-approval by biosafety regulators in many countries. The UN Convention on Biological Diversity’s (CBD) Cartagena Protocol on Biosafety, which

entered into force in 2003, is an international agreement designed to regulate the international trade, handling and use of any genetically engineered organism that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health. In the European Union, China, Japan and a handful of other countries that are important export markets for GE crops, national-level regulations require the Gene Giants to re-register their biotech traits every 3 to 5 years.¹⁷

The looming crisis, according to the Gene Giants, is that when patents on biotech traits expire, the breeders who want to use these generic traits must have biosafety approval from the government authorities where they plan to export the GE commodity or cultivate the GE seeds. If biosafety authorizations are not kept up-to-date – even for tiny traces of expired traits – entire barges of transgenic beans, containers of biotech cotton or maize risk being rejected in Rotterdam, Dalian, or Yokohama. For US and other farmers who depend on exports of GE commodity crops, the presence of un-authorized generic traits could be devastating, according to industry. For example, one quarter of all US soybeans are exported to China, and 95% of those beans are genetically engineered. An estimated 93% of

GE soybeans in the United States contain a Monsanto trait that goes off-patent in 2014.

The complexity, however, is not just the biosafety review process; it's also the fact that re-registration requires legal access to the proprietary safety testing data initially submitted by one of the Gene Giants to government regulators. (For the Gene Giants, safety data are considered "confidential business information" and a protected trade secret – it's not something they're accustomed to sharing, especially with competitors.) Without access to the proprietary information, the cost of bringing generic biotech crops to market would be prohibitive.

"The simplest solution to this problem," points out the biotech-friendly Competitive Enterprise Institute, "is for governments to eliminate the unjustifiable, unnecessary re-registration requirement."¹⁸ The Gene Giants know that concerned governments aren't likely to banish biosafety regulations for GE crops so the companies have devised private sector contracts that will ultimately control the terms of access to expired traits and reinforce market power among a handful of giant seed companies.

What's the deal? In the face of soon-to-expire patents on biotech traits, the Gene Giants claim they have a plan to rescue farmers and save their export markets. The deal, which was originally drafted by Monsanto,¹⁹ encompasses two agreements: 1) The 38-page Generic Event Marketability and Access Agreement (GEMAA); and 2) the Data Use and Compensation Agreement (DUCA), which is not yet finalized. GEMAA is open to all companies and institutions, but as of 1 February 2013, the only signatories are 5 of the Big 6 Gene Giants. (Syngenta indicates that it has not yet fully analyzed the document.²⁰) Detailed information about GEMAA is available here: <http://www.agaccord.org>.

The "accords" are binding contracts among signatories that lay out the rules for access to generic biotech traits at patent expiration. GEMAA covers all commercialized biotech seed traits in the United States that are within 4 years of patent expiration. The Gene Giants claim that the deal is designed to maintain

global regulatory authorizations for these post-patent biotech traits and to ensure that any company that seeks to market them will adopt "stewardship responsibilities."²¹ The agreement requires that signatories give 3-year notice prior to patent expiration, after which the Gene Giant that controls the trait will have three options: 1) continue to maintain regulatory authorization; 2) sign a binding contract to share responsibility with one or more member company; and 3) discontinue filing regulatory authorizations after a 7-year period. The second agreement (DUCA), which is not yet finalized, will determine the fees ("compensation") that Gene Giants will charge for access to their proprietary data (i.e., the biosafety data that must accompany regulatory maintenance and authorization by governments).

The Gene Giants stacked the deck. Back in 1992 when the first Rio Earth Summit adopted the Convention on Biological Diversity, industrialized countries initially refused to join because they saw "access and benefit sharing" as a threat to intellectual property on seeds and other genetic resources. The biotech industry was ultimately reassured by the CBD's ambiguous language ("mutually agreed terms") and the emphasis on bilateral deal making. As one seed industry insider opined, the CBD would actually go beyond the World Trade Organization in entrenching intellectual property monopoly.²² Today, the Gene Giants complain bitterly about the onerous burden of "scientifically unjustifiable" regulatory regimes for biotech crops. The reality, however, is that the regulatory hurdles also act as barriers to entry for industry competitors. For a small or medium size breeder, the cost of producing the required biosafety data is prohibitive. Industry sources claim that the mean cost of bringing a single genetically engineered crop trait to market was \$136 million between 2008 and 2012.²³ An estimated 26% of that amount – \$35 million – went to meeting regulatory requirements.²⁴ It is obviously useful to industry to exaggerate the cost burden, but, at \$136 million, the cost of developing a GE crop – even if significantly inflated – dwarfs the approximately \$1 million it takes to develop a useful, conventionally bred inbred line.²⁵

The important point is that stringent biosafety regulations and even the gentle constraints of the Cartagena Protocol are not a problem in an oligopolistic environment where a handful of companies rule the roost. The more costly the process, the more likely only the biggest companies will be able and willing to pay the price, since the costs also create barriers to entry for others.

The new accords are expected to prompt the establishment of new consortia among the Gene Giants that will enable the top-tier companies to share the costs of maintaining regulatory approvals in export markets – when it is in their interest to do so.

Stacking the Docs: The new deal also seeks to reinforce the Gene Giants’ cross-licensing of each other’s biotech traits that are increasingly bundled in “stacked trait” crop varieties. Stacked traits refer to biotech seeds that contain multiple biotech traits (what the industry refers to as “events”). About half of all commercial GE seeds with stacked traits are the result of cross-licensing between companies.²⁶ For example, Monsanto’s SmartStax maize contains the company’s own Roundup Ready gene as well as Bayer’s herbicide tolerant gene and Dow’s proprietary insecticidal gene.²⁷ (See more on stacked traits below.) GEMAA is especially appealing because a Gene Giant won’t need to worry if a patent expires on a trait that belongs to another company in a stacked trait seed variety. Also, they won’t have to worry about generic competition because the “stackholders” will ultimately determine the cost of gaining access to proprietary biosafety data.

