From: Letzler, Kenneth [mailto:Kenneth.Letzler@APORTER.COM]
Sent: Thursday, December 31, 2009 1:03 PM
To: ATR-Agricultural Workshops
Subject: Comment

Attached please find a comment submitted on behalf of Monsanto Company in Microsoft Word format together with a copy of the transmittal letter that accompanies the filing of two paper copies of the submission.

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December 31, 2009

Via Hand Delivery
Legal Policy Section
Antitrust Division
U.S. Department of Justice
450 5th Street, NW, Suite 11700
Washington, DC 20001

Re: Comments Regarding Agriculture and Antitrust Enforcement Issues in Our 21st Century Economy

Dear Sir or Madam:

Enclosed please find two paper copies of a paper, "Competition and Innovation in American Agriculture: A Response to the American Antitrust Institute's 'Transgenic Seed Platforms: Competition Between a Rock and a Hard Place?'" The paper was prepared by Arnold & Porter LLP and Cornerstone Research on behalf of Monsanto Company for consideration in connection with the upcoming workshops concerning competition in the agricultural industry.

An electronic copy of the paper in native Microsoft Word format has been emailed to agriculturalworkshops@usdoj.gov.

We hope you find the paper useful.

Sincerely,

Kenneth Letzler

Kenneth Letzler
Jonathan Gleklen

cc: Vandy Howell, Dina Older Aguilar
(Cornerstone Research)

Competition and Innovation in American Agriculture

A Response to the American Antitrust Institute's "Transgenic Seed Platforms: Competition Between a Rock and a Hard Place?"

Submitted on Behalf of Monsanto Company In Response to the Request for Comments by the United States Department of Agriculture and United States Department of Justice, Antitrust Division, in Connection with Their Hearings on "Agriculture and Antitrust Enforcement Issues in Our 21st Century Economy"

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I. INTRODUCTION

Agricultural efficiency and food production capability are of paramount global importance in a world where population growth and resource consumption far outstrip traditional farming capability and shrinking resources. Innovative efforts to meet these growing challenges have resulted in development and widespread adoption of technologies to enhance productivity and lower costs. These technologies have also generated controversy, years of patent litigation, and a variety of disputes among Monsanto and its multinational competitors.

Perhaps associated with this backdrop, in October the American Antitrust Institute ("AAI"), an advocacy group funded by DuPont, which is a competitor of Monsanto, released a paper entitled "Transgenic Seed Platforms: Competition Between a Rock and a Hard Place?"[1] The AAI paper has been widely reported in the press, has been characterized by one investment analyst as "the blueprint for a federal antitrust case against Monsanto," and is likely to be noted within the joint Justice Department/USDA workshops.[2]

As we describe in detail in this paper, the analysis in the AAI paper is based on factual claims that are either demonstrably incorrect or premised upon a misreading or misinterpretation of data and the analyses of other scholars. As a result, the conclusions and policy prescriptions of the AAI paper lack foundation.

Several aspects of the AAI paper are striking.

- First, the AAI paper makes numerous basic mistakes regarding the facts – facts that are readily available to interested observers. For example, it overstates Monsanto's share in seed (claiming that Monsanto's share in corn and soybeans is about double its actual share) as well as its share of agricultural biotechnology patents (inflating Monsanto's share by double or more than what the data show).
- Second, the AAI paper, rather than assessing competition in seeds or traits, focuses primarily on the effects on innovation of concentration that it ascribes to recent merger activity, which it argues is driven largely by Monsanto. The AAI paper does not directly evaluate the effects of any particular Monsanto merger, nor does it assess actual innovations coming to market. Instead it simply observes aggregate changes in proxies like counts of patents, patent citations, and regulatory permits over the past decade. While, as we discuss, the AAI paper gets the facts and analysis wrong with regard to these proxies, the more fundamental problem is that the AAI paper relies upon proxies for innovation instead of looking at *actual* innovation. The AAI paper ignores the recent introduction of new biotech traits by Monsanto and its competitors. The AAI paper also ignores what biotechnology

[1] Diana L. Moss, "Transgenic Seed Platforms: Competition Between a Rock and a Hard Place" (Oct. 23, 2009), *available at* http://www.antitrustinstitute.org/archives/files/AAI_Platforms%20and%20Transgenic%20Seed_102320091053.pdf [henceforth "AAI"]. The AAI paper acknowledges funding from DuPont. *Id*. at 1, n.1

[2] *See* David Begleiter, "Monsanto Company Update," Deutsche Bank (Nov. 13, 2009).

competitors are saying about their trait pipelines. Rather than expressing concern about foreclosed innovation, trait developers use superlatives like "game changing," "buzzing with creativity," "robust," and "the richest pipeline in our history." There is no basis for concerns about innovation in agricultural biotechnology.

- Using ominous-sounding section titles ("First Signs of Trouble"), the AAI paper comes to very certain ("indisputable") conclusions and makes sweeping recommendations (compulsory licensing) that are not supported by analyses. Indeed, much of the AAI paper's text consists of assertions that are on their face inconclusive: "arguably," "a threshold question to consider," "may be," or "some analysis indicates". In short, AAI's strong conclusions are not supported by the analysis that AAI presents.

There is thus no factual predicate for the paper's conclusion that there is an "intractable" problem with competition that must be remedied by rewriting the intellectual property laws and through antitrust enforcement based on untested new theories. Rather, the facts demonstrate that competition and innovation are alive and well in agriculture. According to the public pronouncements of Monsanto and its competitors, new product pipelines are as promising as they have ever been in the short history of agricultural biotechnology, while the AAI paper asserts just the contrary.

Monsanto and, we believe, other firms in the industry would welcome the opportunity to demonstrate their pipelines and the products involved in recent product launches at the joint Justice Department/USDA workshops. Actually examining the innovations would cast a different light on the AAI paper's contentions regarding competition and innovation in American agriculture.

II. EXECUTIVE SUMMARY

The title of AAI's report asks whether competition in transgenic seed platforms is "between a rock and a hard place?" The answer to that question is "no."

Competition among providers of corn, soybean, and cotton seeds is vigorous. Monsanto does not dominate any of these seed markets. Indeed, of the big three row crops, it is the leading seed company in only corn: its share of corn is in the mid 30s (just a few points ahead of DuPont/Pioneer); its share of soybean seed is less than 30% (behind market leader DuPont/Pioneer); and Monsanto's cotton seed company, Delta and Pine Land, is no longer the largest U.S. cotton seed company (now behind market leader Bayer). *See* pages 7-10.

Innovation competition (where the AAI paper places so much emphasis) is equally vigorous. The AAI paper ignores the recent introductions of new traits by both Monsanto and its competitors, the glowing descriptions of their trait pipelines, and the public statements regarding increased investment in trait development. *See* pages 27-33.

How did AAI get things so wrong? The answer is that it made basic mistakes in its analysis, and drew conclusions that were not supported by the empirical and academic sources it cited.

- According to the very source that AAI cites, Monsanto's shares of corn and soybean seed are half of what AAI claims. *See* pages 7-10.

- Monsanto's share of "innovation" when measured by patent holdings is half or even less than what AAI says. *See* pages 10-23.
- AAI states that a decline in the USDA deregulation of biotech traits shows a decline in innovation. But even assuming deregulation is a reasonable proxy for innovation, the AAI paper grossly misstates the trend in petitions for deregulation by comparing 1995 (the high water mark of trait deregulation) with 2008 (a year with unusually low petitions for deregulation). Petitions have generally remained flat over the past decade, and there were more petitions for deregulation of new traits filed in 2009 than in any year since 1998. And if one looks only to petitions for deregulation in the key crops of corn, cotton, and soybeans, there were almost twice as many petitions for deregulation filed in 2009 as in any year this decade. *See* pages 24-26.
- AAI cites articles which, even a cursory review reveals, do not support the AAI paper's claims.
    - AAI cites one study that says Monsanto owns four of thirteen "major" patents, but one of those four patents has expired, and another technology (never actually a patent) was divested. So, as it turns out, Monsanto owns fewer "major" patents than Syngenta. *See* pages 20 23.
    - AAI asserts that conclusions about patent quality for the last decade can be drawn from an academic study that counts up the number of citations to a patent. But even if citations were a proxy for patent quality, the authors of that study limit their conclusions to the period from the mid-1980s to the mid-1990s, concluding that limitations on data for the last decade render more recent data not meaningful. In other words, the study has nothing to say about the quality of patents during the only period relevant to the claims of the AAI paper. And, even for the earlier period, the authors conclude that the decline in per-patent quality is offset by the exponential increase in the total number of patents. *See* pages 26-27.
- AAI says that farmers are being "squeezed" because trait prices have increased at a faster rate than the value that farmers receive for their crops. But this calculation is not a measure of the value farmers receive from traits for multiple reasons. First, in making this calculation AAI ignores the savings that farmers have realized in reduced costs for herbicides and insecticides as a result of biotechnology (plus additional nonpecuniary benefits like improved safety, convenience, time savings, and environmental benefits). Even taking the AAI paper's approach, and ignoring these obvious farmer benefits, the paper's calculated "squeeze" is based on an elementary arithmetic error. Because trait prices are just a small portion of a farmer's total input costs, the profits earned by farmers using more expensive seed with transgenic traits can increase *even if* trait prices are rising at a higher rate than revenue per acre. *See* pages 46-51.
- AAI ignores the impact on investment decisions of the controversy over public acceptance of biotech traits that arose at the end of the 1990s and continued through the early 2000s. Even after spending billions of dollars on biotech research and development and in the acquisition of seed companies in the late 1990s, the market valued Monsanto's agricultural business at less than zero. The potentially

huge impact of this on the incentives of both Monsanto and its competitors to invest plays no role in the AAI analysis. *See* pages 17-20.

At bottom, the AAI paper fails to accurately portray the agriculture business. To list just a few of the points, the paper's inflated claims regarding Monsanto seed market shares should have immediately sounded alarm bells to anyone who follows agriculture, even if only by reading the public statements of Monsanto's major competitors. Rather than offering theoretical discussion about whether "inter-platform rivalry in the transgenic seed industry is currently not a viable mode of competition," AAI should have looked at whether there were any stacked trait combinations that growers wanted that were not available. It would have found that there are not. AAI also would have seen that competitors offer or soon will offer traits that are substitutes for all traits currently offered by Monsanto. *See* pages 41-43. And finally, a direct look at innovation (as opposed to counting patents, patent references, field releases and deregulation statistics) would have shown that company after company in this field believes its pipeline is chock full of promising new products. *See* pages 27-33.

Agricultural biotechnology is critically important to America, agriculture, economic growth, international food security, and to meeting global demands and environmental challenges. Policy in this area must therefore be based upon accurate information and careful analysis. Because the AAI paper has the facts and analysis wrong, there is no support for its premise that there is an "intractable" problem with competition that must be remedied by rewriting the intellectual property laws and through antitrust enforcement based on untested new theories.

III. BACKGROUND ON SEEDS AND TRAITS

The seed grown by American farmers today incorporates dramatic advances relative to seed grown just a decade or two ago. Advanced breeding techniques, including in recent years "molecular assisted" breeding based on information about genetic sequences, have led to substantial improvements in crop yields.[3] In addition, significant advances come from biotech traits, i.e., adding useful genes to plants such as corn, soybeans and cotton.

To date, the commercially significant biotech traits have either been herbicide tolerance traits or insect protection traits. Herbicide tolerance traits allow plants to survive the application of herbicides (weed killers) that would normally damage the plant. This allows farmers to combat weeds that would reduce yields and to do so without harming the crops. Insect protection traits allow plants to protect themselves against yield-robbing insects before these insects can cause substantial damage to the crop. To date, these insect protection plants have incorporated genes from the *bacillus thuringiensis* (Bt) bacteria, which has long been used by organic farmers as a natural insecticide.[4]

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[3] *See* Bob Reiter, Monsanto Annual Investor Event (Nov. 11, 2009), *available at* http://www.monsanto.com/pdf/investors/2009/bob_reiter_11_11_09.pdf (describing benefits of molecular marker assisted breeding).

[4] *See generally* Iowa State University, *Bacillus Thuringiensis: Sharing Its Natural Talent with Crops*, *at* http://www.biotech.iastate.edu/publications/bt_curriculum/.

Monsanto was not the first trait developer to launch either herbicide tolerance or insect protection traits, but it has been the most successful. The first herbicide tolerance traits were IMI corn developed by American Cyanamid and BASF and launched in 1991 and DuPont's STS soybeans, launched in 1993. The first transgenic herbicide tolerance trait in cotton, BXN™, came from Rhone Poulenc (now part of Bayer) in 1995. The first transgenic insect protection traits in corn, launched in 1996, were Knockout (sold by a predecessor of Novartis, now part of Syngenta) and NatureGard (sold by Mycogen, now owned by Dow).[5] In cotton, the first insect protection traits from Monsanto and from Calgene also launched in 1996.[6]

Monsanto has also introduced and licensed a number of other traits. The Roundup Ready® glyphosate tolerance trait, launched in soy in 1996, has also has been commercialized in corn, cotton, canola, alfalfa, and sugarbeets. Growers of Roundup Ready plants can treat their fields with glyphosate, an inexpensive and effective weed killer. ("Roundup®" is Monsanto's umbrella brand for its products containing glyphosate, but glyphosate is also available from numerous non-Monsanto branded and generic suppliers.[7]) Monsanto also licenses the YieldGard® and SmartStax™[8] insect protection traits in corn.

A list of traits that have been commercialized in the United States is attached as Appendix 1.

Unlike chemical herbicides and insecticides, which can be sprayed on soil or on plants, biotech traits work in the cells of plant tissue. Thus, in order to be delivered to farmers, biotech traits need to be incorporated into the DNA of the seed itself, which requires a trait developer to work with companies that breed and sell seed. Several hundred companies sell corn, soybean, and cotton seed in the United States.

Trait developers have historically pursued three different models for working with seed companies:

- Some vertically integrated trait developers have made traits available pretty much only in the seed of their own seed companies. Mycogen and Syngenta followed this path with their first Bt insect protection genes, and Dow's Herculex® insect protection trait was originally available almost exclusively in seed sold by DuPont/Pioneer (Dow's development partner) and Dow's Mycogen® brand.[9]
- Some developers of herbicide tolerance traits that were in the herbicide business but not the seed business have licensed their traits to a single seed company. DuPont pursued this route with STS (before it acquired its Pioneer seed company subsidiary), initially licensing the trait exclusively to Asgrow. And Rhone Poulenc

[5] *See* Appendix 1.

[6] Plant Biotech Traits Commercialized (2009) at 492 (Bollgard trait) and 502 (test launch of Calgene's Bt trait).

[7] A list of glyphosate products with EPA registrations is available at http://apps.cdpr.ca.gov/cgi-bin/label/labq.pl?p_chem=1855&activeonly=on.

[8] Plant Biotech Traits Commercialized (2009) at 33-34. SmartStax contains genes from three different trait developers: Bayer, Dow AgroSciences, and Monsanto. It is jointly licensed by Monsanto and Dow.

[9] *Id*. at 411-413 ("Mycogen developed Cry1A(b) for launch as its own NatureGard and as the licensed KnockOut (Ciba).").

followed the same route with BXN, initially licensing the trait only to Stoneville. These firms saw trait licensing as a way to sell more herbicide.[10]

- Monsanto was the first company to pursue a different route – widely licensing the traits it developed to hundreds of seed companies including its major competitors (as well as incorporating its traits in the germplasm sold by its own seed companies).[11] This approach enabled seed companies to use the trait provider's technology in their seed offerings, but did not require such use.

Monsanto's broad licensing approach has helped shape the industry of today. Farmers can choose among thousands of seed varieties from hundreds of seed companies. And although seed companies and farmers have no obligation to use Monsanto traits, Monsanto's traits are so popular with farmers that a significant majority of corn, soybean, and cotton seed sold in the United States has a Monsanto trait added to it.

IV. THE AAI PAPER IS WRONG ABOUT MONSANTO'S SEED MARKET SHARE

The AAI paper says that "[a] threshold question to consider is whether Monsanto has exercised its market power to foreclose rivals from market access, harming competition and thereby slowing the pace of innovation and adversely affecting prices, quality, and choice for farmers and consumers of seed products."[12] In fact, the first question that must be answered is whether Monsanto *has* market power.

Not all companies with a high market share will have market power of antitrust concern. For example, if barriers to entry and expansion are low, even a firm with a high share will not be able to exercise market power because competitors will step in and win business if it does so. While a high market share is not a *sufficient* condition for market power of antitrust concern, well-established industrial organization economics makes clear that a high market share is a *necessary* condition for a firm to have market power of antitrust concern.[13] If customers can

[10] Biotech Traits Commercialized (2003) at CTN5 (BXN cotton), SOY111 (STS soybeans). Indeed, an article cited in the AAI paper reports that DuPont delayed American Cyanamid's efforts to develop herbicide tolerant crops because of competition between the two in the herbicide business. *See* Carl E. Pray and Anwar Naseem, "Intellectual Property Rights on Research Tools: Incentives or Barriers to Innovation? Case Studies of Rice Genomics and Plant Transformation Technologies," *AgBioForum*, 8(2&3): 108-117 (2005), *available at* http://www.agbioforum.org/v8n23/v8n23a07-pray.htm.