For the world’s largest seed and agrochemical corporations, the emphasis on collaboration is nothing new. Even as the Gene Giants compete in bitter litigation battles,²⁸ the same firms are collaborators in creating and maintaining what amounts to a global technology cartel. By agreeing to cross-license proprietary germplasm and technologies, consolidate R&D efforts and, sometimes, even terminate costly intellectual property (IP) litigation, the Gene Giants have designed legal mechanisms to reinforce top-tier market power. For example, Monsanto has cross-licensing agreements with all the other

Big 5 companies; Dow has cross-licensing agreements with four of the other five; and DuPont and Syngenta have entered agreements with three of the other companies.²⁹ As Matt O’Mara, director of international affairs at the Biotechnology Industry Organization (BIO), recently told *Nature Biotechnology*, “Cross-licensing is the lifeblood of the seed breeding industry.”³⁰

Reality Check: What benefits will farmers reap from “generic” biotech traits? In 2012, 93% of all US soybeans, 88% of the US corn crop and 94% of US upland cotton was planted with varieties containing one or more transgenic trait³¹ – but not without steep costs for farmers. Now, with soon-to-expire patents on some biotech traits, some US farmers are reportedly eager to save and re-use biotech seeds without running afoul of industry’s monopoly patents.³² In theory, the introduction of generic biotech seeds should result in lower seed prices and greater seed industry competition. In reality, however, the promise of generic biotech crops – GE seeds that farmers would be able to save and re-use without infringing patents – is sheer fantasy.

In the meantime, the Gene Giants are sending mixed messages. As early as 2010, the CEO of Monsanto, Hugh Grant, was promising growers that they could get “free” Roundup Ready 1 (RR1) soybean seeds when the company’s patent expired in the spring of 2015.³³ Monsanto, of course, is well prepared for the 2015 patent expiration of its blockbuster Roundup Ready trait. In 2009 the company introduced its patented Genuity Roundup Ready 2 Yield (RR2) trait, a second-generation glyphosate tolerant trait (which rival DuPont describes as a new acronym posing as a new invention).³⁴ By 2015 Monsanto will no longer offer the expired trait in its own line of GE soybeans.

And it looks like DuPont didn’t get the memo about the post-patent era of free biotech for all. In the words of Randy Schlatter, DuPont Pioneer’s senior manager of intellectual property: “What growers may not realize is that even though the trait patent expires, there are a host of other intellectual property patents on those varieties that are just

as strong.”³⁵ In an interview with *DTN/Progressive Farmer*, Schlatter observed: “If there is a [first generation genetically engineered] soybean in the market today that is truly generic and not protected by a patent of some sort, I’ve not been able to find it.”³⁶ DuPont Pioneer, the world’s second biggest seed company, has more than 225 patents covering its portfolio of soybean seeds – not just on transgenic traits – but on breeding technologies, germplasm and conventional (“native”) traits.³⁷ Even if a single transgenic trait goes off patent, the maize or soybean variety that contains the trait is likely the subject of a complex web of intellectual property. The two dozen patents on biotech seed traits that will expire over the next decade are dwarfed by the thousands of existing patents on traits, seeds and varieties – heavily concentrated in the hands of the Gene Giants (see pie chart below).

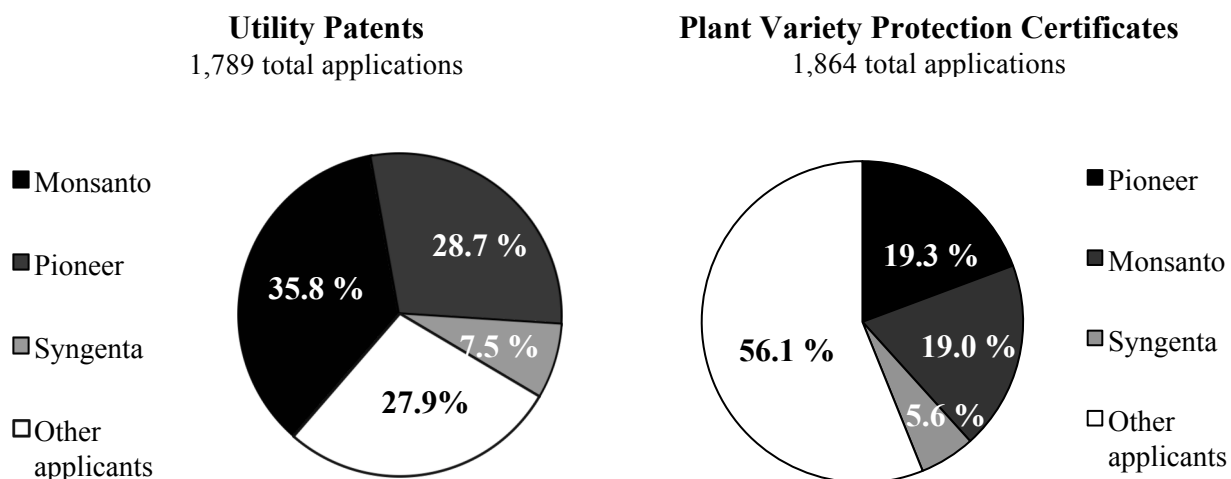
DuPont is now reminding its customers (i.e., farmers) that the company means business when it comes to enforcing patents. To fend off any misconception about generic biotech seeds and seed-saving farmers, DuPont Pioneer recently began hiring “gene police” to enforce seed patents and monitor the fields of North American farmers – a tactic long employed by Monsanto.³⁸ According to the US-based Center for Food Safety, as of January 2013, Monsanto, alleging seed patent infringement, had filed 144 lawsuits involving 410 farmers and 56 small farm businesses in at least 27 different states.³⁹

Charles Benbrook, a research professor at Washington State University’s Center for Sustaining Agriculture and Natural Resources, sums up the promise of generic biotech seeds: “Farmers are never going to get cheap access to these genetically engineered varieties,” Benbrook told *Bloomberg News*.⁴⁰ “The biotech industry has trumped the legitimate economic interests of the farmer again by raising the ante on intellectual property.”⁴¹

Plant Patent Grab: Between 2004 and 2008, 3 Gene Giants accounted for 72% of all US utility patent applications on plant varieties; the same three firms accounted for 44% of the plant variety protection (PVP) certificate applications, the form of IP preferred by most small seed companies – and by most governments around the world, which still view the patenting of plants unacceptable.

Reality Check: What Benefits from Generic Biotech Traits? International public breeders didn’t get the memo either. In February 2013, Thomas Lumpkin, the director of Mexico-based CIMMYT, told *Huffington Post* that his public plant breeding institute would soon be able to pick up cheap GE traits thanks to a \$25 million dollar donation from the Bill & Melinda Gates Foundation and Mexican mega-billionaire Carlos Slim.⁴² Bill Gates (who hasn’t had much experience with competitive markets) added, “Some of these [GE] traits are getting near the end of their patent life or are available from multiple entities, so that there’s even some competition there.”⁴³ Lumpkin said his institute would focus – in Mexico first, then in Africa and South Asia – getting “tried and true GMO traits that are widely used around the world and bring them to the poor farmers...so that the women of the developing world don’t have to spend the entire cropping system pulling weeds in the field...”⁴⁴ Lumpkin is presumably referring to Monsanto’s GE trait for herbicide tolerance. Maybe CIMMYT hasn’t heard that the industry’s “tried and true” traits, especially herbicide tolerant seeds, are exhibiting serious defects in farmers’ fields. Or that Mexico’s peasant farmers, accounting for 85% of the country’s maize producers, adamantly reject proposals to allow the planting of any GE maize in Mexico, the center of origin and diversity for maize.⁴⁵

US Applications for Intellectual Property Protection on Plant Varieties, 2004-2008



Between 2004 - 2008, three Gene Giants accounted for 72% of all US utility patent applications on plant varieties; the same three firms accounted for 44% of the applications for plant variety protection (PVP) certificates.

Source: ETC Group, adapted from Pardey et al., *Nature Biotechnology*, January 2013, Table 1, p. 28.

Monsanto's Charity Cartel Mollifies US Antitrust Regulators

Did Monsanto get US antitrust regulators off its back by crafting the GEMAA scheme for post-patent "access" to the company's Roundup Ready soybean trait? The US Department of Justice (DOJ) gave no official explanation for closing its 3-year probe of Monsanto, but a spokesperson told journalist Tom Philpott that the decision "took into account marketplace developments that occurred during the pendency of the investigation."⁴⁶ A timeline helps connect the dots, showing that less than 3 weeks after GEMAA was opened for signature, the DOJ announced Monsanto was no longer a target of investigation:

August 2009: The Antitrust Division of DOJ announces US government's "concerns about the competitive consequences of how the [agriculture] marketplace is evolving."⁴⁷

January 2010: Monsanto confirms receipt of formal Civil Investigative Demand from DOJ, "primarily seeking a confirmation that...farmers and seed companies will have access to the first-generation Roundup Ready trait following patent expiry in 2014."⁴⁸

February 2010: Monsanto presents draft of what would become the industry's post-patent "accord," GEMAA, to the biotech lobby group BIO. BIO agrees to oversee project.⁴⁹

March - December 2010: DOJ and USDA hold five public workshops on competition and regulatory issues in the agriculture sector.

June 2012: BIO and the American Seed Trade Association (ASTA) approve final draft of GEMAA and send to DOJ for "consultation."⁵⁰

October 31, 2012: GEMAA is open for signature.

November 19, 2012: DOJ announces Monsanto is no longer a target of investigation.

Rubbish Bin Ready?

Despite commercial success in a handful of countries, biotech traits are becoming obsolete even before they go off-patent. As ecologists and civil society predicted decades ago, nature is outsmarting the Gene Giants' high-tech seeds. With the widespread use of herbicide tolerant genes, especially in soybeans, maize and cotton, farmers have been bombarding weeds year-after-year with the same chemical weed killer – mostly Roundup⁵¹ – without killing their crop. But in recent years farmers are seeing an epidemic of glyphosate-resistant weeds. In 2012, weeds in the United States resistant to Roundup infested 16.8 million acres of farmland, up from 2.4 million acres just four years earlier.⁵² Worldwide, 23 weed species have developed glyphosate resistance, and at least 10 of these have also developed resistance to other herbicides.⁵³ One farm official in Arkansas referred to Roundup resistant weeds as “the single largest threat to production agriculture that we have ever seen.”⁵⁴ In March 2012 the president of Dow AgroSciences warned that glyphosate-resistant weeds, and weeds that are tough to control, surged 25% in 2011 and now infect 60 million acres of US farmland.⁵⁵ So-called “superweeds” require farmers to use increasing amounts more toxic weedkillers. Chemical weed control based on genetically engineered herbicide tolerant seeds is a failed, unsustainable technology. Yet the Gene Giants are responding to the crisis by investing hundreds of millions on the development of a new generation of genetically engineered seeds that will survive spraying of two or more herbicides – more toxic and environmentally hazardous ones – such as 2,4-D, a component of the Vietnam War defoliant, Agent Orange, and dicamba, which is chemically-related to 2,4-D. Dow AgroSciences has applied for regulatory approval of 2,4-D tolerant corn, with similar applications for soybeans and cotton close behind.

Similarly, crop-damaging insects that used to succumb to insecticidal toxins (*Bacillus thuringiensis*) in biotech maize and cotton are no longer packing a lethal punch because insects are evolving resistance. Scientists have long warned that escalating use of *Bt* maize hybrids that are genetically engineered to resist European corn borer and/or corn rootworm could trigger evolved resistance in pests.⁵⁶ In November 2011, the Environmental Protection Agency (EPA) warned that Monsanto's genetically engineered maize with built-in *Bt* genes may be losing its effectiveness against corn rootworms in four states. In 2012, scientists confirmed that rootworms, the most destructive insect pest for US maize, have become resistant to one of Monsanto's genetically engineered maize seeds containing the *Bt* strain, Cry3Bb1.⁵⁷

Scientists are urging US farmers in some areas to stop planting maize with anti-rootworm genes, or to use these varieties intermittently. Other scientists caution that the only way to slow evolving resistance of corn pests is to plant larger “refuge” areas of non-GE maize.⁵⁸ It is troubling, however, that the recommendation can't be implemented because there's reportedly not enough conventional maize seed (non-*Bt*) available to plant larger refuges.⁵⁹

Trait Troubles Stacking Up

A February 2013 article by University of Wisconsin researchers cites evidence of new problems associated with stacked traits in GE maize: “We found strong evidence of gene interactions among transgenic traits when they are stacked,” report the researchers in *Nature Biotechnology*.⁶⁰ It turns out that some combinations of stacked traits exhibit yield-reducing gene interactions in maize. Farmers who are now paying price premiums for a GE seed package loaded with patented traits will be unhappy to learn that “the evidence of negative interaction effects among transgenes suggests that transgenic hybrids can perform more poorly than conventional hybrids.”