[11] Biotech Traits Commercialized (2001) at CORN9 ("YieldGard shares with Roundup Ready soybean the distinction of being the most broadly licensed of the biotech traits.").

[12] AAI at 1.

[13] *See, e.g.*, *United States v. Microsoft Corp.*, 253 F.3d 34, 51 (D.C. Cir. 2001) ("Under [the] structural approach, monopoly power may be inferred from a firm's possession of a dominant share of a relevant market that is protected by entry barriers."); *American Prof'l Testing Serv. v. Harcourt Brace Jovanovich*, 108 F.3d 1147, 1154 (9th Cir. 1997) ("Even if Harcourt has a high market share, neither monopoly power nor a dangerous probability of achieving monopoly power can exist absent evidence of barriers to new entry or expansion.").

readily turn to competing suppliers and competing suppliers can readily supply new customers, a firm will not be able to exercise market power.

While AAI claims that "[i]t is indisputable that Monsanto possesses market power in . . . markets for . . . traited seed,"[14] the seed share data AAI relies upon is obviously wrong.[15]

AAI says that Monsanto is the dominant seed company in corn, soybeans, and cotton, asserting that "[i]n 2008, the firm had substantial shares of up to 65 percent for traited corn and soybeans."[16] In fact, Monsanto's corn and soybean shares are about *half* of what AAI claims. The correct shares are available in the business press, where as recently as 2007, Pioneer was saying that "[w]hen it comes to North America corn market share, we are the leader. We have the highest market share of acres in the U.S. for both corn and soybeans; we have for years."[17]

That Monsanto's soy and corn shares are closer to 30 than 65 is plain on the face of documents that AAI has read and that it cites in its paper. For example, in discussing Monsanto's trait share, AAI points to a Monsanto presentation to stock analysts as an authoritative source for corn and soybean shares.[18] That presentation (pictured below) sets out seed share as well. It makes clear that Monsanto's share of corn is 36% (25.5% in the DEKALB® brand and 10.5% in the ASI brands), *not* "up to 65%." Monsanto's share of soybeans is 29% (20% in the Asgrow® brand and 9% in the ASI brands), *not* "up to 65%."[19]

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[14] AAI at 27.

[15] We do not conduct a market definition analysis in this paper, but instead focus on the AAI proposed separate "markets" for seeds and traits. An alternative approach, if one were to consider all the substitute products that constrain the pricing of transgenic traits, would be to look at a systems marketplace. Under this derived demand market definition, the market would be defined as alternative systems for killing weeds and insects, and seed with transgenic traits would be in the same market as non-transgenic seed used with alternative chemical systems. Under this approach it is clear that many products constrain Monsanto's ability to raise its prices.

A word about data sources: **dmr**kynetec is the leading provider of market share data for the agricultural industry. However, because of contractual limitations on the public disclosure of **dmr**kynetec data, this paper relies upon public sources of share data (which may vary in small ways from the **dmr**kynetec data) where use of the **dmr**kynetec data would not be permitted under Monsanto's license.

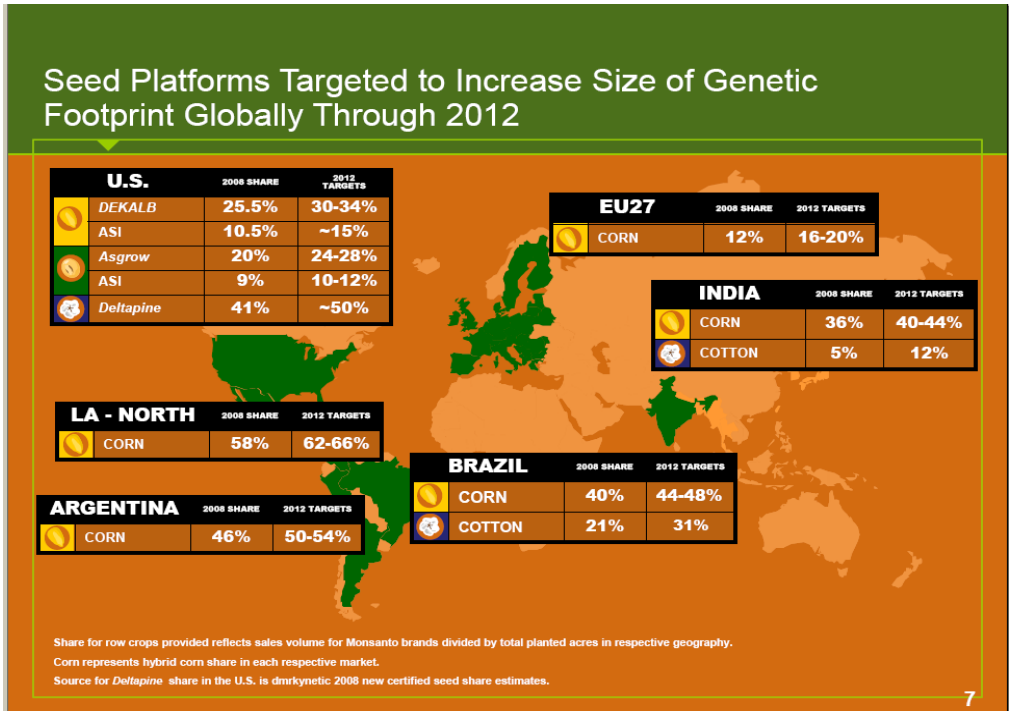
[16] AAI at 13-14.

[17] Sarah Bzdega, "The Seed Race," *The Business Record (*Mar. 25, 2007) (quoting Pioneer executive Frank Ross, Vice President and business director of Pioneer's North American operations), *reprinted at* http://www.agbioworld.org/newsletter_wm/index.php?caseid=archive&newsid=2671. *See also* Dan Piller, "Seed Delay a Blow to Pioneer," *Des Moines Register* (Dec. 5, 2009) ("Monsanto and Pioneer are virtually neck and neck in U.S. corn and soybean market shares, together controlling about two-thirds of the market. Differences in the way the two companies break out their shares makes comparisons difficult, but Monsanto is the slight leader in corn and Pioneer the leader in soybeans."), *available at* http://www.desmoinesregister.com/article/20091205/BUSINESS01/912050342/Seed-delay-a-blow-to-Pioneer.

[18] AAI at 13.

[19] Carl Casale, "Morgan Stanley: Global Basic Materials Conference 2009," (February 18, 2009), *available at* http://www.monsanto.com/pdf/investors/2009/02_18_09.pdf (cited in AAI at 13, n.31).

Exhibit 1



What AAI has done is ignore this clear presentation, and public statements by Monsanto and its competitors. It instead offers a non-standard "share" analysis relying on a separate Monsanto document that has the same numbers as shown above, plus numbers that reflect foundation seed sold by Monsanto to independent seed companies, as if that made independent seed companies no longer "independent" but rather Monsanto seed companies and competitively irrelevant.[20] This is a bit like attributing GM's market share to Toyota because GM sources some engines from Toyota. (It is all the more improper because it would attribute to Monsanto seed share from companies that have a deep relationship with Pioneer through Pioneer's PROaccess program, which Pioneer says increases its "global seed market reach through co-brands, second brands and investments."[21]) To take such an approach is inconsistent with the very thrust of a paper that argues that competition is most robust when upstream innovation entities sell to downstream independent seed companies.

Finally, AAI erroneously states that Monsanto's share of cotton seed is 45%.[22] In fact, the cited presentation showed Monsanto's share (in its Deltapine® brand) as 41%,[23] and year-end

[20] Monsanto Supplemental Toolkit for Investors Updated at 6, 8 - 9 (June 2009), *available at* http://www.monsanto.com/pdf/investors/supplemental_toolkit.pdf.

[21] Pioneer Press Release, "DuPont Unveils New Strategy to Expand its Seed Business," (Dec. 11, 2008), *available at* http://www.pioneer.com/web/site/portal/menuitem.5ccca40c3d1d8a6269e269e2d10093a0/.

[22] AAI at 13 - 14.

2009 data from the USDA puts Monsanto's share at 39%.[24] As Bayer CropScience put it in an October 2009 press release, the most recent USDA acreage report for cotton shows that "Bayer CropScience cotton seed brands FiberMax® and Stoneville ® are planted on the largest share – almost half – of U.S. cotton acres for a third consecutive year."[25]

Monsanto's true share of U.S. corn, soybean, and cotton seed sales are well below the level where Monsanto could be considered to have monopoly power in seed sales. Again, even though high shares are not a *sufficient* condition, they are a *necessary* condition.

V. THE AAI PAPER IS WRONG ABOUT MONSANTO'S SHARE OF "INNOVATION"

AAI supports its call for change in the agricultural biotechnology industry by repeatedly claiming that changes in industry structure due to merger activity "primarily driven" by Monsanto have led to reduced incentives to innovate, which in turn has resulted in a decline in quantity and quality of innovation.[26] Economists and antitrust lawyers do not have a single well-established way of calculating shares of "innovation."[27] The AAI paper uses four statistics as proxies for innovation: patents, field releases (approvals by the USDA to test new biotech traits), deregulation of transgenic seeds, and the number of times a patent is cited by another patent. The first two are asserted to be proxies for the quantity of innovation and the latter two proxies for quality of innovation.

It is not self-evident that any of these statistics is a good proxy for what AAI purports to measure, and the AAI paper nowhere explains why these statistics are the best measures or indeed why they are accurate measures at all. As an example, the AAI paper's list of leaders in innovation based on patent counts omits BASF, a company that reports that "BASF Plant Science forms the industry's leading research and technology platform, employing approximately 700

Footnote continued from previous page

[23] Carl Casale, "Morgan Stanley: Global Basic Materials Conference 2009," (February 18, 2009), *available at* http://www.monsanto.com/pdf/investors/2009/02_18_09.pdf (cited in AAI at 13, n.31).

[24] USDA, "Cotton Varieties Planted 2009 Crop," p. 5 (Aug. 28, 2009), *available at* http://www.ams.usda.gov/mnreports/cnavar.pdf.

[25] *See* Bayer Press Release, "Cottonseed Brands from Bayer CropScience Claim Largest Share of 2009 U.S. Acres," (Bayer brands planted on 46% of cotton acres) (Oct. 19, 2008), *available at* http://agfax.com/updates/misc/2009/pr/bayer-cottonseed-2009-1019.pdf.

[26] *See* e.g., AAI at 18 - 19.

[27] The DOJ/FTC Antitrust Guidelines for the Licensing of Intellectual Property provide (in § 3.2.3) that the "Agencies may base the market shares of participants in an innovation market on their shares of identifiable assets or characteristics upon which innovation depends, on shares of research and development expenditures, or on shares of a related product. When entities have comparable capabilities and incentives to pursue research and development that is a close substitute for the research and development activities of the parties to a licensing arrangement, the Agencies may assign equal market shares to such entities."), *available at* http://www.justice.gov/atr/public/guidelines/0558.htm#t323.

people" and that it has spent €1 billion on its plant biotechnology operations in the decade 1998 - 2008.[28] Particularly in light of the weakness of a proxy that ignores BASF, there is nothing to explain why one should not look to the approach of the DOJ/FTC Intellectual Property Licensing Guidelines which posits that where companies "have comparable capabilities and incentives to pursue research and development," they should be accorded equal shares of an innovation market.[29] On this basis, Monsanto's share would be no greater than that of DuPont, Syngenta, Dow, Bayer, and BASF, all of which are larger companies than Monsanto.[30] In such a market, with share equally divided six ways, Monsanto's share would be under 17%.

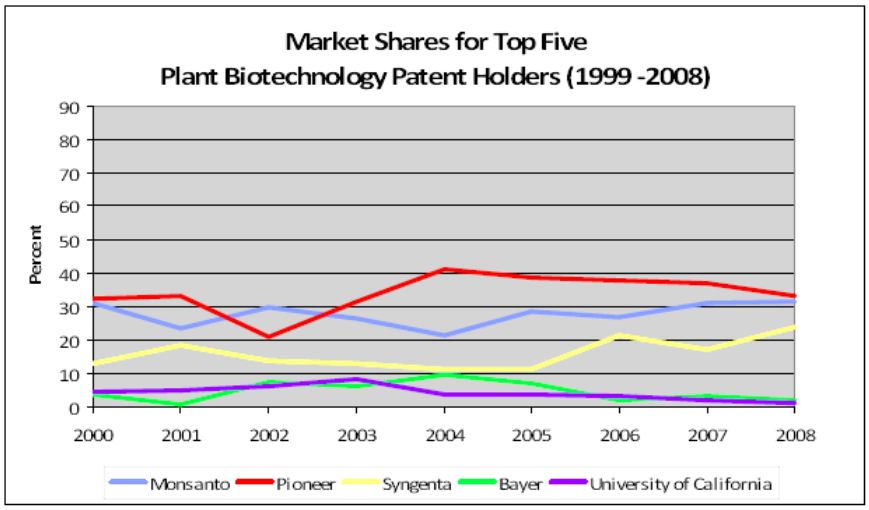
Separately, and as important, the AAI paper does not evaluate these "innovation" statistics consistently or properly – often drawing conclusions that are directly at odds with the data or the conclusion described by the cited academic source.

A. THE AAI PAPER'S CALCULATION OF SHARE BASED ON AG BIOTECH PATENTS IS WRONG

While patents may be reflective of investment and innovation, the mere ownership of intellectual property rights is neither inherently improper nor a true indication of the competitive significance of any company in a particular field.

In figure 5, reproduced below, AAI purports to plot the patent shares of the "Top Five Plant Biotechnology Patent Holders" (DuPont/Pioneer, Monsanto, Syngenta, Bayer and University of California) from 2000-2008.

Figure 5



[28] http://www.basf.com/group/corporate/en/content/products-and-industries/biotechnology/plant-biotechnology/index.

[29] U.S. Department of Justice and the Federal Trade Commission, "Antitrust Guidelines for the Licensing of Intellectual Property," (Apr. 6, 1995), *available at* http://www.justice.gov/atr/public/guidelines/0558.htm#t323.

[30] *See* "Special Report: The Global 2000," *Forbes* (Apr. 8, 2009), *available at* http://www.forbes.com/lists/2009/18/global-09_The-Global-2000_Rank.html.

Importantly, a fundamental problem with this analysis is that the AAI paper does not explain how it extracted these "market shares" in sufficient detail to allow independent readers to replicate what was done. AAI does state, however, that its calculation includes "plant-related" patents granted to only those firms that were among the top 25 agricultural biotech patent holders in 1999. This is an odd choice as it by definition excludes from its analysis any potential new entry. More so, even in the absence of entry, it inflates the estimated shares of the top five companies reported.[31] For example, if the top 25 patent holders were issued only one-half of all patents, the AAI calculation would overestimate market shares by 100%. If the top 25 patent holders were issued only one-third of all patents, the AAI calculation would yield market shares that are three times their actual size.

As the foregoing suggests, the AAI paper's "shares" of Monsanto and its competitors do appear to be about *two times or more* their actual share of biotech patents based on the very data source upon which AAI claims to rely. From 1976 to 2000, according to the 2002 USDA study on which AAI relies, the top 25 patent holders were issued 5,222 patents, or 44% of 11,761 total agricultural biotech patents awarded in that timeframe.[32] If the top 25 represented a similar small share of all "plant-related" patents issued in 2000-2008, the "market shares" that AAI computes are dramatically overstated, i.e., they are 2.3 times their true level.

This overstatement is confirmed by looking at the share of biotech patents accounted for by the top *ten* biotech patent holders in 2000. According to the same USDA source, the top 10 patent holders collectively accounted for only 38% of biotech patents.[33] It follows that the top *five* biotech patent holders necessarily account for less than 38%, and much less than half of the roughly 85% estimated for the top five shown in Figure 5 of the AAI paper. It is not possible to confirm Monsanto's exact share since the AAI paper does not provide its criteria for selecting "plant-related" biotechnology patents from the universe of all agricultural biotechnology patents.[34] However, Monsanto's share *could not* have been the 31% that AAI shows—in fact, it is likely half or less of the share estimated by the AAI paper.[35]

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[31] AAI at 18, n.45 ("Based on the top 25 patent-holders in 1999, the number of plant-related patents granted to each of the patent-holders from 2000-2008 was retrieved from the PTO database.")

[32] See http://www.ers.usda.gov/Data/AgBioTechIP/Data/Table10_Top100USNonUSSummarySubs.htm and http://www.ers.usda.gov/Data/AgBioTechIP/Data/Table4.htm.

[33] *See* http://www.ers.usda.gov/Data/AgBiotechIP/Data/Table4.htm.

[34] For example, it is not clear whether the AAI paper's calculations exclude genetic transformation technologies or genomics technologies, both of which are included in the USDA patent database upon which the AAI paper relies. (The categories and subcategories used in the database are described at http://www.ers.usda.gov/Data/AgBiotechIP/Technologies.htm.)