One of the authors, University of Wisconsin agronomist Joe Lauer, explains: “A lot of farmers assume that if it’s transgenic, it’s great in terms of yield, but we know that putting a transgene into a corn hybrid isn’t always successful... You don’t want to pay \$75 dollars more per bag of seed to produce 12 bushels less per acre.”⁶¹

The study’s finding of negative impacts from unanticipated gene interaction in commercial, multi-trait seeds should be profoundly troubling for those farmers who have paid premium prices for the “stack.” Why weren’t the potential negative impacts of gene interaction in stacked traits evaluated and tested *before* they reached the market? Stacked trait plants are created by crossing, via conventional breeding, two GE plant varieties that already incorporate biotech traits. In the United States – where adoption of stacked trait GE varieties is accelerating – multi-trait biotech crops do not require independent regulatory approval, so long as the biotech traits in the parent plants have previously undergone regulatory approval. Cotton varieties with stacked traits reached 63% of US cotton plantings in 2012; plantings of stacked maize made up 52% of corn plantings in 2012.⁶² Internationally, stacked traits occupied one quarter (26%) of the total area devoted to biotech crops in 2012.⁶³

Proponents of generic biotech crops warn that regulatory requirements outside of the United States “will pose a challenge for generic breeders who might wish to create their own stacks by hybridizing varieties containing off-patent traits developed by more than one innovator.” The argument is flawed and misleading. New findings on gene interaction in stacked traits indicate that it is essential for biosafety regulators to require testing data on the newly developed multi-trait biotech seeds. In fact, international standards for food safety assessment of transgenic crops developed by the Codex Alimentarius Commission (“Codex” – a joint FAO/WHO body) allow for pre-market risk assessment of both direct effects (from the inserted gene) and unintended effects (that may arise as a consequence of insertion of the new gene).⁶⁴

And, if the philanthropopoly doesn’t do the trick, the Gene Giants have a Plan B: new technologies to sidestep GE regulations.

For decades, plant breeders have been zapping seeds with x-rays or chemical treatments to induce random mutations that might lead to interesting new traits.⁶⁵ With the advent of genetic engineering, classical mutation breeding became old hat. Now, using new techniques known as “site-specific mutagenesis” biotech companies are modifying plant genes without adding foreign DNA – a feat that enables them to avoid the

transgenic or GE label – and sidestep regulatory oversight. In at least two cases, US government regulators have quietly ruled that Dow’s “zinc-finger nuclease technique” and Cibus Genetics’ “gene repair system” do not require the same regulatory review as transgenics.⁶⁶ The rulings are not without controversy and it remains to be seen if Canadian and European regulators will accept the same definitions that exempt regulatory review. For Gene Giants, the appeal of modifying plant genes with patented techniques while avoiding regulatory review and the tainted transgenic label is spurring

new R&D alliances. Industry trade journal, *Seed World*, calls it the “mutagenesis revolution.”⁶⁷ Bayer CropScience, for instance, has trait development agreements with KeyGene and Cibus Genetics. Cibus claims that its non-transgenic technique is not only “free of the market resistance and regulatory burden”⁶⁸ of GE seeds, but it’s also three years faster and about a tenth the cost of transgenic technology.

Syngenta’s new approach to Benefit-Sharing: “iTunes of Plant Breeding” and PR charm offensive for quelling concerns about monopoly seed patents

One of the majors hasn’t said whether it will join the other five Gene Giants in GEMAA. On 17 January 2013 the world’s top-ranking agrochemical giant and third largest seed firm, Swiss-based Syngenta, unveiled its new platform to “share the benefits” of a select group of the company’s patented seeds and traits. The new IP platform – dubbed “the iTunes of plant breeding and innovation sharing”⁶⁹ – pledges to give free research licenses to public sector researchers and non-profit organizations – allowing them to use available traits and technologies for research, and to distribute the non-commercial results in the global South. In addition, Syngenta initially agreed to share 20% of e-licensing royalties with the cash-strapped Benefit Sharing Fund (BSF) of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), although the offer “expired” before the e-licensing platform was publicly launched – and the Treaty’s BSF has not received any contributions from Syngenta’s e-licensing royalties.⁷⁰

Why is Syngenta suddenly “sharing” IP like a precocious kindergartener? First, it’s a strategic business decision. The company is not giving away traits and technologies; it’s opening up a new revenue stream from e-licenses on a handpicked group of patents. Secondly, in the midst of growing controversy over monopoly patents on seeds, particularly in Europe, Syngenta’s e-licensing platform is a clever and calculated public relations move that aims to deflect anti-monopoly sentiment.

Seedy Benefit Sharing?

Syngenta initially agreed to share 20% of e-licensing royalties with the cash-strapped Benefit Sharing Fund of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) but the offer “expired” in April 2012 before the e-licensing platform was publicly launched.⁷¹ The Seed Treaty governs access to and exchange of seeds for research and plant breeding. The Treaty’s Benefit Sharing Fund aims to provide reciprocal benefits to farming communities in the global South who are responsible for developing and conserving crop diversity in their fields. Although the seed industry is a major beneficiary of the Treaty, after almost 7 years, the Treaty’s mechanism for generating benefit sharing funds (voluntary and mandatory) is not working as intended, and the seed industry’s participation is conspicuously absent.⁷² As a result, international support for *in situ* (“on-farm”) seed conservation in the South is desperately underfunded – particularly in the face of crop-withering climate extremes. However, by embracing Syngenta’s voluntary offer to donate patent royalties the Treaty risks validating industry’s monopoly seed patents – and endorses the view that patents are instruments of benefit sharing. One danger is that the Benefit Sharing Fund of the Treaty could find itself in the awkward position of receiving royalties from patented technologies, which, by definition, restrict access to genetic resources. Syngenta’s initial offer was a bilateral deal – not linked to genetic resources accessed from the Treaty’s multilateral system – so Syngenta is not obliged to play by the multilateral rules.⁷³ Syngenta’s move is much less magnanimous than it is Machiavellian. The FAO’s Seed Treaty has the potential to do great good. But not via the pressure of the Gene Giants.

Background: At the beginning of 2013, Syngenta launched its new “TraitAbility” platform – what the company calls a new intellectual property model based on “collaborative innovation.” The online

platform provides e-licensing for “quick and easy” access to patented native (non-transgenic) traits that are available in a catalogue of Syngenta’s commercial vegetable varieties. It also provides access to patented enabling technologies for both genetically engineered and conventional plants, such as plant transformation techniques, control of gene expression, protein targeting and the development of hybrids. Details about the e-licensing platform, a catalogue of available technologies and financial terms are available here: <http://www3.syngenta.com/global/e-licensing/en/Pages/home.aspx>.

Syngenta acknowledges that “plant breeders have traditionally been challenged by the complex, costly and time-consuming process of obtaining licenses to use the innovations developed by patent owners.” The company claims that its e-licensing platform will enhance collaboration with breeders and ultimately provide more options for farmers by giving breeders transparent, fair and reasonable access to patented technologies on a non-discriminatory basis. The e-licensing platform provides a standard licensing agreement for commercial firms – with a sliding scale for small, medium and large-scale breeders. The company will reportedly give free access to licensed traits during development and breeding of new varieties; royalty payments are due only if the newly developed and commercialized variety contains the patented trait.

Syngenta’s initiative may appeal to some academics and scientists at international plant breeding institutes (CGIAR) because it provides free research licenses for public sector researchers and non-profit organizations – allowing them to use available traits and technologies for research, and to distribute the non-commercial results in developing countries free-of-charge. Although some may see it a magnanimous gesture, many non-profit researchers would point out that such research exemptions should be automatic and non-negotiable in any patent regime. Today, public plant breeders are increasingly engaged in partnerships with private sector companies, which means that most of what is available through Syngenta’s

e-licensing would ultimately be distributed in a commercial setting. Thanks to the decline of publicly supported plant breeding and the rise of public-private partnerships, public sector seed production and distribution through public extension have almost disappeared.

Private Designs on Public Goods

Working hand-in-hand with the world’s richest governments, the Gene Giants are taking an ever more prominent role in shaping foreign aid, agricultural development and their vision of market-based food security in the global South. Corporate-led investment to feed the world focuses on public-private partnerships and business-as-usual approaches. Typically, this means opening up new markets for high-tech seeds and crop chemicals accompanied by intellectual property laws and other policies favoring agribusiness. The World Economic Forum’s New Vision for Agriculture, led by 28 agro-industrial corporations (including nearly all the Gene Giants) works with the G8 and G20 to “foster multi-stakeholder collaboration to achieve sustainable agricultural growth through market-based solutions.”⁷⁴ The Forum’s New Vision is already active in 11 countries in Africa, Asia and Latin America. Meanwhile, public plant breeding institutes in the CGIAR network continue to cozy up to philanthro-capitalists (e.g., Bill Gates & Carlos Slim) and their mega-foundations. According to a recently released report from the Special Rapporteur on the Right to Food, the private sector now funds just under 5% of the UN Food and Agriculture Organization’s work.⁷⁵ In the name of feeding the hungry and helping smallholder farmers, corporate-led coalitions are overriding food sovereignty and co-opting multilateral agendas. (For an in-depth discussion of this issue, see ETC Group’s 2012 *Communiqué*, “The Greed Revolution.”⁷⁶)

Trojan Traits? Furthermore, for those South countries where Syngenta's patents are not recognized, there would be no legal obligation for them to respect the company's "property" in any case. In this respect, Syngenta's offer to distribute licenses free-of-charge in the global South is a Trojan Horse – a move that encourages South countries to capitulate to the supremacy of patent laws – even when there is no legal obligation to do so. By conveniently ignoring this reality, Syngenta is imposing the terms and conditions for technology transfer to the global South based on its self-appointed IP rules.

Why is Syngenta suddenly championing access to its valuable IP assets? In addition to opening a new revenue stream from royalties on patented traits, an even more cynical possibility is that the platform provides an opportunity to make money from underperforming patents that will soon expire. Not surprisingly, the vast majority of the available technologies will appeal primarily to industrial breeders – traits for prolonging shelf life, controlling ripening and extending storability of commercial vegetables. Some patented traits, such as disease resistance (e.g., resistance to Cauliflower Mosaic Virus, Fusarium wilt or clubroot in fruits and vegetables), would have broader appeal.

Traitor-ability? Syngenta is also offering licenses for patented "enabling" technologies that allow breeders to restrict access to germplasm. These include an array of technologies for developing hybrid crops, as well as for controlling the expression of plant genes using external chemical triggers (e.g., control of gene expression using chemical ligands⁷⁷ and chemically-inducible plant gene expression cassettes⁷⁸). These traits don't come cheap. In the case of the chemically-inducible plant gene expression, the licensee must pay a signing fee of between €10,000 and €50,000 (depending on the company size), an annual maintenance fee of between €5,000 and 25,000, plus a €250,000 commercialization fee (on the first commercial sale of a licensed product for each licensed event) for use in soybeans, maize,

cotton, rice, etc. – and €100,000 for use in vegetables.

Ultimately, Syngenta decides which traits and technologies it makes available for licensing, and the terms of access. Syngenta's head of Intellectual Property, Michael Kock, is admittedly nervous about going overboard on Syngenta's new oxymoronic approach to "sharing" the company's patented traits. In an interview with Catherine Saez of *IP Watch*, Koch observed: "Abandoning IP to foster access to innovation is potentially a very short-sighted solution. It is like killing the goose which lays the golden eggs."⁷⁹

But Syngenta is not "abandoning" IP. Far from it. Besides the obvious PR benefits, Syngenta's TraitAbility initiative aims to soften opposition to exclusive monopoly patents, appease the angst of antitrust regulators and mollify critics who point to the seed industry's impenetrable barriers to entry. Francois Meienberg of Switzerland-based Berne Declaration points out that Syngenta is launching its IP platform on patented vegetable traits at the very time the patentability of conventionally-bred plants is being legally challenged at the European Patent Office (EPO).⁸⁰ It remains to be seen if plants resulting from conventional breeding will be excluded from patentability. The European Seed Association as well as German, French and Dutch breeders, farmers' organizations, NGOs and the European Parliament have all argued against patents on conventionally-bred plants. As of late February 2013, the EPO Appeals Board has not disclosed when it will make its decision.

Historic Note: Back in 2007 EPO's Appeal Board finally did the right thing when it struck down Monsanto's "species-wide patent" covering *all* genetically engineered soybeans – but it took 13 years for EPO to revoke biotech's biggest, baddest and broadest patent.⁸¹ In a testament to the predatory and dysfunctional nature of the patent system, Monsanto took full advantage of the 13-year period by building an unprecedented market monopoly on its GE soybean trait.⁸²

No Terminators

To be clear, the technologies offered on Syngenta's e-licensing platform do *not* include, at least so far, patents on Terminator – a technology that renders farmers' seeds unable to germinate in the second generation. The chemically-induced system of controlling plant genes described in the above-mentioned patents might be used, for example, to kill pollen or egg cells to impair a plant's fertility for the purpose of making hybrids, but it does not impair fertility for the purpose of preventing seed saving. However, these technologies are externally inducible plant traits that can be controlled by the company via chemical or other triggers – a prerequisite for developing a Terminator technology.