[35] For example, assuming that the top 5 "plant-related" patent holders accounted for the full 38% that the USDA study attributes to the top 10 patent holders (for all agricultural biotechnology patents), Monsanto's share would still be less than 14% = 31% × (38% / 85%). *See also* "Table 26: Utility patents, all preselected fields," *available for download at* http://www.ers.usda.gov/Data/AgBiotechIP/Index.ASP#StartofTables. This table, which is part of the same data source relied on by the AAI, contains detailed data on patents granted by firm and technology class. Under multiple alternate assumptions regarding which technology classes the AAI has included as

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Because the "market shares" AAI uses are not actually market shares, the HHI concentration index calculated from them is meaningless.[36] That said, if one corrects for the mistakes shown above, the calculated HHI of a patent innovation market is not in the "mid to high 2000s," as reported by AAI, [37] but rather is *less than 750.* This is true even if each player has even one half of the share that AAI incorrectly attributes to it.[38] This market – where the largest firm (DuPont) has a share of less than 18% – is an exceptionally unconcentrated market.

Even if one were to rely on the data in AAI's paper, however, it fails to support the conclusion reached by AAI. Figure 5 shows that DuPont has more patents than Monsanto in every year but one, and that Syngenta's annual share of patents in each of 2006-2008 was double what it was in 2005.[39] It is difficult to see a basis for claiming that Monsanto has market power in an innovation market where it is not the largest player, where one of its competitors doubled its share over a short period, and where entry barriers are so low that a public university is one of the top five players.

Nor does AAI deal with the historic record with respect to patent litigation among agricultural biotechnology companies, which illustrates that several multinational competitors (Bayer, Syngenta and Dow) each sought to enjoin Monsanto from the ability to sell corn, soy and cotton products as a result of patent litigation they filed and took to verdict without success. It is Monsanto's competitors, not Monsanto, that attempted to block competition through patent holdings in this series of litigation.[40] Thus, patent counting alone is unlikely to present any accurate picture of the industry or how innovation and competition should be viewed.

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patent-related, the shares calculated by the AAI paper are two or more times greater than those supported by the data.

[36] The HHI is the "Herfindahl-Hirschman Index," used by antitrust lawyers and economists as a measure of market concentration. It is calculated by summing the squares of market shares. For example, if a market had five equal-sized competitors, the HHI would be $20^2+20^2+20^2+20^2+20^2=2000$. It is used in the U.S. Dep't of Justice and Federal Trade Comm'n, *Horizontal Merger Guidelines* § 1.5.

[37] AAI at 18.

[38] If, instead of having shares of 35%, 30%, 25%, 5%, and 2% as suggested by Figure 5 of the AAI paper, the largest patent holders had shares 1/2 as large (i.e. of 17.5%, 15%, 12.5%, 2.5%, and 1%), and if every remaining firm had 1% market share, the HHI would be at most $17.5^2+15^2+12.5^2+2.5^2+1^2 + 52\times (1^2)=747$.

[39] DuPont has touted its leadership in biotech patents in press releases. *See, e.g.*, DuPont Press Release, "The Patent Board(TM) and Nature Biotechnology Rank DuPont No. 1 Innovator in Chemical Industry and No. 1 in Biotech Patents," (Mar. 12, 2008), *available at* http://www2.dupont.com/EMEA_Media/en_GB/newsreleases_2008/article20080312.html. In fact, the *Nature Biotechnology* analysis shows that DuPont and Pioneer received almost five times as many biotech patents in 2006 as Monsanto (161 for DuPont and Pioneer versus 33 for Monsanto). Monsanto subsidiaries may increase the total number of patents held by Monsanto, but no other Monsanto entity is present in the top 20 organizations with the most US biotech patents. *See* http://www.nature.com/nbt/journal/v25/n12/box/nbt1207-1341_BX4.html.

[40] *See, e.g.*, *Monsanto Co. v. Bayer Bioscience N.V.*, 514 F.3d 1229 (Fed. Cir. 2008) (affirming finding that Bayer patents were invalid); *Syngenta Seeds, Inc. v. Monsanto Co.*, 231 Fed. Appx. 954 (Fed. Cir. 2007)

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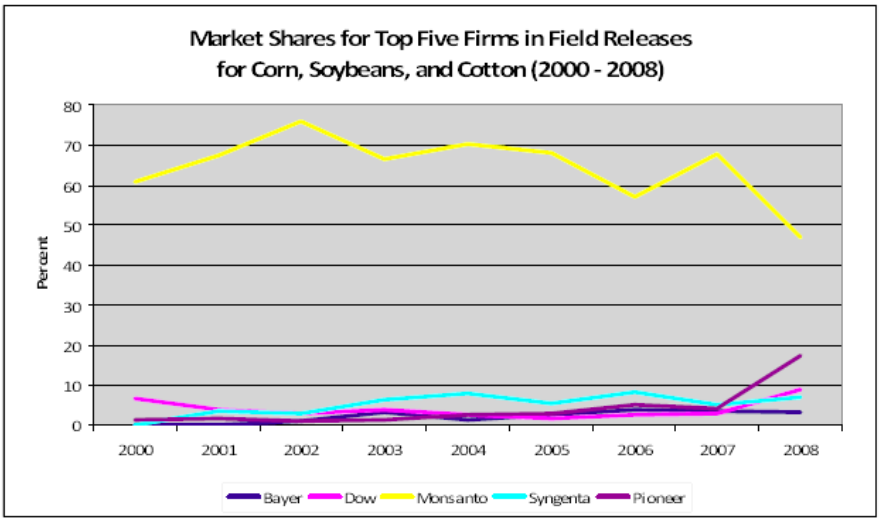
Finally, the AAI paper's key argument for why action should be taken against Monsanto is based not on the level of its calculated market HHI (which is in a range where mergers are regularly approved) but rather on the purported increase in the HHI over the last decade.[41] AAI's thesis is that concentration, driven largely by Monsanto, has led to an increase in concentration of innovation. But the data do not support this conclusion. The small increase in the HHI is not due to one of Monsanto's competitors' ceasing to file patents (as might be expected in the presence of anticompetitive conditions). To the contrary, by inspection of Figure 5, the small increase in the HHI appears to be largely driven by the *growth* in share of patents held by Syngenta, a Monsanto *competitor*. Thus the facts in the AAI paper cannot support the AAI conclusion that "concentration has increased in tandem with a period of vigorous merger activity in the 2000s" that is driven "primarily" by Monsanto.[42]

B. FIELD RELEASE DATA DO NOT SUPPORT THE AAI PAPER'S CLAIMS ABOUT A DECLINE IN INNOVATION

Figure 4 of the AAI paper, which shows the "Market Shares for Top Five Firms in Field Releases for Corn, Soybean, and Cotton," is reproduced below:

Figure 4



Monsanto has the largest number of field releases in this figure, but Monsanto's share of field releases *fell* from a high of over 75% to approximately 47% in 2008. Additionally, the HHI *declines* dramatically over this time period, by something on the order of 3000 points.[43] And

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(affirming finding that Syngenta patents were invalid); *Mycogen Plant Science, Inc. v. Monsanto Co.*, 243 F.3d 1316 (Fed. Cir. 2001) (affirming finding that Dow/Mycogen patents were invalid).

[41] AAI at 18.

[42] *Id.* at 19.

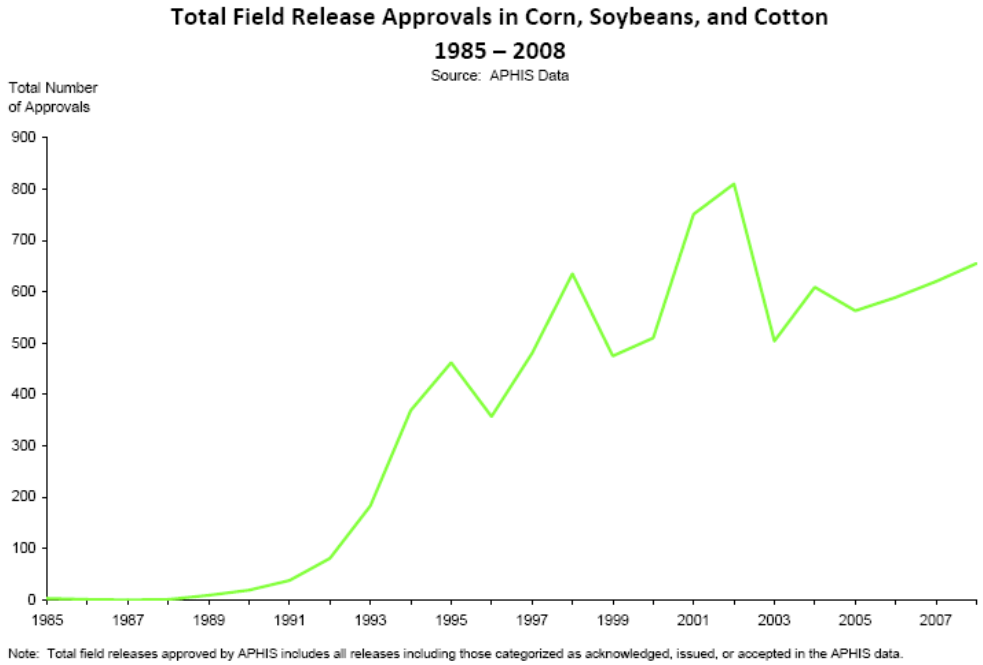
[43] AAI does not report HHIs for field releases by year, but states that the HHI hit a peak of almost 6,000 in this time period. Inspection of Figure 4 indicates that an HHI based on field releases would fall below 3,000 in 2008. AAI at 17-18.

while the AAI conclusions regarding innovation market shares based upon patent holdings above (Figure 5) relied on its "finding" that a small increase in market HHI over time was evidence of decreased innovation, the AAI analysis of USDA field release data as a measure of innovation ignores the large declining trend in concentration. The HHI clearly has dropped dramatically over the relevant time period, as Monsanto's share dropped and others' rose.

The AAI paper's choice of how to describe these two charts bears comment. Neither chart supports the conclusion that increased concentration driven primarily by Monsanto has led to an increase in concentration or caused a decrease in innovative activity. To the contrary, each shows evidence of increased innovative activity by Monsanto's competitors.

Additionally, the AAI paper fails to provide data on the total number of field releases over time. We present this information in Exhibit 2 below, which shows that by this measure of innovation there is a continuation of the "surge in quantity of innovative activity in the 1990s" that AAI acknowledges early in its paper.[44] In sum, analysis of the AAI paper's field release measure of innovation unequivocally indicates that innovation is growing and concentration has dropped, as more firms undertake field trials to bring new traits and varieties to market. AAI offers this measure as a proxy for innovation, but then fails to accurately describe what it shows.

Exhibit 2



Finally, assessing field releases by crop and over a longer time period than AAI did confirms that there is no clear trend in concentration and that the number of field release approvals has been trending generally upward. For instance, Exhibit 3 below shows that Monsanto had its

[44] *Id*. at 19.

highest shares of soybean field releases in 1989 and 1990, long before the acquisition activity with which AAI is concerned.

Exhibit 3

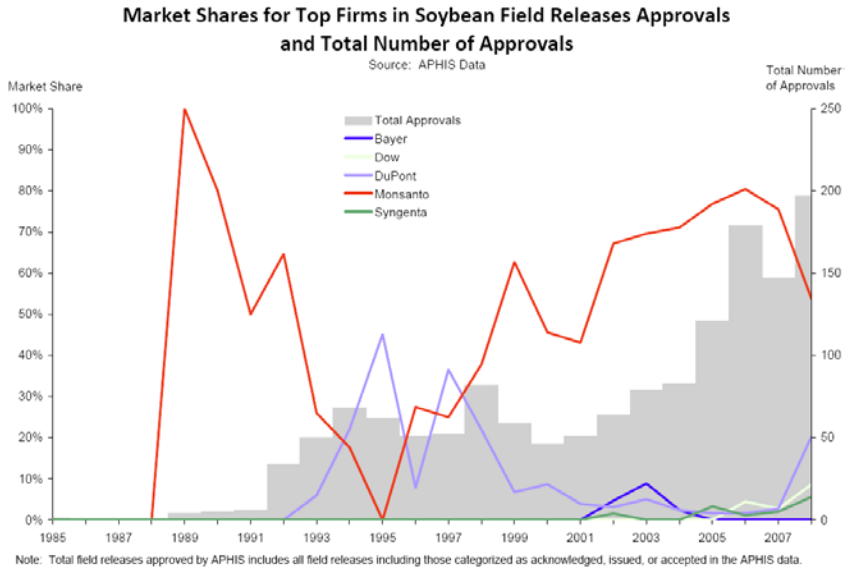


Exhibit 4 below shows that participation in cotton field releases hit a high in the mid to late 2000's with Bayer taking over the leading share by 2005, but with Monsanto, Syngenta, and Dow still accounting for meaningful shares.

Exhibit 4

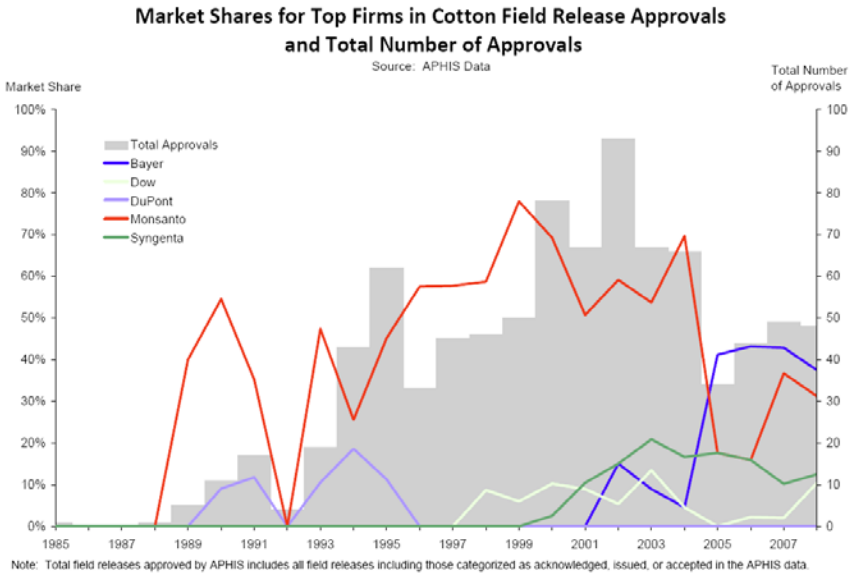
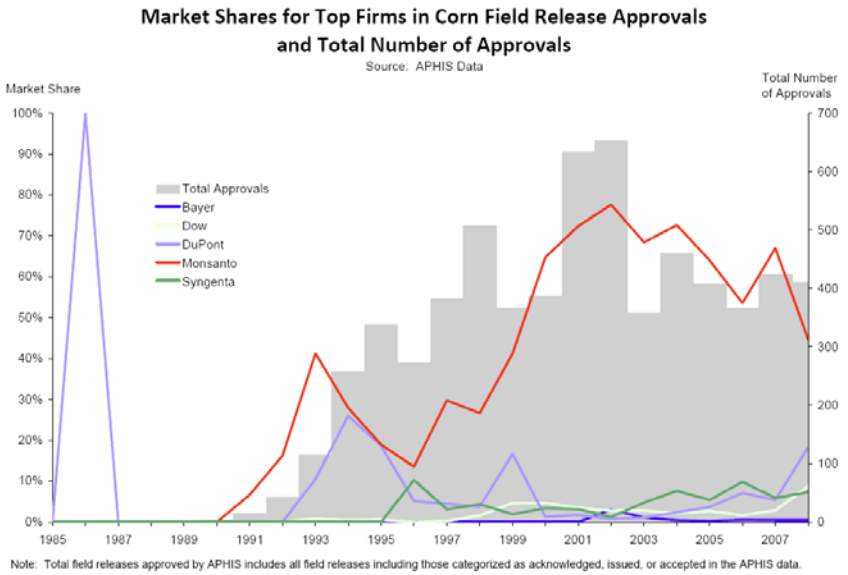


Exhibit 5 below reveals that the trend in corn is similar to the overall trend in field releases, with Monsanto's share of field releases peaking in 2002, but then falling back down to less than 50% of corn field releases in 2008.

Exhibit 5



AAI also analyzes the changes in the share of field releases over time using a measure called a "mobility index." AAI reports that "mobility values are extremely low" and concludes that these small changes in share indicate that "firms are unable or unwilling to challenge Monsanto's dominant position in innovation markets."[45] But AAI is misusing this analytical tool. The developer of the mobility index recognizes the "normative ambiguity of mobility statistics as indicators of 'competitiveness' in policy contexts" and cautions that "the mobility measure already embodies concentration and its change … . Thus their joint use would involve an element of double counting."[46] An index that involves "ambiguity" in results and "double counting" cannot support the AAI paper's "indisputable" conclusion.[47]

C. THE AAI PAPER'S ANALYSIS OF INNOVATION IGNORES THE IMPACT OF THE CONTROVERSY OVER BIOTECH ACCEPTANCE

Any serious analysis of cause and effect, e.g., whether changes in concentration have affected incentives for innovation, also requires an inquiry into whether other factors occurring at the time in question might have been at work. The AAI paper's analysis of the "output" of innovation in biotechnology (i.e. field releases and patents) fails this test. The AAI paper

[45] AAI at 20.

[46] John R. Cable, "Market Share Behavior and Mobility: An Analysis and Time Series Application," *Review of Economics and Statistics,* Volume 79, Number 1 (1997), at 136-141, app. 137-8.