Since 1998, Terminator has been widely condemned as a threat to biodiversity, food sovereignty and Farmers' Rights – especially for the 1.4 billion people who depend on farmer-saved seed. Syngenta, BASF, DuPont and Monsanto have previously filed for and won patents on Terminator technology.⁸³ Thanks to campaigns launched by civil society, farmers' organizations and indigenous peoples, the UN Convention on Biological Diversity adopted a moratorium on field-testing and commercial development of Terminator in 2000, which was re-affirmed in 2006. Nevertheless, controversial research continues. Farmers, civil society organizations and indigenous peoples from all over the world have called for a ban on the technology.

Conclusion: Since the 1970s, the wriggle room for cartels has opened up. Regulators used to be alarmed if four companies had more than 40% of the market for seed-drilling equipment, and alarm bells rang if 40% of the market for broad-leaf herbicides was controlled by four companies. Today, there is an assumption that competition is only at risk if four companies dominate all forms of agricultural implements or all crop chemicals. Even then, action is unlikely. Ploys like GEMAA seem to have already caused US Department of Justice regulators to back

off and Syngenta's "iTunes" gambit may be designed expressly to mollify anti-plant-patent fervor in the European Commission. Without so much as a blush, Monsanto – with 26% of the world's commercial seed market – still maintains that it has only a tiny fraction of the global seed business.⁸⁴ This, of course, is a total distortion. Anti-combines regulators focus on the commercial marketplace. If almost half of the world's tractors are sold by just four companies they see that as a problem. (That figure, however, is for a market that doesn't reach the vast majority of the world's farmers – most of whom are using hand plows or oxen and are not about to buy tractors.) Likewise, although 80-90% of the seeds planted every year by peasant farmers were not bought from a seed company, the global commercial seed market is overwhelmingly dominated by Monsanto and its Gene Giant partners. Poor farmers can't afford – and probably don't want – Monsanto's seeds and are not part of any regulator's calculations.

It's popular wisdom that when patents expire, generics move in, competition soars and prices drop. We are told that critical GE patents are about to expire and the big multinational biotech companies will lose interest in marketing the seeds and maintaining the regulatory paperwork. The big companies blame the UN's Cartagena Protocol and national-level scrutiny for burdensome regulations that make their continued support for off-patent seeds unprofitable. Out of the goodness of their hearts, they tell us, they are forming an exclusive club of the biggest enterprises that are willing to shoulder the bureaucratic load to make sure that farmers don't go without. But, if the regulatory cost for generic providers is so high, then the holder of the defunct patent still has a *de facto* monopoly. **If the patent-holder isn't interested in keeping up the necessary paperwork, it means the GE traits are obsolete and no longer profitable.** So, the big company charity cartel creates an illusion of generosity while permitting otherwise unacceptable cartel practices. And, as the public-spirited multinationals warn of the fast-approaching

patent cliff, the out-of-sync head of IP for DuPont Pioneer has let the cat out of the bag saying that the patent thicket surrounding every important seed trait ensures that the monopolies are in no danger – and seed-saving farmers are still out-of-luck. Astonishingly, the Thelma and Louise of the patent cliff – Bill Gates and Carlos Slim – two men who know a lot about monopoly and vanishingly little about agriculture, and CIMMYT (which already has a number of bilateral arrangements with the same

companies), are claiming that the expiration of a handful of GE patents will let them get the cheap traits to poor farmers. GEMAA is designed to let the already close-knit Gene Giants coordinate publicly to undermine national and international GE regulations. Likewise, EU competition policy concerns are forcing Syngenta (the world's number three seed company and number one crop chemical company) to “do something.” While talking about iTunes, it may be constructing “Nabster.”

Endnotes

¹ Olivier De Schutter, *Report of the Special Rapporteur on the right to food: Mission to the Food and Agriculture Organization of the United Nations*, 14 January 2013, p. 17.

² ETC Group, “Who Will Feed Us?,” *ETC Communiqué*, no. 102, November 2009: <http://www.etcgroup.org/content/who-will-feed-us>.

³ D.I. Jarvis, B. Sthapit and L. Sears, eds., *Conserving agricultural biodiversity in situ: A scientific basis for sustainable agriculture*, International Plant Genetic Resources Institute, Rome, Italy, 2000. See especially chapter VII, Seed supply systems; data collection and analysis. See also CIAT, “Understanding Seed Systems Used by Small Farmers in Africa: Focus on Markets,” *Practice Brief* 6.

⁴ Jarvis, Sthapit and Sears, *Conserving agricultural biodiversity in situ*.

⁵ *Ibid.*, p. 126.

⁶ BASF is active in the new seed agreement and is a leader in agrochemical sales, seeds and pesticide research, but it does not rank among the top 6 in global seed sales.

⁷ Keith O. Fuglie, Paul W. Heisey, John L. King, Carl E. Pray, Kelly Day-Rubenstein, David Schimmelpfennig, Sun Ling Wang, and Rupa Karmarkar-Deshmukh, *Research Investments and Market Structure in the Food Processing, Agricultural Input, and Biofuel Industries Worldwide*, ERR-130, USDA, Econ. Res. Serv., December 2011, p. 19.

⁸ The 1996 figure comes from ETC Group: RAFI, “The Life Industry,” RAFI Communiqué, September 1996. The 2002 figure is from ETC Group, “Oligopoly Inc. Concentration in Corporate Power 2003,” *ETC Communiqué*, no. 82, November/December 2003:

<http://www.etcgroup.org/upload/publication/136/01/comm82oligopnovdec03.pdf>. The 2009 figures come from ETC Group, “Who Will Control the Green Economy?” *ETC Group Communiqué*, no. 107, November 2011: <http://www.etcgroup.org/en/node/5296>.

The 2011 figure comes from Phillips McDougall and ETC Group, forthcoming.

⁹ Fuglie et al., *Research Investments and Market Structure*

¹⁰ *Ibid.*, p. 13.

¹¹ Based on 2008 study by Le Buanec, cited in Fuglie et al., *Research Investments and Market Structure*, p. 13.

¹² Fuglie et al., *Research Investments and Market Structure*.

¹³ *Ibid.*

¹⁴ DuPont, Syngenta, Bayer and Dow each accounted for at least 3% global trait-acres in 2007.

¹⁵ Fuglie et al., *Research Investments and Market Structure*, Table 2.3, p. 128.