[47] AAI at 27.

suggests that the figures it presented as to innovation activity from 2000 to 2008 reflect the effect of merger activity on biotechnology innovation. But the AAI does nothing to directly relate any merger activity to these figures, and also ignores completely the effects on research spending attributable to the confidence and acceptance challenges facing biotechnology in the late 1990s and early in this century.

While biotechnology today has been accepted as a promising agricultural technology in many world areas, the technology continues to be controversial in other world areas. In Europe, Africa, and other parts of the world, biotech crops are not grown in meaningful quantities because the issue has become politicized.[48] During the period examined by AAI, it was an open issue whether and to what extent the sale of biotech seeds would be limited by political forces in the United States and elsewhere. It goes without saying that this increased the risk and reduced the expected return associated with any given investment in these technologies. As an article in the August 2000 issue of *Plant Physiology* describes:

> In response to the demands of activists, European governments have restricted the import and release of GMOs, and activists here and abroad have taken to destroying field plots and in one case firebombing a laboratory. Multinational corporations, anxious about preserving the public virtue of their brand names, have declared themselves GMO-free in response to as little provocation as a single letter of inquiry concerning their position on GMOs. Hundreds of Internet sites proclaim the evils of GMOs, and some newspapers and radio commentators, especially in Europe, fan the flames of public fear by uncritically publishing activist propaganda.[49]

The attack on traited seeds intensified at the end of the 1990s and continued through the early 2000s. The specter of political action against these crops and the risk of bad publicity for companies that sold "Frankenfoods" affected incentives. The New York Times has suggested that, in Europe at least, lack of public acceptance was the single most important issue blocking approval and adoption of GM crops, which to this date limits the market for seed with transgenic traits and the incentives of trait developers to innovate.[50] This public acceptance

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[48] In April 2009 Germany banned the cultivation of genetically modified corn because of fears that it was "dangerous for the environment." "Germany Bans Cultivation of GM Corn," *Spiegel Online* (Apr. 14, 2009), *available at* http://www.spiegel.de/international/germany/0,1518,618913,00.html. A German scientist wrote in the October 15, 2009 issue of *Nature* that scientists who work on biotechnology "have to endure bomb threats, insulting letters and telephone calls, destructions of their fields (almost no UK field experiment has survived since 2000) and harassment of their children at school." Jens A. Katzek, "Communication (Battlefield: Hitting the Supporters of Biotechnology)," *Nature*, p. 875 (Oct. 15, 2009). In the early 2000s, some African governments blocked genetically modified food aid from entering their countries due to health and environmental concerns. "Controversy Rages Over 'GM' Food Aid," *Africa Renewal, Vol. 16 #4* (Feb. 2003), *available at* http://www.un.org/ecosocdev/geninfo/afrec/vol16no4/164food2.htm.

[49] Chris Somerville, "The Genetically Modified Organism Conflict," 123 *Plant Physiology* 1201-02 (Aug. 2000), *available at* http://www.plantphysiol.org/cgi/content/short/123/4/1201.

[50] Paul Voosen, "Ghost of Frankenfood Haunts Europe," *New York Times* (Oct. 21, 2009), *available at* http://www.nytimes.com/gwire/2009/10/21/21greenwire-ghost-of-frankenfood-haunts-europe-55309.html.

furor led many technology companies, particularly pharmaceutical companies, to abandon the field and drop their biotech research divisions.[51]

In the late 1990s Monsanto's agriculture business was part of a conglomerate that included the G.D. Searle & Company pharmaceutical business.[52] Yet, according to a financial analyst quoted in the February 21, 2000 *Fortune* magazine, the market valued all of Monsanto lower than it would value the Searle unit alone. That meant that Monsanto's two decades of industry leading innovation in biotechnology were "seen as worse than worthless."

> Talk about nasty reversals of fortune. Only nine months ago, President Clinton pinned the National Medal of Technology on four Monsanto researchers for pioneering bioengineered crops. But recently their two decades of work have been seen as worse than worthless. Spooked by the ruckus about genetically modified, or GM, crops, investors have valued Monsanto's profitable, $5 billion-a-year agricultural-business unit at less than zero dollars during the past few weeks, according to calculations by Salomon Smith Barney analyst James Wilbur.[53]

Some months later, after Monsanto had merged with Pharmacia and its agricultural assets were placed in a separate unit (15% of which was being sold to the public),[54] the market's view of biotechnology had improved, but only barely. According to an article that ran on the Dow Jones news wire, Monsanto's seed and trait business no longer had negative value; it was merely worth nothing.

> The valuation is very attractive at current levels," said Morgan Stanley Dean Witter analyst Mark Wiltamuth in New York. "You're essentially getting the company's ag-chemical business at a reasonable chemical-industry valuation, and you're getting the seed business for free."[55]

Thereafter, when Pfizer acquired Monsanto's parent, Pharmacia,[56] it was no coincidence that, at the height of this anti-GMO campaign, Pfizer concluded that the acquisition would not

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[51] As one article noted, "drug companies want nothing to do with the growing public alarm over genetically modified crops." Matthew Herper, "Biotech Briefing: Monsanto," *Forbes* (Oct. 19, 2000), *available at* http://www.forbes.com/2000/10/19/1019bbrief.html.

[52] Pfizer Company Timeline, "2003: Pfizer and Pharmacia Merger," *available at* http://www.pfizer.com/about/history/pfizer_pharmacia.jsp.

[53] David Stipp, "Is Monsanto's Biotech Worth Less Than a Hill of Beans?" *Fortune* (Feb. 21, 2000), *available at* http://www.biotech-info.net/beans.html.

[54] Monsanto Company History, "Relationships Among Monsanto Company, Pharmacia Corporation, Pfizer Inc., and Solutia Inc." *available at* http://www.monsanto.com/who_we_are/monsanto_relationships.asp.

[55] Desiree J. Hanford, "Tales of the Tape: Some See Upside in New Monsanto," *Dow Jones News Wire* (Dec. 26, 2000), *available at* http://www.mindfully.org/Industry/Monsanto-New-Upside.htm.

[56] Pfizer Company Timeline, "2003: Pfizer and Pharmacia Merger," *available at* http://www.pfizer.com/about/history/pfizer_pharmacia.jsp. *See also* "Pfizer Merges with Pharmacia," *JAVMA News* (July 15, 2003), *available at* http://www.avma.org/onlnews/javma/jul03/030715i.asp.

involve Monsanto and instead spun off the company. (The *Forbes* headline was "Crops, Shmops. Pharmacia Spins Off Monsanto").[57]

Faced with uncertainty about the public acceptance of agricultural biotechnology, Monsanto narrowed the scope of its innovation efforts to focus on its core crops, spinning off or dropping efforts in other areas (e.g., Roundup Ready strawberries and transgenic tomatoes). Evidence suggests firms such as DuPont and Syngenta, which were and are far more diversified than Monsanto, shifted resources away from biotech innovation to a much greater degree than Monsanto. Years later, as confidence in and acceptance of the technology evolved, investment ramped back up.[58]

AAI speaks of trait developers who "forged aggressively ahead,"[59] an "explosion of applications,"[60] and "profits in a highly lucrative industry."[61] It suggests that from 1980 to the present the system of IP rights created "strong protection" and thus strong incentives.[62] By ignoring the high level of risk associated with biotechnology traits and different companies' approaches to dealing with that risk, the AAI paper inaccurately reports that there has been a down turn in innovation over the past decade, and then erroneously assigns the blame solely to concentration "primarily driven" by Monsanto acquisitions. This is not careful analysis, and it misses the real story of the risks involved in innovation during this time period.

D. MONSANTO'S ACQUISITIONS HAVE NOT CREATED "PATENT STRONGHOLDS"

AAI also claims that Monsanto has developed "Patent Strongholds" through mergers and acquisitions of biotechnology and seed companies.[63] This claim is also false and ignores Monsanto's role as a pioneer within the field of biotechnology. The leading gene technologies for insect protection (via Bt genes) and herbicide tolerance (for glyphosate herbicide such as Monsanto's Roundup® product) were invented at Monsanto. Other technology enablement has occurred via in-licensing from competitors such as DuPont (gene gun). New breakthrough products using multiple-genes (Genuity SmartStax®) are the result of license and business

[57] Matthew Herper, "Crops, Shmops. Pharmacia Spins Off Monsanto," *Forbes* (Nov. 28, 2001), *available at* http://www.forbes.com/2001/11/28/1128pha.html.

[58] For example, in early 2007 DuPont announced a new $100 million commitment to biotechnology. *See* DuPont Press Release, "DuPont Executes Investments to Accelerate New Seed Product Development" (Feb. 27, 2007), *available at* http://www2.dupont.com/Production_Agriculture/en_US/news_events/cp_releases/2007-2-27.html.

[59] AAI at 6.

[60] *Id.* at 7.

[61] *Id.* at 15.

[62] *Id.* at 6.

[63] *Id.* at 14.

arrangements with DuPont, Bayer, and Dow. [64] Multiple companies and the complexity of the emerging global industry contradict the analogy of any company to a fortress.

Monsanto has developed the principal traits it licenses in-house, not by acquisition. (Monsanto also collaborates with other trait developers to jointly develop and license traits that each has developed.[65]) Indeed, AAI reports that only a small set of the companies acquired by Monsanto were agricultural biotechnology firms,[66] which belies the claim that mergers and acquisitions have led to Monsanto's patent stronghold. Thus, as explained below, much of the present antitrust concern voiced by the AAI paper boils down to the proposition that innovation by Monsanto's scientists created too much success.

The AAI paper's claims of a Monsanto "patent stronghold" represent the "too successful" theme. AAI claims that Monsanto's share of ownership of what AAI claims are key patents related to transgenic trait development is too high:

> It is instructive to note that Monsanto holds four of the 13 major, patented plant transformation techniques and technologies used in the agrobacterium-mediated transformation of plants. Those patents include the "agrobacterium co-transformation method" (divested to the University of California, Berkeley in the merger of Monsanto and DeKalb), the "particle gun electric discharge," the "antibiotic resistance gene under control of plant promoter," and "the CaMV 35S promoter." Syngenta is the patent-holder on two techniques. Bayer, CAMBIA, Zeneca, and DuPont each hold one patent or an exclusive license, and universities account for the remaining two.[67]

A number of flaws in AAI's analysis are immediately apparent. For example, AAI's inclusion of Cornell University's gene gun (licensed by DuPont) among "techniques and technologies used in the agrobacterium-mediated transformation of plants" is improper. To the contrary,

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[64] *See, e.g.*, "DuPont, Monsanto Reach Agreement on Bio-Tech Cross Licensing," *Southwest Farm Press* (Aug. 15, 2002), *available at* http://southwestfarmpress.com/mag/farming_dupont_monsanto_reach/; "Dow Agrosciences, Monsanto Reach Global Agreement on Trait Products," *Southwest Farm Press* (Feb. 8, 2006), *available at* http://southwestfarmpress.com/news/06-02-08-Dow-Monsanto-global/; Monsanto Press Release, "Bayer CropScience and Monsanto Enter Long-Term Business and License Agreements for Key Enabling Technologies," (June 20, 2007), *available at* http://monsanto.mediaroom.com/index.php?s=43&item=501.

[65] Monsanto's Genuity SmartStax offering includes traits from Monsanto, Bayer, and Dow and is jointly licensed by Monsanto and Dow. *See* Monsanto Press Release, "Monsanto, Dow AgroSciences Complete U.S. and Canadian Regulatory Authorizations for SmartStax Corn; Plans Set to Launch Seed Platform on 3 Million- to 4 Million-Plus Acres," (July 20, 2009), *available at* http://monsanto.mediaroom.com/index.php?s=43&item=729. Monsanto is also working together with BASF to jointly develop genes that help plants better tolerate stresses like drought. *See* Monsanto Press Release, "BASF and Monsanto Announce R&D and Commercialization Collaboration Agreement in Plant Biotechnology," (Mar. 21, 2007), *available at* http://monsanto.mediaroom.com/index.php?s=43&item=470.

[66] AAI at 15.

[67] *Id.* at 22.

agrobacterium and the gene gun are actually alternative technologies used for gene insertion.[68] AAI also lists Zeneca separately from Syngenta, even though its agricultural business was acquired by Syngenta.

Further, although AAI states that Monsanto owns four of thirteen[69] key patents, AAI acknowledges that agrobacterium rights were divested to U.C. Berkeley.[70] But what of the other three Monsanto patents identified in the article upon which AAI relies?

- One patent ("antibiotic resistance gene under control of plant promoter") is related to the use of antibiotic resistance genes as selectable markers for use in trait development. Antibiotic resistance markers are less common today due to regulatory and public acceptance concerns, and in some cases have been replaced by genes that convey tolerance to certain herbicides that can substitute for antibiotic resistance markers.[71]
- One patent ("particle gun electric discharge") expired in 2008.[72]
- One patent ("the CaMV 35S promoter") relates to a gene sequence used to "turn on" genes. But the authors of the study cited by AAI acknowledge that 35S is only one of "a large number of promoters [that] have been used in transformation," and the 35S promoter has in any event been widely licensed to Monsanto's competitors.[73]

In other words, there is no reason to believe that any of the Monsanto "patent strongholds" identified by AAI are today of any competitive significance, let alone that Monsanto's ownership of the 2 of 12 patents still-in-force that AAI identifies would lead to "intractable" competitive

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[68] This is made clear in the article that AAI relies upon. Carl E. Pray and Anwar Naseem, "Intellectual Property Rights on Research Tools: Incentives or Barriers to Innovation? Case Studies of Rice Genomics and Plant Transformation Technologies, 8 AGBIOFORUM (2005), (henceforth "Pray and Naseem"), at 108, *available at* http://www.agbioforum.org/v8n23/v8n23a07-pray.htm.

[69] One must worry about the care that has gone into a paper that purports to provide a complete list of ownership of 13 patents by detailing who owns ten of them and then says that "universities account for the remaining two."

[70] In fact, while Monsanto had claims relating to the use of agrobacterium technology, it did not have any patents. *See* U.S. Dep't of Justice Press Release, "Justice Department Approves Monsanto's Acquisition Of DEKALB Genetics Corporation" (Nov. 30, 1998) ("After the Department's Antitrust Division raised competitive concerns, Monsanto spun off its claims to a recently developed technology used to introduce new genetic traits into corn seed -- called agrobacterium-mediated transformation technology -- to the University of California at Berkeley."), *available at* http://www.justice.gov/atr/public/press_releases/1998/2103.htm.

[71] The European Commission, "Directive 2001/18/EC had imposed a phasing out of antibiotic resistance selectable marker genes by 2005 for commercial releases and 2009 for research purposes," *Biotech Traits Commercialized 2009*.

[72] *See* http://www.patentstorm.us/patents/5015580.html.

[73] According to Biotech Traits Commercialized 2009, the 35S promoter is used in Dow's Herculex and in Bayer's Liberty Link Cotton.

issues. Syngenta (given its ownership of the Zeneca patent AAI identifies[74]) now owns more "patent strongholds" than Monsanto, and Bayer and DuPont together match Monsanto.

To the extent that any of these patents are essential, which is not the case in fact, it is apparent that each of these firms have obtained appropriate access to needed technology via licensing arrangements.[75]

AAI also points to a "second issue" in the form of a "patent thicket'" where, because Monsanto's scientists are not the only innovators to have patented their inventions, Monsanto and other "innovators must seek permissions to use multiple patented technologies, resolve patent conflicts, and sustain challenges to the validity of their own patents."[76] As we point out below (in part XII.A), the only source AAI cites for this proposition finds "few examples of holdups" and finds them outweighed by "the benefits in terms of improved technology to farmers."[77]

To put it another way, the experience in this market is that cross licensing generally works. Traits have reached and continue to reach market.

VI. THE AAI PAPER'S CLAIM THAT THE QUALITY OF INNOVATION HAS DECREASED IGNORES THE PUBLIC STATEMENTS OF COMPETING TRAIT DEVELOPERS

Faced with the fact that the quantity of innovation has increased, it is somewhat surprising that AAI argues that the quality of innovation is down.[78] It attributes this decline in innovation quality to high concentration of the innovation market, concentration that has increased as a result of "unchecked" merger activity.[79] But the AAI paper is as wrong about innovation quality as it is about innovation concentration and the effect of mergers on that concentration.

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[74] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 32 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[75] *See, e.g.*, "DuPont, Monsanto Reach Agreement on Bio-Tech Cross Licensing," *Southwest Farm Press* (Aug. 15, 2002), *available at* http://southwestfarmpress.com/mag/farming_dupont_monsanto_reach/; "Dow Agrosciences, Monsanto Reach Global Agreement on Trait Products," *Southwest Farm Press* (Feb. 8, 2006), *available at* http://southwestfarmpress.com/news/06-02-08-Dow-Monsanto-global/; Monsanto Press Release, "Bayer CropScience and Monsanto Enter Long-Term Business and License Agreements for Key Enabling Technologies," (June 20, 2007), *available at* http://monsanto.mediaroom.com/index.php?s=43&item=501.

[76] AAI at 22. Monsanto Company History, *available at* http://www.monsanto.com/who_we_are/history.asp.

[77] Pray and Naseem at 116.

[78] AAI at 19.

[79] *Id.* at 2, 19.

It is difficult to appropriately measure the quality of innovation. The most obvious approach would be to address the question directly, i.e., look at the quality of products that came to market after the asserted change in market structure and the quality of products in the pipeline today, keeping in mind that products reaching market in, say 2003, were likely begun around 1993 or earlier.[80]

But rather than take this approach, AAI looks at statistics it claims are proxies for innovation quality. The AAI paper's analysis of these proxies is deeply flawed. And, more fundamentally, if one looked at the actual pipelines of new products that have been publicly announced by Monsanto and its competitors, one could not plausibly claim that innovation quality has decreased. Better products providing higher crop yields and solutions to problems previously unaddressed via technology have launched in recent years and more are poised to do so.

A. THE AAI PAPER'S MEASUREMENT OF INNOVATION QUALITY BASED ON DEREGULATED EVENTS IS BOTH MISGUIDED AND ERRONEOUS

AAI bases its argument that innovation quality has declined on statistics on the deregulation of transgenic research products by the USDA (a step that allows sale of the product without USDA restrictions). AAI claims that trait deregulations have "trended steadily downward since the mid 1990s, falling by about 80 percent between 1995 and 2008."[81] This analysis of innovation quality in the AAI paper is deeply flawed.

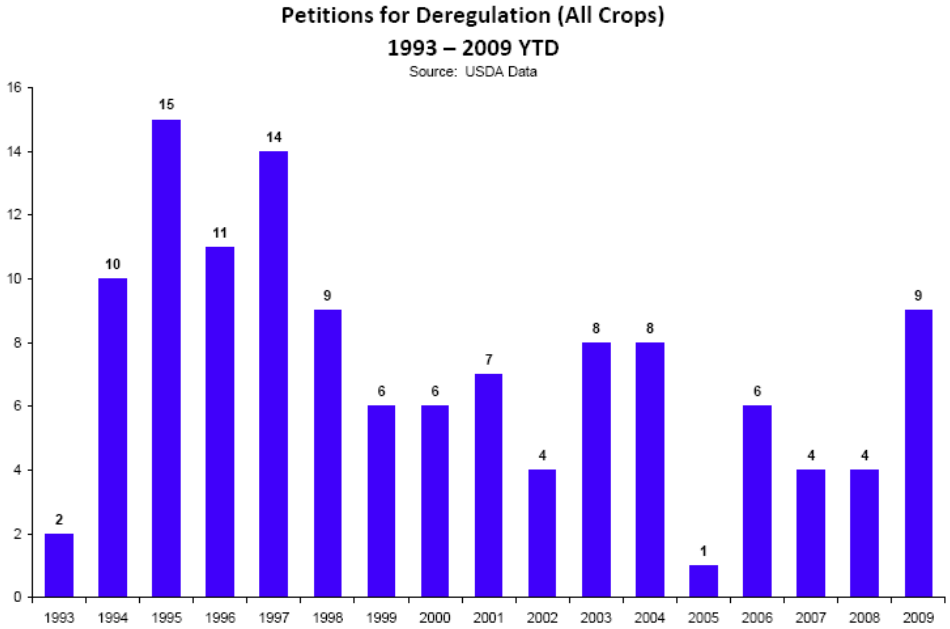
The AAI paper uses 1995 and 2008 as the only points of comparison, despite the fact that its other analyses of innovation look at trends from 2000 to the present. Perhaps coincidentally, 1995 was the high water mark for petitions for trait deregulation (15 petitions), and 2008 saw an unusually low number of trait deregulation petitions filed with the USDA (only 4 petitions). Had AAI followed the course it took in measuring its other proxies for innovation in AAI Figures 4 and 5 and looked at the trend from 2000 (6 petitions) to 2009 (9 petitions), the data would tell quite a different story – not a 73% decrease in petitions for deregulation, but a 50% *increase*.[82] Data on all petitions for deregulation filed with the USDA are shown on the chart below.

[80] *See* Ted Crosbie, Citigroup Pre-Conference Teach-In (Dec. 1, 2008) at 12 (showing product timeline from discovery to launch typically ranging from 6 to 13 years), *available at* http://www.monsanto.com/pdf/investors/2008/12-01-08.pdf.

[81] AAI at 19.(citing "Petitions of Nonregulated Status Granted or Pending by APHIS," U.S. Department of Agriculture, *available at* http://www.aphis.usda.gov/brs/status/petday.html.). For other asserted proxies for innovation in the AAI paper (patents and field release data), the focus is on post 2000 activity (see Figures 4 and 5 of the AAI paper, which cover the years 2000-2008), and it seems fair to assume that is the focus of the AAI paper's analysis for this measure as well.

[82] *See* http://www.aphis.usda.gov/brs/status/petday.html.

Exhibit 6

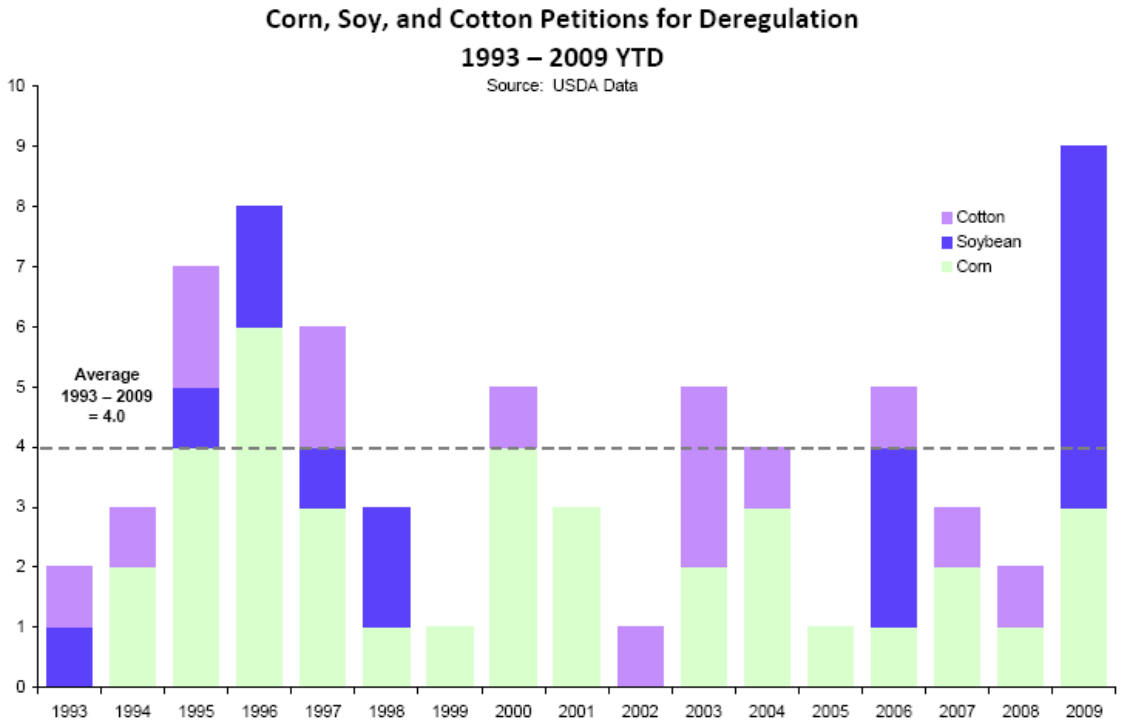


Another fundamental problem with the statistics presented by the AAI paper is that they do not speak to innovation in the core crops of corn, soy and cotton. That is because the data AAI cites are heavily driven by data on petitions for deregulation of transgenes in other crops. The 1995 data, for example, includes petitions for the deregulation of biotech tomatoes (4 petitions) and potatoes (2 petitions).[83] If not apples and oranges, the AAI paper is literally comparing soybeans and tomatoes.

A more meaningful chart – one that looked only at petitions for deregulation each year in corn, soybeans, and cotton – shows that there has been no decline in innovation. The chart below shows that petitions have varied from year to year, averaging four petitions per year since 1993, with no clear trend up or down. But petitions have spiked in 2009, with more petitions for deregulation in the three crops that the AAI paper focuses on than in any prior year, and almost twice as many petitions for deregulation filed in these three crops for 2009 as in any other year this decade.

[83] Tomato petitions were filed by Agritope, Calgene, and Monsanto. Potato petitions were filed by Monsanto. *See* http://www.aphis.usda.gov/brs/status/petday.html.

Exhibit 7



Finally, it is not possible to draw the link, as AAI does, between industry concentration and deregulation of traits by the USDA. Deregulation comes late in the development process and reflects innovative activity that began a decade or more earlier.[84] As such, it is difficult or impossible to draw a temporal link between recent mergers and industry concentration and trends in trait deregulation by the USDA. A surge in approvals in the mid 1990s and a decline in the late 1990s would, if anything, reflect the incentives for and the intensity and success of innovative activity that occurred in the 1980s, and would say little about the impact of mergers or other conduct that occurred in the 1990s.

B. THE PATENT CITATION DATA UPON WHICH AAI RELIES DO NOT SHOW A DECLINE IN INNOVATION QUALITY

The claim that innovation quality is declining is simply misplaced.[85] The findings of the paper AAI cites in support of its argument (Steven Buccola and Yin Xia, "The Rate of Progress in Agricultural Biotechnology") do not support the AAI paper's claim that "the quality of innovation has deteriorated with impaired market structure."[86]

[84] At page 7, AAI suggests that "the process of developing new varieties can span 10 - 15 years."

[85] AAI at 20.

[86] *Id.* at 19. Buccola and Xia themselves note that "[u]sing citation frequencies as a measure of patent quality is, however, inherently difficult" and that count of patent citations is "a robust though noisy

Footnote continued on next page

Buccola and Xia look to the number of citations to a patent as a potential measure of patent quality. Although the number of citations per patent has declined over time, Buccola and Xia find that the decline in per-patent citations is offset by the exponential increase in total patents: "Thus despite the evidence from figure 3 that average patent quality [i.e., the frequency with which a patent is cited in later patents] has been falling, we conclude from figure 2 that agricultural biotechnology growth rates remained positive and roughly constant" throughout the period for which the authors have reliable data.[87]

More fundamentally, even if a simplistic "count the patent references" approach made sense, Buccola and Xia recognize that given data limitations "per-patent citations rates after the mid 1990s" are "poorly reflective of patent quality."[88] The authors limit their conclusions to the period from the mid-1980s to mid-1990s,[89] and their paper recognizes that it has nothing reliable to say about the period from 2000 to the present that is the focus of the AAI paper, i.e., the 2000 - 2008 period (see their Figures 4 and 5). These considerations should be understood when reading the AAI paper's "indisputable" conclusion on innovation.

C. THE AAI PAPER IGNORES INFORMATION ABOUT ACTUAL PRODUCT PIPELINES

Because the "count the patent references" article cited by AAI disclaims reliability past the mid 1990s, it tells us nothing about innovation quality in the 2000 - present time frame. But an examination of the publicly available information on recent product introductions and research and development pipelines of Monsanto's largest competitors is very informative. For example, the Herculex traits were introduced in 2003 and have seen significant market success.[90] They are now planted on roughly 23% of corn acres.[91] In 2005, Dow released Widestrike®, a second-

Footnote continued from previous page

measure of a patent's unit value." Steven Buccola and Yin Xia, "The Rate of Progress in Agricultural Biotechnology," *Review of Agricultural Economics*, Volume 26, Number 1, at 3-18, 6-7.

[87] Steven Buccola and Yin Xia, "The Rate of Progress in Agricultural Biotechnology," *Review of Agricultural Economics*, Volume 26, Number 1, at 3-18, 10. Buccola and Xia interpret the fall in average patent quality combined with increased quantity as evidence that applicants may strategically have decided to patent numerous small innovations as a strategic tool to use in negotiations with competitors or as decoys to protect more valuable patents. They also hypothesize that the drop off in patent citations may reflect a maturing in the industry with a transition from fundamental technologies to innovations that are more derivative implementations of early, more fundamental, technologies. Id at 3-18, 9.

[88] Steven Buccola and Yin Xia, "The Rate of Progress in Agricultural Biotechnology," *Review of Agricultural Economics*, Volume 26, Number 1, at 3-18, 8.

[89] Monsanto acquired Hybritech, Farmer's Hybrid and Jacob Hartz Seed Company in the early 1980s and did not engage in additional seed or biotech company acquisitions until 1996 (when it acquired Calgene). Even if one credits a "count the patent references" approach to show that patent quality did decline in the mid-1980s to mid-1990s, Monsanto acquisitions could not be the cause of the decline.

[90] *See* Appendix 1.

[91] According to **dmr**kynetec, in 2009, seeds with Herculex traits were planted on 19.9 million acres (or 23 percent) of a total of 86.4 million acres planted that year. See also projections by The Context Network

Footnote continued on next page

generation trait for insect protection in cotton.[92] Monsanto has launched second generation traits in all of its core crops. Product launches and sales (i.e., the votes that farmers have cast with their seed purchases) indicate quality of innovation far more reliably than biotech trait deregulation or patent citations, the AAI benchmarks.

The current pipeline is most pertinent to any claim that "the quality of innovation has deteriorated with impaired market structure"[93] because much of what is about to come to market would have been initiated and brought close to fruition after the 1990s merger activity that AAI suggests would chill innovation.[94] As described more fully below, a subjective analysis of the pipeline rebuts that claim. Major players and third parties wax rhapsodic about their pipelines and use phrases like "game changing," "buzzing with creativity," "robust," and "the richest pipeline in our history" to describe them.[95]

It is a familiar theme among critics of traited seeds that they do nothing for consumers and that they just help growers do what they've always done: control weeds and bugs. While that may oversimplify societal benefits, even that criticism is expected to change over time. In the pipeline or recently approved are input traits that do new things (drought tolerance and nitrogen efficiency) as well as a number of consumer and customer friendly output traits – soybeans with healthy Omega 3 fatty acids for example.

- The leading firm by patent filings (AAI Figure 5) is DuPont. According to DuPont, its Optimum® GAT® is the "first-ever agricultural trait developed through proprietary DuPont gene shuffling technology," and "will enable new herbicide options that will

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Footnote continued from previous page

that seed containing Herculex traits would be planted on 21% of corn acres in 2009. Plant Biotech Traits Commercialized (2009) at 21.

[92] *See* Appendix 1.

[93] AAI at 19.

[94] *Id.* at 7. "Overall, the process of developing new varieties can span 10-15 years."

[95] *See* Monsanto Press Release, "Monsanto Is Extending Its Industry Leadership Through 2012, Executives Tell Investors at Annual Field Event" (Aug. 12, 2008), ("Monsanto Company is in a position between 2008 and 2012 to launch multiple game-changing technologies, widen its competitive lead, and create even greater growth from seeds and traits as it brings greater yield to farmers around the world, Hugh Grant, Monsanto's chairman, chief executive officer and president, will tell investors today."), *available at* http://monsanto.mediaroom.com/index.php?s=43&item=627; Syngenta Press Release, "Syngenta Names Industry Veteran to Lead Biotechnology R&D" (Oct. 29, 2009) (Syngenta "is buzzing with creativity and customer-focused drive for innovation"), *available at* http://www.syngentacropprotection.com/news_releases/news.aspx?id=110281; Dow Press Release, "Dow AgroSciences Recognized with Three International Awards for Best Novel Agricultural Biotechnology, Best Formulations Innovation, Best New Crop Protection Product" (Nov. 13, 2009) ("Our robust pipeline of crop protection and agricultural biotech technologies will continue to deliver powerful new tools and options to growers around the globe."), *available at* http://www.dowagro.com/newsroom/corporatenews/2009/20091113a.htm; DuPont Press Release, "DuPont Executes Investments to Accelerate New Seed Product Development" (Feb. 27, 2007) ("'DuPont continues to accelerate its pace of development of new and improved products, traits and enabling technologies," said Niebur. 'We have the richest pipeline in our history. '"), *available at* http://www2.dupont.com/Production_Agriculture/en_US/news_events/cp_releases/2007-2-27.html.

provide broader spectrum weed control without compromising crop safety."[96] DuPont's publicly disclosed trait pipeline includes (in addition to Optimum GAT) anthracnoses stalk rot resistance, drought tolerance, nitrogen efficiency, increased yield, next generation insect control, improved ethanol and feed value in corn, and Asian soybean rust resistance, sclerotinia resistance, increased yield, triple-mode herbicide tolerance, aphid resistance, lepidopteran resistance, cyst nematode resistance, high oleic acid oil, improved feed, and healthier oil in soy.[97] DuPont asserts that it gained significant share in corn and soy in 2009 and expects its seeds and traits business to grow by 20 percent annually through 2012.[98] While DuPont recently noted that it faces years of product delay due to performance and regulatory issues with its Optimum GAT technology, it maintains its long-term commitment to this path.[99]

- Monsanto has been spending between 8% and 9% of its revenue on R&D over the last few years, and projects spending more than 10% of revenue on R&D in coming years.[100] Monsanto introduced its next generation glyphosate tolerance trait in soy in 2009, a trait that combines glyphosate tolerance with improvements in soybean yield.[101] Monsanto is also now introducing Genuity™ SmartStax™, an eight trait product that stacks traits from Monsanto, Dow, and Bayer, in 2010.[102] In a December 2009 presentation, Robb Fraley (Monsanto's Chief Technology Officer) and Ted Crosbie (Monsanto Vice President, Breeding) reported that, at 2009 levels of insect pressure, *SmartStax* varieties deliver a 15 bushel per acre advantage over competitors (8.7 bu/ac from genetics, 3.9 bu/ac from insect control, and 2.4 bu/ac from refuge reduction). This yield advantage was estimated to increase to almost 19 bushels per acre in years and environments with high insect pressure. *SmartStax*

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[96] DuPont Press Release, "DuPont Corn and Soybean Leadership Advances with Canadian Approval of Optimum(TM) GAT(TM) Trait" (Sept. 1, 2009), *available at* http://www.pioneer.com/web/site/portal/menuitem.917ffb4c5c0ae4574a624a62d10093a0/.