¹⁶ Gregory Conko and Henry I. Miller, “The Ripple Effects of Flawed Agbiotech Regulation,” 9 January 2013: <http://cei.org/op-eds-articles/ripple-effects-flawed-agbiotech-regulation>.

¹⁷ *Ibid.*

¹⁸ *Ibid.*

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- ¹⁹ 5 March 2010, Monsanto blog post by Glynn Young:
<http://monsantoblog.com/2010/03/05/what-rr1-patent-expiration-means-for-farmers/>.
- ²⁰ Email communication with Christine Gould, Senior Manager, Global Public Policy, Syngenta Crop Protection AG, 29 January 2013.
- ²¹ So-called “stewardship responsibilities” may require, for example, assessment of grower compliance with steps such as “refugia” which are meant to ensure that farmers adopt practices to prevent pests from developing resistance to the plant’s novel trait/s. In the U.S., for example, farmers who use insect resistant maize with B.t. are required to plant 20% of the crop area in refugia.
- ²² According to John Deusing, formerly of Ciba-Geigy. See *The Crucible Group, People, Plants and Patents*, IDRC Canada, 1994:
<http://www.idrc.ca/EN/Resources/Publications/Pages/IDRCBookDetails.aspx?PublicationID=251>.
- ²³ Phillips McDougall Consultancy, “The cost and time involved in the discovery, development and authorisation of a new plant biotechnology derived trait,” *A Consultancy Study for CropLife International*, September 2011.
- ²⁴ Ibid.
- ²⁵ M. Goodman, “Plant Breeding Requirements for Applied Molecular Biology,” *Crop Science*, Vol. 44, November-December 2004, pp. 1913-14.
- ²⁶ Daniel Grushkin, “Threat to global GM soybean access as patent nears expiry,” *Nature Biotechnology*, Vol. 31, January 2013.
- ²⁷ Ibid.
- ²⁸ One seed industry consultant observes, “Litigation, to a large extent, now both controls and refines the entire process of how future technologies will be delivered and used” in Dick Hagen, “Seed World Wrangling,” *Seed World*, January 2013.
- ²⁹ Fuglie et al., *Research Investments and Market Structure*, p. 38.
- ³⁰ Daniel Grushkin, “Threat to global GM soybean access”
- ³¹ USDA, National Agricultural Statistics Service, 29 June 2012:
<http://www.usda.gov/nass/PUBS/TODAYRPT/acrg0612.pdf>.
- ³² Conko and Miller, “Ripple Effects”
- ³³ Roger Parloff, “Monsanto’s seeds of discord,” *Fortune*, May 11, 2010:
http://money.cnn.com/2010/05/06/news/companies/monsanto_patent_full.fortune/index.htm.
- ³⁴ Ibid.
- ³⁵ Pam Smith, “Seed Industry Supports Post-Patent Accord,” *DTN/Progressive Farmer*, 20 November 2012.
- ³⁶ Ibid.
- ³⁷ Ibid.
- ³⁸ Jack Kaskey, “DuPont Sends in Former Cops to Enforce Seed Patents: Commodities,” *Bloomberg News*, 28 November 2012: <http://www.bloomberg.com/news/2012-11-28/dupont-sends-in-former-cops-to-enforce-seed-patents-commodities.html>.
- ³⁹ Center for Food Safety and Save Our Seeds, *Seed Giants vs. U.S. Farmers*, 2013:
http://www.centerforfoodsafety.org/wp-content/uploads/2013/02/Seed-Giants_final.pdf.
- ⁴⁰ Kaskey, “DuPont Sends in Former Cops”
- ⁴¹ Ibid.
- ⁴² Mark Stevenson, “CIMMYT: Bill Gates Invests \$25 Million In Controversial GM Crop Center,” *Huffington Post*, 13 February 2013: http://www.huffingtonpost.com/2013/02/15/cimmyt-bill-gates-gm-crop-center_n_2695241.html.
- ⁴³ Ibid.
- ⁴⁴ Ibid.
- ⁴⁵ ETC Group news release, “The Great Mexican Maize Massacre,” 15 November 2012:
<http://www.etcgroup.org/content/great-mexican-maize-massacre>.

-
- ⁴⁶ Tom Philpott, "DOJ Mysteriously Quits Monsanto Antitrust Investigation," *Mother Jones*, 1 December 2012: <http://www.motherjones.com/tom-philpott/2012/11/dojs-monsantoseed-industry-investigation-ends-thud>.
- ⁴⁷ Philip Weiser, *Towards a Competition Policy Agenda for Agriculture Markets*, 7 August 2009: <http://www.justice.gov/atr/public/speeches/248858.htm>.
- ⁴⁸ Monsanto news release, *Monsanto announces continued cooperation with the U.S. Department of Justice*, January 14, 2010. <http://monsanto.mediaroom.com/index.php?s=27632&item=77137>.
- ⁴⁹ 5 March 2010 Monsanto blog post by Glynn Young: <http://monsantoblog.com/2010/03/05/what-rr1-patent-expiration-means-for-farmers/>.
- ⁵⁰ Thomas Carrato and Brandon Neuschafter, "From Proprietary to Generic: A Private Contractual Mechanism for Biotech Seed Products," *WLF Legal Backgrounder*, Washington Legal Foundation, Vol. 27, No. 19, 2 November 2012. Carrato is Associate General Counsel of Monsanto Co.: http://www.wlf.org/publishing/publication_detail.asp?id=2349.
- ⁵¹ According to ISAAA, in 2011, 85% of the worldwide area devoted to GE crops contained at least one trait for Roundup tolerance: <http://www.isaaa.org/resources/publications/briefs/43/executivesummary/default.asp>.
- ⁵² Bill Freese, Center for Food Safety, "Comments to USDA/APHIS on Environmental Assessment for the Determination of Nonregulated Status of Herbicide-Tolerant DAS-40278-9 Corn, *Zea mays*, Event DAS - 40278-9," April 27, 2012.
- ⁵³ *International Survey of Herbicide Resistant Weeds*, 2013: <http://www.weedscience.org/Summary/UspeciesMOA.asp?lstMOAID=12>.
- ⁵⁴ Andrew Wargo III, the president of the Arkansas Association of Conservation Districts, quoted in William Neuman and Andrew Pollack, "Farmers Cope With Roundup-Resistant Weeds," *New York Times*, May 3, 2010.
- ⁵⁵ Jack Kaskey, "Monsanto, Dow Gene-Modified Crops to Get Faster U.S. Reviews," *Bloomberg News*, March 9, 2012.
- ⁵⁶ Michael Gray, "Relevance of traditional integrated pest management strategies for commercial corn producers in a transgenic agroecosystem: a bygone era?" *Journal of Agricultural and Food Chemistry*, 2011, 59, 5852-5858.
- ⁵⁷ A.J. Gassmann et al., "Field-Evolved Resistance to Bt Maize by Western Corn Rootworm," *PLoS ONE* 6(7), 2011. doi:10.1371/journal.pone.0022629 See also, Claire Everett, "University Study Reveals Pest Now Resistant To Genetically Modified Corn," *The Daily Illini*, 29 August 2012: <http://www.dailyillini.com/article/2012/08/university-study-reveals-pest-now-resistant-to-genetically-modified-corn>.
- ⁵⁸ The planting of a non-Bt "refuge" is designed to prevent or delay resistance by increasing the probability that any resistant insects would mate with non-resistant insects (from the non-Bt areas); the resulting offspring would not be resistant.
- ⁵⁹ Dan Charles, "Insect Experts Issue 'Urgent' Warning On Using GM Seeds," National Public Radio, March 9, 2012.
- ⁶⁰ G. Shi, J. Chavas and J. Lauer, "Commercialized transgenic traits, maize productivity and yield risk," *Nature Biotechnology*, Vol. 1, No. 2, February 2013, p. 113.
- ⁶¹ Nicole Miller, "Value of modified corn is more in reducing losses than boosting yields," Univ. of Wisconsin-Madison News. 14 February 2013: <http://www.news.wisc.edu/21505>
- ⁶² USDA: <http://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us.aspx>
- ⁶³ According to International Service for the Acquisition of Agri-biotech Applications (ISAAA), "Global Status of Commercialized Biotech/GM Crops: 2012," *ISAAA Brief 44-2012*, Executive Summary: <http://www.isaaa.org/resources/publications/briefs/44/executivesummary/default.asp>.
- ⁶⁴ Codex Alimentarius Commission, *Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants (CAC/GL 45, 2003, 2008)*, para. 14: "Unintended effects may be deleterious, beneficial, or neutral with respect to the health of the plant or the safety of foods derived