[97] http://www.pioneer.com/CMRoot/Pioneer/research/pipeline/DuPont_BG_Pipeline.pdf.

[98] Phillip Brasher and Dan Piller, "Pioneer Joins Rival Monsanto in Expecting Seed Sales Growth," *Des Moines Register* (Sept. 20, 2009), *available at* http://m.dmregister.com/news.jsp?key=527393.

[99] *See* "DuPont Updates its Commercialization Timelines for Optimum(R) GAT(R) Corn and Soybeans," *Yahoo Finance* (Dec. 4, 2009), *available at* http://finance.yahoo.com/news/DuPont-Updates-its-prnews-935067197.html/print?x=0.

[100] Carl Casale, Monsanto Biennial Investor Event, (Nov. 10, 2009), at p. 11, *available at* http://www.monsanto.com/pdf/investors/2009/carl_casale_11_10_09.pdf.

[101] Early trials show that Monsanto's Roundup Ready 2 Yield trait produced a 7% yield increase, which would be worth about $28 per acre to a typical grower. (*See* Monsanto Press Release, "Roundup Ready 2 Yield Soybeans Hitting the Road," (*available at* http://www.monsanto.com/rr2y/summer_of_soy/mobile_greenhouse.asp and "2010 Purdue Crop Cost & Return Guide" *available at* http://www.agecon.purdue.edu/extension/pubs/id166_2010_Sept09.pdf.)) Monsanto believes yield gains for this trait will increase as the product becomes available in more seed varieties and growers can better match the seed to the growing conditions.

[102] Plant Biotech Traits Commercialized (2009) at 33-34.

was also reported to deliver an 11 bushel per acre advantage over Monsanto's own YieldGard VT triple stack hybrids.[103] Through its R&D collaboration with BASF, Monsanto has what it views as game-changing technologies in drought tolerance and nitrogen utilization in late stages of development. It is in the process of obtaining approval for soy with omega 3 fatty acids and has a wide variety of other output traits under development in soy.[104]

- Reuters reports that Dow is "investing in a big way" and that its objective is to be a "long-term player." Dow will also be marketing SmartStax and sees "intense interest" in the product. It hopes to sell seed with a new DHT herbicide tolerance trait for glyphosate resistant weeds, with production beginning in 2011 and sales to growers in 2012. Dow AgroSciences President Antonio Galindez predicted that with their "ramp up in research and development spending, including new work into biotech wheat, the company's product offerings should be significantly expanded by 2015."[105]

- The head of Bayer AG's agriculture unit, Friedrich Berschauer says that he plans to triple sales in the biotech and seed business to 1.4 billion euros ($2 billion) by 2018, and the company is planning to invest 3.5 billion euros over the period, not including acquisitions.[106] Among the products in the Bayer pipeline is a soybean herbicide tolerance trait that will offer tolerance to both glyphosate and Bayer's HPPD inhibitor herbicides; Bayer will also be offering a triple stack that includes Bayer's Liberty Link herbicide tolerance trait.[107]

- Citibank analyst P.J. Juvekar reported that Syngenta "made a splash" at the September 2009 Farm Progress Show in Decatur, IL, with its Agrisure Viptera® trait, which will be available in 2010. "As part of the Agrisure 3000GT triple stack, it will provide control of lepidopteran pests including European corn borer, corn earworm, Western bean cutworm, black cutworm and armyworm. … In addition, it will provide corn rootworm control and glyphosate and glufosinate tolerance, with a MIR604 RW control gene and glyphosate tolerance (GA21 event). … The company

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[103] *See* Monsanto Presentation, "Monsanto Yield Results Luncheon" (Dec. 8, 2009), *available at* http://www.monsanto.com/pdf/investors/2009/yield_data_presentation_12_08_09.pdf.

[104] *See* Monsanto Press Release, "Monsanto Is Extending Its Industry Leadership Through 2012, Executives Tell Investors at Annual Field Event" (Aug. 12, 2008), *available at* http://monsanto.mediaroom.com/index.php?s=43&item=627.

[105] Carey Gillam, "Dow AgroSciences Racing to Compete," *CNN Money* (Dec. 2, 2009), *available at* http://money.cnn.com/news/newsfeeds/articles/reuters/MTFH27862_2009-12-02_21-01-40_N0237426.htm.

[106] Eva von Schaper, "Bayer Crop Margin Goal Is Ambitious, Berschauer Says," *Bloomberg* (Sept. 17, 2009), *available at* http://www.bloomberg.com/apps/news?pid=20601202&sid=anRKPA3MkvKg.

[107] Bayer Press Release, "Bayer CropScience, Mertec and M.S. Technologies to Co-Develop New Soybean Trait Products," (Nov. 26, 2007), *available at* http://www.bayercropscience.com/bcsweb/cropprotection.nsf/id/20071126_EN.

is also launching Enogen™ corn amylase for ethanol production, which more efficiently converts starch to ethanol."[108]

- BASF says that it "is looking for competitive new technologies and is strongly committed to this dynamic field. We want to take full advantage of the great economic potential of biotechnology."[109] Like Monsanto, BASF is pursuing plants that will create their own omega 3 fatty acids.[110]

Start ups have rosy views of the future as well. Syngenta invested an undisclosed amount in a privately held biotechnology company Metabolon, which develops technology to accelerate development in plants.[111] Makhteshim-Agan (a $2.2 billion Israeli chemical company[112]) is reportedly investing $37 million in a San Diego startup company, Cibus Global. Cibus Global uses a proprietary Rapid Trait Development System to develop new traits.[113]

Additional publicly available information about pipeline products in soy and corn, with announced launch dates, is set out in the following charts (which are based upon data from U.S. Grains Council, American Soybean Association, US Soybean Export Council, and United Soybean Board)[114]:

[108] P.J. Juvekar, "Fresh Insights from the Farm Progress Show," Citi (Sept. 9, 2009).

[109] http://www.basf.com/group/corporate/en/products-and-industries/biotechnology/index.

[110] http://www.basf.com/group/corporate/en/products-and-industries/biotechnology/plant-biotechnology/better-healthier-nutrition

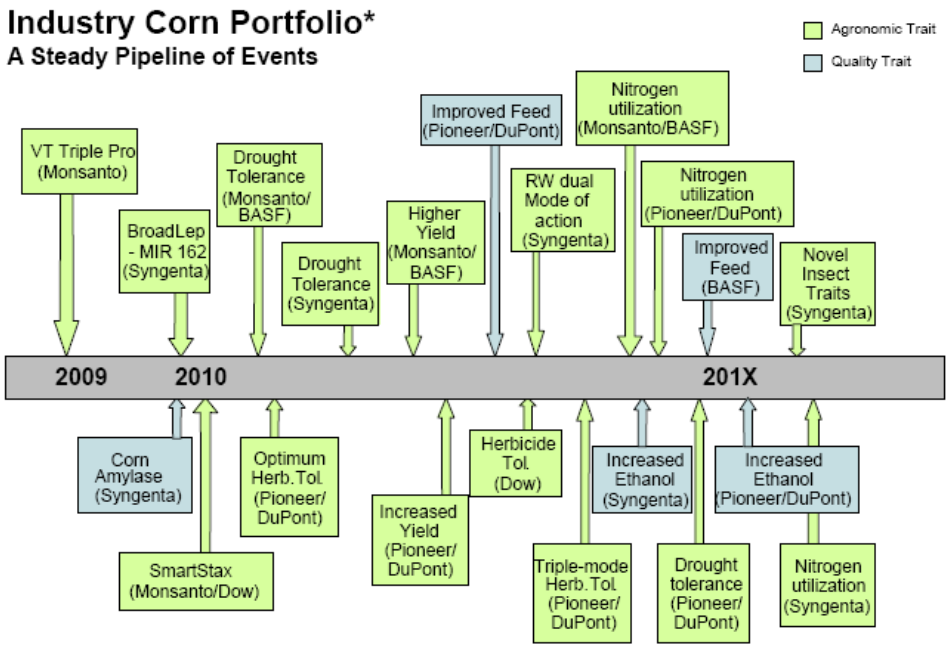
[111] *See* Syngenta Press Release, "Syngenta Ventures Invests in U.S. Biotech Company Metabolon," (Oct. 27, 2009), *available at* http://www.syngenta.com/en/media/mediareleases/en_091027.html.

[112] *See* Makhteshim-Agan Industries Ltd. Condensed Consolidated Interim Financial Statements (Sept. 30, 2009), *available at* http://www.ma-industries.com/finance/fin2009/fin_q3_09_eng.pdf.

[113] *See* Jeffrey M. O'Brien, "Ag-tech Upstart is Armed to Take on Monsanto," *CNN Money*, (Sept. 21, 2009), *available at* http://brainstormtech.blogs.fortune.cnn.com/2009/09/21/ag-tech-upstart-is-armed-to-take-on-monsanto/?source=yahoo_quote.

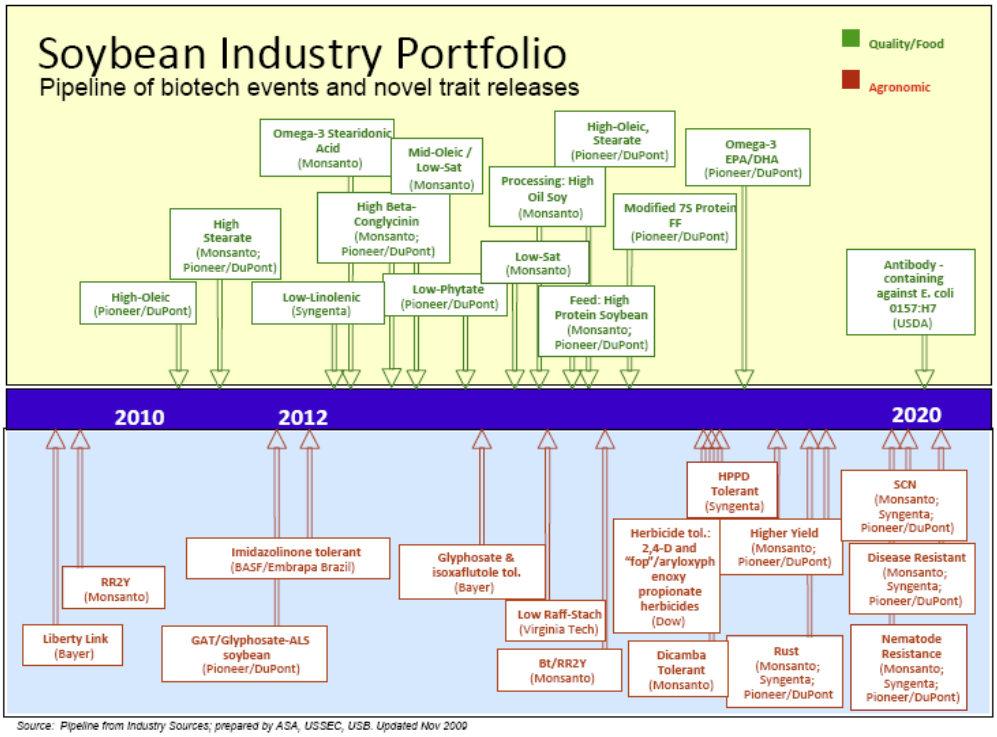
[114] These pipelines are part of a presentation entitled *NAEGA and Biotech*, *available at* http://www.graintrade.org.au/__data/page/263/Australia_Nov._2009__NAEGA_and_Biotech_Sydney_Friday_Nov._13.pdf.

Exhibit 8



[*Estimated commercialization pipeline of corn biotech events prepared by the U.S. Grains Council Commercialization dependent on many factors, including successful conclusion of regulatory process] 2/2009

Exhibit 9



There is an explosion of new traits coming to market in the next few years. Syngenta Seeds President David Morgan recently told the *Des Moines Register*: "We're heading into an era where there will be so many new technologies that the old standbys, like Roundup Ready, will gradually lose their hold."[115]

The AAI paper's claims about innovation are just plain wrong, and its sweeping claims that compulsory licensing is required to fix innovation problems in the ag biotech industry fall away. AAI either did not look at the data regarding trait pipelines and the views of industry participants on new traits, or ignored that information. Instead, AAI resorted to bean counting: it tallied up deregulation decisions that are not linked in time to the industry structure about which AAI expresses concern and it pointed to an analysis of citations relating to patents that is reliable only for the period from the 1980s-mid 1990s.

The AAI paper sees a threat to innovation, and if that is to be explored, we believe that a focus of the Workshops should be on direct evidence as to innovation. AAI claims that its analysis shows that innovation is indisputably down in quantity and quality, but the data and the views of industry participants suggest just the contrary. Monsanto, and we believe, other innovators would be happy to show the USDA and the DOJ that innovation is alive and well and that game-changing technology is about to be commercialized.

VII. THE AAI PAPER IS WRONG ABOUT THE EFFECT OF AGRICULTURE INDUSTRY MERGERS ON CONCENTRATION AND COMPETITION

AAI claims that unchecked merger activity has increased concentration and reduced the number of firms engaged in what the AAI paper calls the "three horizontal layers" of the industry: new transgenic trait development, germplasm development, and seed production.[116] And, AAI asserts, Monsanto's acquisitions have been *the leading cause* of this increased concentration.[117] AAI reaches this conclusion without conducting any analysis of concentration in these "layers" or relating concentration to Monsanto's acquisitions. Rather, AAI simply

[115] Dan Piller, "Monsanto-Pioneer Squabble May Build Syngenta Market," *Des Moines Register* (Nov. 25, 2009), *available at* http://www.desmoinesregister.com/apps/pbcs.dll/article?AID=/200911250405/BUSINESS01/911250344.

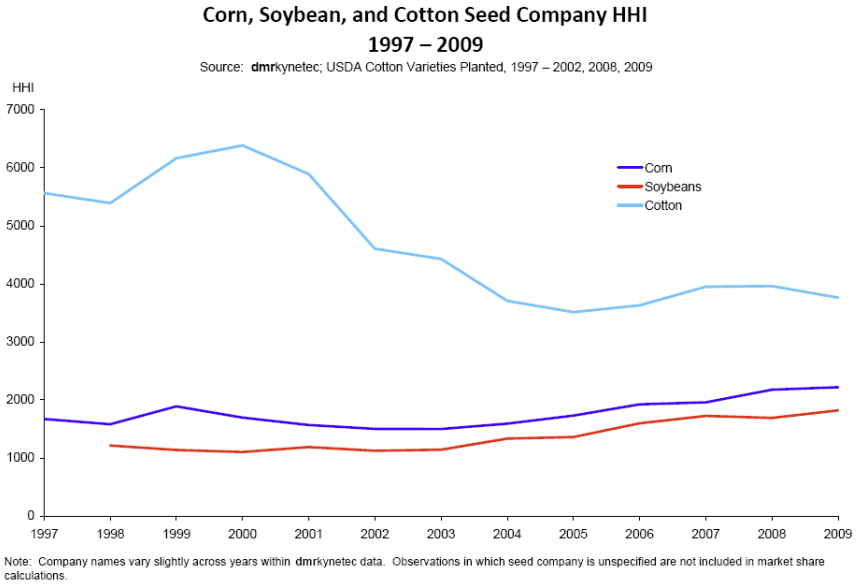
[116] AAI at 2; *See also* "One impediment is a high level of concentration in innovation, genetic traits, and seed markets, induced by significant M&A activity over the last 10 years and exacerbated by the high entry barriers posed by heavy R&D requirements. This consolidation has dramatically reduced the number of traits developers and concentrated patent holdings among only a few, disproportionately-sized rivals. At the same time, it has eliminated the numerous independent seed companies (ISCs) which have historically held the substantial base of seed germplasm that is needed for traits developers to breed new varieties." AAI at 13.

[117] "Monsanto's successive acquisitions of seed companies have been the primary driver behind increased concentration at the traited seed level and removed from the market many of the ISCs that have historically been important as a distribution channel for rival traits developers." AAI at 16.

reports that Monsanto has made acquisitions,[118] and assumes that this was the primary cause of any concentration that occurred over the past decade. AAI does not assess the relationship of particular mergers to any of the concentration measures of interest, nor does it discuss non-Monsanto mergers in any detail. For example, it barely mentions DuPont's 1999 acquisition of Pioneer, which was twice the size of Monsanto's largest acquisition.[119] In order to analyze whether there has been an increase in concentration across each of these three layers (i.e. trait development, germplasm development and seed production), primarily driven by Monsanto acquisitions, it is necessary to analyze each horizontal layer and the effects by crop (corn, soybeans, and cotton) separately.

A review of Exhibit 10 below showing the concentration of the corn, soy, and cotton industries shows that the concentration of the cotton seed business has declined substantially over the past decade, while the concentration of the corn and soybean markets as AAI defines them has increased only modestly. Certainly the chart does not suggest "relentless and unchecked merger activity" leading to substantially increased market concentration and the concomitant potential for anticompetitive effects on prices or innovation.

Exhibit 10



[118] "During the late 1990s through 2000s, Monsanto acquired almost 40 companies, creating the horizontal and vertical integration that underlies the firm's platforms in cotton, corn, and soybeans." AAI at 15. In fact, Monsanto has not acquired a corn, soybean, or cotton seed company in the United States since 2007.

[119] According to reports at the time of the acquisition, the equity value offered for the 80% of Pioneer not yet owned by DuPont was $7.7 billion, implying a total value of $9.6 billion. "DuPont to Acquire Pioneer," *SeedQuest*, (Mar. 15, 1999), *available at* http://claria13.securesites.net/News/releases/usa/Pioneer/N1620.htm. Monsanto acquired 60% of DeKalb in 1998 for approximately $2.3 billion. Monsanto 10-K, Fiscal Year 2000, filed on March 26, 2001, at 43.

A. SOYBEAN

According to **dmr**kynetec, the leading supplier of agricultural industry market data, in 1998 there were three larger vertically integrated (i.e. with share over 5%) soybean players (Monsanto, Pioneer, and Syngenta) that competed with 194 independent soybean seed companies.[120] At the end of 2008, the soybean industry had four large vertically integrated trait providers (Monsanto, DuPont/Pioneer, Syngenta, and Bayer) and another 146 independent seed companies.[121] Thus there was only a moderate increase in concentration in soybean over this decade.

Monsanto, Syngenta, DuPont, and Dow each made vertical acquisitions that added to their seed company holdings in the last decade, but none had a large effect on concentration.

- Prior to its acquisition of Asgrow in 1997,[122] Monsanto owned the small Hartz® soybean seed company.[123] With the acquisition in 1998 of DEKALB,[124] Monsanto combined Asgrow's then 16% of the market with DEKALB's 8% share.[125] Even after acquiring these two companies and the soybean businesses of a number of smaller brands that make up the ASI companies,[126] Monsanto's share of soybean seed is less than 30%[127] and it is the number 2 firm in soybean seed sales.[128]

- DuPont, a competing biotechnology firm, acquired Pioneer in 1999.[129] Because this changed the ownership of Pioneer, but did not combine Pioneer with another seed company, this acquisition did not increase concentration in soybean sales. However, Pioneer, a competitor to Monsanto-owned soybean seed companies, has grown from selling 17% of soybeans planted in 1998[130] to roughly one-third of the market in

[120] *See* Appendix 3. *See also* Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 37 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/

[121] *See* Appendix 3.

[122] Monsanto Company History, *available at* http://www.monsanto.com/who_we_are/history.asp.

[123] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 34 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[124] Monsanto Company History, *available at* http://www.monsanto.com/who_we_are/history.asp.

[125] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 37 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[126] Monsanto Company History, *available at* http://www.monsanto.com/who_we_are/history.asp.

[127] Monsanto Press Release, "Supplemental Toolkit for Investors," at 9(June 2009), *available at* http://www.monsanto.com/pdf/investors/supplemental_toolkit.pdf.

[128] "Seed Delay a Blow to Pioneer," *Des Moines Register*, (Dec. 5, 2009), *available at* http://www.desmoinesregister.com/article/20091205/BUSINESS01/912050342/Seed-delay-a-blow-to-Pioneer.

[129] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 33 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[130] *Id.* at 37.

2009.[131] Such growth increases market "concentration" but is unrelated to acquisitions. (If growth after acquisition is related to acquisitions, then it is DuPont, not Monsanto, that drives increase in concentration in soy.)

- Novartis Seeds, which merged with AstraZeneca to form Syngenta in 2000, sold 5% of soybean seed planted in the U.S. in 1998.[132] In 2004, Syngenta acquired Garst®[133] and Golden Harvest®[134] and its soybean share increased to 13%,[135] but it has since fallen slightly to 12% in 2008.[136]

- Dow acquired the Mycogen seed company in 1998,[137] which made 3% of soybean sales in that year.[138] Since then Dow has acquired another six small seed companies[139] but its total share of seed sold has fallen.[140]

The act of combining two midsized seed companies in 1998 (i.e. Asgrow and DEKALB) along with the addition of small regional seed companies in the 2005-2007 time period, and the growth of Monsanto's largest competitor, Pioneer, both have led to a moderate increase in firm

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[131] "Seed Delay a Blow to Pioneer," *Des Moines Register*, (Dec. 5, 2009), *available at* http://www.desmoinesregister.com/article/20091205/BUSINESS01/912050342/Seed-delay-a-blow-to-Pioneer.

[132] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 32 and 37 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[133] "Syngenta Buys Garst Seed Company," *California Farmer* (May 12, 2004), *available at* http://californiafarmer.com/story.aspx?s=1475&c=8.

[134] Syngenta Company History, *available at* http://www.syngenta.com/en/about_syngenta/companyhistory.html.

[135] "Syngenta Acquires Golden Harvest," *California Farmer* (June, 25, 2004), *available at* http://www.californiafarmer.com/story.aspx?s=1815.

[136] "Monsanto and Syngenta Settle GM Seed Disputes; Share Technologies," *Chemical Week* (June 2, 2008), *available at* http://www.britannica.com/bps/additionalcontent/18/32590288/Monsanto-and-Syngenta-Settle-GM-Seed-Disputes-Share-Technologies.

[137] Dow AgroSciences, *available at* http://www.dowagro.com/mycogen/who/.

[138] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 37 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[139] "Dow Completes Acquisition of Dairyland Seed Co., Bio-Plant Research Ltd." *Michigan Farmer* (Sept. 3, 2008), *available at* http://michiganfarmer.com/story.aspx?s=19110&c=8. *See also* "Hyland Seeds assets acquired by Dow AgroSciences," *Today's Farmer* (Dec. 1, 2009), *available at* http://www.todaysfarmer.ca/ArticleDisplay.aspx?e=2200896. *See also* "DowAgro Plants Seeds of Growth with Acquisition," *Indy.com* (July 14, 2009), *available at* http://www.indy.com/posts/dowagro-plants-seeds-of-growth-with-acquisition. *See also* "Dow AgroSciences LLC (DAS) acquires Renze Hybrids Inc., Carrol, IA, and Brodbeck Seed, Wabash, IN," *Agri Marketing* (Nov. 1, 2008), *available at* http://www.allbusiness.com/company-activities-management/company-structures-ownership/11738113-1.html. *See also* "Dow Acquires Triumph Seeds," *Prairie Farmer* (Mar. 7, 2008), *available at* http://prairiefarmer.com/story.aspx?s=16116&c=8.

[140] Analysis of **dmr**kynetec data.

concentration in soybean seed – but it is not dramatically different than historical concentration. Indeed, the biggest driver of HHI increase is the growth of Pioneer's share after its acquisition by DuPont, going from 17% in 1998 to roughly one-third in 2009,[141] leading to a total increase of about 600 points.[142]

The key point is that there is no reason to believe that Monsanto's acquisition of soybean companies (or the soy acquisitions by others) has lessened soybean competition or threatened to foreclose trait developers. As of 2008, non-Monsanto companies accounted for over 70% of the soybeans sold,[143] and there remained more than 146 seed companies, selling over 30% of soybean seed planted in the United States, that are not owned by vertically integrated trait developers.[144]

B. CORN

Today, Monsanto, Syngenta, DuPont, and Dow each own their own corn seed companies and, as of 2008, competed with more than 170 independent seed companies, which accounted for 24% of corn acres in the United States.[145] Monsanto's share of corn seed sales has increased through acquisitions, but also through the success of its seed companies once acquired. Even with this growth, Monsanto sells 36% of seed planted,[146] which is only slightly more than the second largest firm, DuPont/Pioneer.[147]

As with soybeans, seed company acquisitions have not led to high seed company concentration in corn over the past decade.

- Asgrow and DEKALB were smaller players in corn seed and their combination had a much smaller effect on concentration in corn than in soybean. Asgrow made 4% of corn sales in 1998,[148] which were combined with DEKALB's 11%,[149] a total which then fell to

[141] "Seed Delay a Blow to Pioneer," *Des Moines Register*, (Dec. 5, 2009), *available at* http://www.desmoinesregister.com/article/20091205/BUSINESS01/912050342/Seed-delay-a-blow-to-Pioneer.

[142] *See* Appendix 4.

[143] Monsanto Press Release, "Supplemental Toolkit for Investors," at 9 (June 2009), *available at* http://www.monsanto.com/pdf/investors/supplemental_toolkit.pdf.

[144] *See* Appendix 3.

[145] *Id.*

[146] Monsanto Press Release, "Supplemental Toolkit for Investors," at 6 (June 2009), *available at* http://www.monsanto.com/pdf/investors/supplemental_toolkit.pdf.

[147] "Seed Delay a Blow to Pioneer," *Des Moines Register*, (Dec. 5, 2009), *available at* http://www.desmoinesregister.com/article/20091205/BUSINESS01/912050342/Seed-delay-a-blow-to-Pioneer.

[148] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 31 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[149] *Id.*

roughly 10% in 2001.[150] By 2008 Monsanto's overall share of corn seed planted had increased to 36%. The bulk of these sales, however were made by DEKALB, the seed share of which had more than doubled to 26% solely through internal growth. Other corn seed companies acquired by Monsanto between 2004 and 2007 had a total of about 9% share at the time they were acquired, and those brands have since grown slightly, accounting for less than 11% of U.S. corn seed planted in 2008.[151]

- DuPont-Pioneer corn seed sales have declined over the last decade, falling from 42% in 1997[152] to 30% in 2008.[153] But Pioneer has grown share in the last two years, with its President, Paul Schickler, claiming that Pioneer could "extend [its] soybean market share leadership and gain 1 to 2 points of global seed corn share next year."[154] Pioneer recently stated that its market share gains this past season are the largest in the industry: more than 1 percent in corn and 2% in soybeans.[155]
- Syngenta seed company acquisitions increased its share to 15% in 2004,[156] when it acquired Garst[157] and Golden Harvest,[158] but its sales have since fallen to 10% in 2009.[159]

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[150] "Monsanto, Pioneer Fight for Seed Market," *The Washington Post* (Dec. 8, 2006), *available at* http://www.washingtonpost.com/wp-dyn/content/article/2006/12/08/AR2006120800030.html.

[151] Monsanto Press Release, "Supplemental Toolkit for Investors" at 6 and analysis of **dmr**kynetec data.

[152] Marvin L. Hayenga, "Structural Change in the Biotech Seed and Chemical Industrial Complex," *AgBioForum* Volume 1, Number 2, (1998), pp. 43-55, at p. 44, Table 1.

[153] Carey Gillam, "Biotech Giants Battle for Better Corn Seed," *Reuters* (Mar. 18, 2009), *available at* http://www.reuters.com/article/idUSTRE52G7FQ20090318.

[154] Pioneer Press Release, "Product Performance to Fuel 2010 Share Gains for DuPont Seed Business" (Nov. 23, 2009), *available at* http://www.pioneer.com/web/site/portal/menuitem.c12b08ac72934512e6a4e6a4d10093a0/.

[155] Paul Schickler, Presentation at J.P. Morgan 4thAnnual Diversified Industries Conference, (Sept. 16, 2009), at 6, *available at* http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTU0Njd8Q2hpbGRJRD0tMXxUeXBlPTM=&t=1. Pioneer also touted its ability to raise prices by 20% in corn and 35% in soybeans. *Id*.

[156] "Syngenta Acquires Golden Harvest," *California Farmer* (June, 25, 2004), *available at* http://www.californiafarmer.com/story.aspx?s=1815.

[157] "Syngenta Buys Garst Seed Company," *California Farmer* (May 12, 2004), *available at* http://californiafarmer.com/story.aspx?s=1475&c=8.

[158] Syngenta Company History, *available at* http://www.syngenta.com/en/about_syngenta/companyhistory.html.

[159] "Price of US Corn Seed – Will it Impact Market Share?" Gerson Lehrman Group (Apr. 8, 2009), *available at* http://www.glgroup.com/News/Price-of-US-corn-seed----wil-it-impact-market-share--37174.html.

- Dow acquired the Mycogen seed company in 1998,[160] which made 4% of corn seed sales in that year.[161] Since then, Dow has acquired another six seed companies[162] but its total share of seed sold remains at 4% of acres planted.[163]

The HHI of the U.S. corn seed industry is shown on Exhibit 10 above. It shows that the HHI declined – not increased – from 2000 to 2003[164] following the Monsanto-DEKALB and DuPont-Pioneer transactions in 1998[165] and 1999[166] respectively. The increase in HHI after 2003[167] was driven significantly by internal growth at Monsanto, fueled not by a difference in access to traits but by Monsanto's success in traditional breeding, which gave it a significant yield advantage over DuPont and its other rivals.[168]

C. COTTON

Monsanto acquisitions have not increased concentration in the cotton seed industry. Rather, concentration has fallen dramatically since the early 2000s.[169] The industry also shifted from one in which one company sold more than half of seed planted to one where there are two equal sized competitors.

- In 2003, Delta and Pine Land sold the cotton seed planted on roughly 60% of farmer acres.[170] The next largest companies were Stoneville with roughly 16% share and FiberMax with roughly 14%.[171]

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[160] Dow AgroSciences, *available at* http://www.dowagro.com/mycogen/who/.

[161] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 31 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[162] *See* n. 139.

[163] "INTERVIEW – Dow AgroSciences racing to compete – CEO," *CNNMoney.com* (Dec. 2, 2009), *available at* http://money.cnn.com/news/newsfeeds/articles/reuters/MTFH27862_2009-12-02_21-01-40_N0237426.htm.

[164] *See* Exhibit 10.

[165] Monsanto Company History, *available at* http://www.monsanto.com/who_we_are/history.asp.

[166] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 33 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/..

[167] *See* Exhibit 10.

[168] *See* Monsanto Press Release, " 2009 Harvest Data Demonstrate Yield Advantages of Monsanto Seed Genetics and Cutting Edge Trait Technologies in Corn and Soybeans," (Dec. 9, 2009), *available at* http://monsanto.mediaroom.com/index.php?s=43&item=780.

[169] *See* Exhibit 10.

[170] "Delta and Pine Land Acquisition," Monsanto Investor Conference Call at 6 (Aug. 15, 2006), *available at* http://www.monsanto.com/pdf/investors/2006/08-15-06.pdf.

[171] *Id.*

- Monsanto sold Stoneville in 1999,[172] reacquired it in 2005,[173] but then divested it again when it acquired Delta and Pine Land in 2007.[174] By 2007, Deltapine's share had fallen to 46% of the market.[175] The exchange of Stoneville for Delta and Pine Land, increased Monsanto's share of cotton seed sold, but did not increase concentration.

- In 2007, Bayer, which already owned FiberMax, acquired portions of Stoneville.[176] This increased Bayer's share of cotton seed sales from 29% in 2006[177] to 44% in 2007.[178] Bayer's share in 2009, according to USDA data, has grown to 46%.[179]

AAI opposed Monsanto's acquisition of Delta and Pine Land in 2007, arguing that divestiture of the Stoneville business would not restore competition because "[u]nder the terms of the consent decree, it is highly unlikely that the proposed acquirer (Bayer) of the Enhanced Stoneville Assets will be a viable competitor to the vertically-integrated firm created by the merger."[180] In fact, Bayer is more than a viable competitor; it has pushed into the market share lead[181] while Deltapine's share has fallen sharply since the acquisition – from 46% in 2007[182] to

[172] "Monsanto Completes Sale of Stoneville to Hicks, Muse, Tate & Furst and Emergent Genetics, Inc." *SeedQuest* (Dec. 29, 1999), *available at* http://www.seedquest.com/News/releases/usa/Monsanto/N2038.htm.

[173] Emergent Genetics At a Glance, *available at* http://www.emergentgenetics.com/about/glance/index.html.

[174] Monsanto Company History, *available at* http://www.monsanto.com/who_we_are/history.asp.

[175] Brett Begemann, "CITI 2007 Basic Materials Symposium," at 18 (Dec. 4, 2007), *available at* http://www.monsanto.com/pdf/investors/2007/12-04-07.pdf.

[176] "Bayer CropScience Completes Acquisition of Stoneville Pedigreed Seed Company," *SeedQuest* (June 19, 2007), *available at* http://www.seedquest.com/News/releases/2007/june/19574.htm.

[177] USDA, "Cotton Varieties Planted 2006 Crop," at 1 (Aug. 2006), *available at* http://supima.files.cms-plus.com/pdf/2006-07%20-%20AMS%20-%20Planted%20Varieties%20Report%20-%20Pima%20Varieties.pdf.

[178] "Bayer Cotton Seed Brands Account for Largest Share of U.S. Acres," *Delta Farm Press* (Dec. 21, 2007), *available at* http://deltafarmpress.com/mag/farming_bayer_cotton_seed/.

[179] USDA, "Cotton Varieties Planted 2009 Crop," p. 5 (Aug. 28, 2009), *available at* http://www.ams.usda.gov/mnreports/cnavar.pdf.