from the plant. Unintended effects in recombinant-DNA plants may also arise through the insertion of DNA sequences and/or they may arise through subsequent conventional breeding of the recombinant-DNA plant. Safety assessment should include data and information to reduce the possibility that a food derived from a recombinant-DNA plant would have an unexpected, adverse effect on human health.”

⁶⁵ Daniel Grushkin, “Agbiotech 2.0,” *Nature Biotechnology*, Vol. 30, No. 3, March 2012.

⁶⁶ USDA decisions to exempt site-specific mutagenesis techniques were not disclosed publicly, but uncovered by journalists as a result of Freedom of Information requests. Emily Waltz, “Tiptoeing around Transgenics,” *Nature Biotechnology*, Vol. 30, No. 3, March 2012, p. 215.

⁶⁷ David Voss in “Giant Views of the Industry,” *Seed World*, International Edition 2011, p. 24.

⁶⁸ Cibus Genetics: www.cibus.com.

⁶⁹ “iTunes of plant breeding and innovation sharing” – as tweeted here:

<https://twitter.com/SyngentaXchange/status/291964468630536192>.

⁷⁰ Personal communication with Dr. Shakeel Bhatti, Secretary of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), 6 March 2013.

⁷¹ Ibid. According to Dr. Bhatti’s notification of 29 Feb. 2012, for licensing agreements signed before 30 April 2012, Syngenta agreed to donate 20% of the royalty income to the Benefit-sharing Fund of the International Treaty for the entire lifetime of the patent on native traits and an additional €5,000 to the Benefit Sharing Fund immediately upon signature of the license agreement.

⁷² Claudio Chiarolla and Stefan Jungcurt, “Outstanding Issues on Access and Benefit Sharing Under the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture,” *Berne Declaration and Development Fund*, March 2011.

⁷³ Syngenta’s patented traits are not necessarily derived from or incorporated in genetic resources in the Multilateral System.

⁷⁴ World Economic Forum, *Agriculture and Food Security*:

<http://www.weforum.org/issues/agriculture-and-food-security>.

⁷⁵ Olivier De Schutter, *Report of the Special Rapporteur on the right to food: Mission to the Food and Agriculture Organization of the United Nations*, 14 January 2013. p. 17.

⁷⁶ ETC Group, “The Greed Revolution: Mega Foundations, Agribusiness Muscle In on Public Goods,” *ETC Group Communiqué*, no. 108, January 2012:

<http://www.etcgroup.org/content/greed-revolution>.

⁷⁷ See description of patent and licensing terms on TraitAbility website:

<http://www3.syngenta.com/global/e-licensing/en/e-licensing/Catalog/Pages/Controlofgeneexpressioninplantsusingchemicalligands.aspx>

⁷⁸ Ibid.

⁷⁹ Catherine Saez, “Syngenta Opens Doors To Its Patented Technologies, For Easier But Not Free Access,” *IP Watch*, 18 January 2013: <http://www.ip-watch.org/2013/01/18/syngenta-opens-doors-to-its-patented-technologies-for-easier-but-not-free-access/>.

⁸⁰ The so-called “Tomato case” and “Broccoli case” before the highest Appeal Board of the European Patent Office will determine the patentability of conventional seeds in Europe. Broccoli Patent, EP 1069819, was granted in 2002, the Tomato Patent, EP 1211926, in 2000.

⁸¹ ETC Group news release, “Revoked! Monsanto Monopoly Nixed in Munich,” 3 May 2007: <http://www.etcgroup.org/content/revoked-monsanto-monopoly-nixed-munich-0>.

⁸² ETC Group blog post, “Further Reflections on EPO Decision to REVOKE Monsanto’s Transgenic Soybean Patent,” 9 May 2007: <http://etcblog.org/2007/05/09/further-reflections-on-epo-decision-to-revoke-monsantos-transgenic-soybean-patent/>.

⁸³ ETC Group, “2001: A Seed Odyssey,” *RAFI Communiqué*, no. 68, January/February 2001: <http://www.etcgroup.org/content/2001-seed-odyssey>.

⁸⁴ Anon., “Monsanto Company Profile part III - Second Wave of the Green Revolution,” *Organic Lifestyle Magazine*, October / November 2009:

<http://www.organiclifestylemagazine.com/issue-10/monsanto.php>.