[180] Diana L. Moss, AAI Tunney Act Comments in Monsanto/Delta and Pine Land (Aug. 27, 2007) at 14, *available at* http://antitrustinstitute.org/documents/Monsanto_DPL/AAI%20Tunney%20comments_Monsanto_DPL.pdf.

[181] Bayer Press Release, "Cottonseed Brands from Bayer CropScience Claim Largest Share of 2009 U.S. Acres," (Oct. 19, 2009), *available at* http://agfax.com/updates/misc/2009/pr/bayer-cottonseed-2009-1019.pdf.

[182] Brett Begemann, "CITI 2007 Basic Materials Symposium," at 18 (Dec. 4, 2007), *available at* http://www.monsanto.com/pdf/investors/2007/12-04-07.pdf.

39% in 2009.[183] Moreover, Dow's Phytogen brand has been gaining share rapidly in the Mid-South and Southeast, the two regions where the DOJ alleged the merger would reduce competition but for the required divestitures.[184] This experience shows that agricultural competition is in fact much more robust than some critics believe it to be.

VIII. THERE IS NO EVIDENCE THAT MONSANTO'S STACKING POLICIES HAVE RESTRAINED COMPETITION OR INNOVATION AND SUCH EFFECTS ARE IMPLAUSIBLE.

AAI offers a two step proposition regarding trait stacking. First, it contends that the introduction of new biotech traits requires the ability to combine (or "stack") with Monsanto's popular biotech traits. In other words, the claim is that new traits must be bred into seed that also contains Monsanto traits in order to be successful. Second, it argues that permission to do so from Monsanto will not be forthcoming.[185] This might be an interesting theoretical argument – but the question is whether it has any basis in fact. The AAI paper does not assess the facts, and it turns out that neither the facts nor the theory is supported. The AAI paper offers no evidence that any stacked trait combination desired by growers is not available, and certainly no evidence of a reduction in competition or innovation as a result of Monsanto's stacking policies. Stacking, including stacking of traits from multiple technology providers, is widespread, as is shown in the charts in Appendices 1 and 2.

As a preliminary matter, it is clear that Monsanto *has* broadly authorized competing trait developers to stack their traits with Monsanto's. DuPont/Pioneer, for example, is licensed to create *any* stack with Monsanto's Roundup Ready trait other than a stack of two glyphosate tolerance genes.[186] Moreover, a review of information regarding currently-available seed options shows multiple Monsanto traits stacked with non-Monsanto traits as well as stacked products that do not contain Monsanto's traits.[187] This is what economic theory would predict: that Monsanto and other trait providers have an incentive to allow valuable stacks in order to earn more money from their patented traits. The suggestion to the contrary is thus supported by neither theory nor experience.

Even if Monsanto had not licensed or did not license stacking, it is not clear why a trait developer would need to stack with Monsanto's traits when comparable traits are available from Monsanto's competitors. For example, instead of stacking with Monsanto's YieldGard

[183] USDA, "Cotton Varieties Planted 2009 Crop," p. 5 (Aug. 28, 2009), *available at* http://www.ams.usda.gov/mnreports/cnavar.pdf.

[184] In 2009, Dow varieties were planted on over 15% of cotton acres in the Mid-South and over 11% in the Southeast, up from just over 1% in both regions at the time of the merger. *Id.*

[185] AAI at 12.

[186] *See* Hearing Transcript, *Monsanto Co. v. E.I. du Pont de Nemours and Company* (Oct. 23, 2009), *available at* http://www.monsanto.com/pdf/dupont_legal/oral_hearing_transcript.pdf.

[187] *See* Appendices 1 and 2.

Corn Borer or YieldGard Rootworm traits, a trait developer could stack with Dow's Herculex corn borer and rootworm traits or with Syngenta's Agrisure® corn borer and rootworm traits. Instead of stacking with Monsanto's Roundup Ready trait in corn, a trait developer could stack with Syngenta's Agrisure GT glyphosate tolerance trait. A developer of cotton traits could stack with Bayer's GlyTol™ glyphosate tolerance trait, which Bayer is launching in 2010.[188] DuPont claims that an additional glyphosate tolerance trait in both soy and corn will be available and on the market in a time frame that would fit with the needs of any firm that is about to embark on new trait development today. Thus, taking DuPont's claims at face value, unless DuPont would refuse to stack, a trait developer starting a project today need not worry about access to glyphosate tolerance.[189] And even if DuPont continues to experience problems with its Optimum GAT trait in soybeans, Bayer and its development partners are working on their own glyphosate tolerance trait for soybeans.[190]

Monsanto has legitimate reasons for wanting to prevent unrestricted stacking. By requiring licensees to obtain Monsanto's consent before stacking, Monsanto is able to consider issues such as how the quality and performance of its traits will be affected by stacking. The history of transgenic trait development is full of examples of the difficulty of integrating biotech traits into native plant germplasm. One need look only to the recent example of DuPont's Optimum GAT trait for glyphosate and ALS inhibitors tolerance in corn and soybeans. DuPont has recently pushed back plans for commercial release of the trait in corn and soybean. In corn, this was reportedly due to disappointing yield effects of the trait.[191] The biotechnology literature also discloses potential performance issues when similar traits (e.g. two glyphosate tolerance traits) are stacked, including "gene silencing."[192]

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[188] Bayer Press Release, "U.S. Department of Agriculture Grants Approval for Bayer CropScience's GlyTol™ Cotton Technology," (May 22, 2009), *available at* http://www.press.bayer.com/baynews/baynews.nsf/ID/2009-0213-e

[189] DuPont has acknowledged delays in launching Optimum GAT but has insisted that the problem is not in efficacy of the trait. Rather, according to DuPont, it is a delay in regulatory approvals on soy and a yield problem, not an efficacy problem, in corn. "DuPont Updates its Commercialization Timelines for Optimum(R) GAT(R) Corn and Soybeans," *Yahoo Finance* (Dec. 4, 2009), *available at* http://finance.yahoo.com/news/DuPont-Updates-its-prnews-935067197.html/print?x=0.

[190] Bayer Press Release, Bayer CropScience, Mertec and M.S. Technologies to Co-Develop New Soybean Trait Products," (Nov. 26, 2007), *available at* http://www.bayercropscience.com/bcsweb/cropprotection.nsf/id/20071126_EN.

[191] "Optimum GAT corn demonstrates excellent glyphosate and ALS herbicide tolerance efficacy; however, based on comprehensive harvest results, the current version of the trait in corn does not meet Pioneer's high yield standards. Therefore, Pioneer has reset its plans to commercialize Optimum GAT corn and will not have controlled releases in 2010 and 2011 in North America. Meanwhile, Pioneer will intensify its ongoing research efforts along multiple pathways for the corn trait and work toward commercialization in the middle of the next decade." "DuPont Updates its Commercialization Timelines for Optimum(R) GAT(R) Corn and Soybeans," *Yahoo Finance* (Dec. 4, 2009), *available at* http://finance.yahoo.com/news/DuPont-Updates-its-prnews-935067197.html/print?x=0..

[192] When transgenes are created, they necessarily carry along some additional DNA. Combining transgenes in stacks creates risks that certain genes may be turned off or "silenced" because they contain common DNA. *See, e.g.*, *Genetic Issues and Pitfalls in Transgenic Plant Breeding.* Zhong G-Y. (2001)

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Monsanto's stacking policies allow it to protect its reputation by avoiding association of its traits with traits from other companies that may raise public acceptance concerns (e.g., StarLink or biopharmaceuticals[193]) or that put Monsanto's licensees and their grower customers at risk of being unable to export their crop because the trait lacks foreign import approvals. And by requiring that stacking rights be specifically licensed, Monsanto can ensure that companies with their own intellectual property do not block Monsanto and its hundreds of licensees from offering desirable products (e.g., Monsanto may license its Bt trait for stacking with another Bt trait only on condition that, in return, Monsanto and the hundreds of seed companies that are its customers be licensed under the other company's patent rights.) The pro-competitive nature of stacking provisions can be seen in the fact that their use is widespread, even by firms that could never be claimed to have market power.[194]

Finally, Monsanto's stacking policies enable Monsanto to charge lower prices to seed companies that want to obtain fewer rights under Monsanto's patents. The ability to put a Monsanto trait in a seed with no other biotech traits may be worth one price to a seed company, while the ability to put the trait in a seed with other traits may be worth considerably more. The stacking provisions in Monsanto's licenses enable it to negotiate a separate price for the right to stack its traits with other traits as opposed to setting the higher price for all comers.

IX. THERE IS NO BASIS FOR COMPULSORY LICENSING

The AAI paper acknowledges that Monsanto has broadly licensed the traits it has invented and that, but for that fact, AAI believes that Monsanto's innovative efforts would have allowed it to "control large, totally closed platforms in transgenic seed that could be challenged only by the unlikely emergence of rival platforms."[195] However, rather than applaud Monsanto's pro-competitive strategy, AAI suggests that Monsanto's strategy is contrary to Monsanto's "ability and incentive[s]." It then offers the specter that one should in the future expect to see Monsanto reversing course and "leveraging its market power downstream to the markets for traited seed" in order to create a closed system.[196] It is on this speculative basis that AAI sees "an almost intractable situation for competition." It later cites this same "intractable situation"

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Euphytica 118:137-144 ("The typical observation is that when two or more copies of a transgene, or a transgene with homology to an endogenous plant gene, are integrated into a plant genome, some or all of the homologous copies are inactivated or silenced.")

[193] For a discussion of use of plants such as soybeans and corn as "biofactories" for pharmaceuticals, *see, e.g.*, Maria Andrawiss, "Plant-Made Pharmaceuticals," *Drug Discovery & Development* (Mar. 9, 2006), *available at* http://www.dddmag.com/plant-made-pharmaceuticals.aspx; Margot Roosevelt, "Cures on the Cob," *Time* (May 19, 2003), *available at* http://www.time.com/time/magazine/article/0,9171,452804,00.html?iid=chix-sphere.

[194] Based on review of confidential licenses offered to or executed by Monsanto-owned seed companies.

[195] AAI at 13.

[196] *Id.*

– one that would exist only if Monsanto had acted differently than it has for the past decade – as "requir[ing] antitrust enforcement and/or legislative relief" including compulsory licensing.[197]

As noted, this conclusion rests on arguments that a vertically integrated firm's inherent incentives are to create a closed system,[198] yet there is no explanation of why Monsanto has not done this when it had the ability to do so. Economics and experience both teach that successful companies generally follow their economic self interest. Thus, the first inquiry ought to be whether there are in fact incentives to in-license and out-license broadly, i.e., to do what Monsanto has done successfully to date.

Monsanto has found that it makes money when it out-licenses its traits to all comers and gets paid for traits on acres sold by non-Monsanto seed companies. AAI recognizes that this effort has been financially successful for Monsanto. AAI provides no analysis to support an expectation that Monsanto would change that policy, let alone an anticipatory reason so compelling as to support a repeal of long established rules on patent protection that are designed to encourage innovation. Rather, it simply asserts that Monsanto has the "ability and incentive" to do otherwise.[199]

This claim that Monsanto has an incentive to leverage its supposed market power in traits into market power in seed is not correct.[200] Assuming *arguendo* that Monsanto has market power in traits, this would mean that Monsanto has the ability to set prices for its traits and earn patent-protected profits on these innovations. Monsanto can collect these profits either by licensing its traits to others or by selling seed with the traits directly to growers. The principle of "one monopoly rent" is that a firm generally cannot profit by leveraging market power in an upstream vertical level into a monopoly in a downstream competitive market; the theoretical monopolist makes just as much profit with a competitive downstream market purchasing its product as an input as it does if it controls the downstream market and sells to consumers.[201] While economic theory teaches that there are exceptions to this general principle, AAI makes no suggestion that any of them apply here.

Monsanto's past and current actions speak louder than AAI's speculative predictions. Monsanto has demonstrated that it has incentives to allow stacking of non-Monsanto traits in Monsanto-branded seed when quality can be ensured and there is consumer demand for the stack. The stacking can benefit a new trait by allowing growers to adopt the new trait without giving up the established traits they like, but it can also help established traits to retain share. If Monsanto were to refuse to permit its traits to be stacked with a new insect protection trait, for example, some growers may give up Roundup Ready seed if the new trait is more valuable to them. Even more threatening to Roundup Ready trait sales would be if that insect protection trait were to be stacked with a competing trait for glyphosate tolerance. This loss could be

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[197] *Id.* at 13, 14, 26, 27, 29.

[198] *Id.* at 13.

[199] *Id.*

[200] *Id*.

[201] *See, e.g.*, Aaron Director & Edward H. Levi, *Law and the Future: Trade Regulation*, 51 NW. U. L. REV. 281, 290-92 (1956); RICHARD POSNER, ANTITRUST LAW: AN ECONOMIC PERSPECTIVE 198-199 (2d Ed. 2001).

avoided by allowing the new trait to be stacked with the Roundup Ready trait. As one industry analyst has noted, even though Monsanto has its own YieldGard traits for insect resistance, Monsanto's stacking of the Roundup Ready 2 trait with the popular Herculex traits "makes good sense, due to the availability of Bayer's GA21, as well as the understanding that other glyphosate tolerance traits may emerge from other competing laboratories."[202]

Again, we have a situation where both economic theory and the observed market activity (Monsanto's in-licensing traits from others and permitting stacking) point towards a competitive market that works, while AAI seeks sweeping legislation or litigation based on an unsupported assertion that in the future things will, for no specific reason, be different.

X. THERE IS NO EVIDENCE OF FORECLOSURE OF TRAIT DEVELOPERS BECAUSE OF MONSANTO'S POSITIONS IN SEED, AND SUCH FORECLOSURE IS IMPLAUSIBLE

Innovation in agricultural biotechnology is robust (see section VI above) and the companies engaged in this effort have not expressed any doubts that they can find seed companies interested in taking their pipeline traits to market. This expectation is consistent with past experience. No trait has failed because it lacked sufficient seed company support. Rather there are ample available seed assets controlled by Monsanto's rivals to support the launch of new traits. Monsanto's competitors account for more than 70% of soybean acres, 64% of corn acres, and almost 60% of cotton acres.[203] In addition it would be contrary to Monsanto's past practice to refuse to in-license traits developed by a competitor. For example, Monsanto is now selling Genuity SmartStax corn that will include insect protection traits from Dow along with Liberty Link herbicide tolerance from Bayer.[204]

It is clear that the opportunity to access this level of acreage creates sufficient incentives for trait development and commercialization. Not only is there evidence of ongoing trait development and commercialization by DuPont, Syngenta, Bayer, BASF and Dow, notwithstanding the current market structure that is claimed to deter such work, but the history of trait introduction shows that developers have launched traits even when they had (of their own choice) a limited number of acres available to them. Rhone Poulenc chose to license its BXN herbicide tolerance trait exclusively to Stoneville even though Stoneville accounted for less than 10% of cotton acres.[205] DuPont commercialized its STS trait through Asgrow even though

[202] Plant Biotech Traits Commercialized, 2008 Ed., CRN 50-1.

[203] Monsanto Press Release, "Supplemental Toolkit for Investors," (June 2009), *available at* http://www.monsanto.com/pdf/investors/supplemental_toolkit.pdf.

[204] *See* http://www.monsanto.com/pdf/smartstax_brochure.pdf. In addition, Monsanto-owned seed companies are already selling seed with Dow's Herculex trait.

[205] Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 39 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

Asgrow had a less than 20% share of soybean acres.[206] And Novartis and Mycogen launched Bt traits essentially confined to their own seeds even though they each had shares of less than 10%.[207] These traits were all released between 1993 and 1996,[208] before Monsanto traits had been launched and before it had acquired the bulk of its current seed company holdings. In other words, before Monsanto had the ability to limit trait developers' access to seed that AAI claims it has, trait developers had already chosen to launch their new traits on exclusive seed company platforms rather than deal with the independents.

Moreover, given the value of Monsanto's seed business, Monsanto cannot plausibly risk refusing to in-license a trait that growers will highly value. Imagine, for example, that a competitor of Monsanto created a new transgenic trait that substantially improved the yield of corn. Monsanto and other seed companies would move quickly to gain licenses to breed the trait into their varieties rather than watch their seed share wither.

And even if all the other vertically integrated competitors of Monsanto (i.e., firms like Bayer's cotton seed companies, DuPont-Pioneer, Syngenta, and Dow) refrained from selling a new trait, independent seed companies could still produce the new traited seed and increase their share of seed sales at the expense of these big firms.

Finally, concerns about foreclosure of innovation assume that a trait developer must be vertically integrated to be successful. That is not the case in the pharmaceutical industry, which AAI elsewhere compares to seed development. Innovation in pharmaceuticals is robust in part because academic labs and startup companies can come up with promising concepts that they sell to large pharma for further development. The same system is at play in traits, where an academic lab or boutique company could come up with a new trait concept and then sell it to a DuPont, a Syngenta, a Dow, a Bayer, a BASF, or a Monsanto. Indeed, DuPont's glyphosate tolerance gene grows out of work done by a smaller, unintegrated firm (Maxygen) that developed a gene shuffling technology, applied it to the plant field, and then sold its rights to DuPont.[209] AAI fails to explain why this fertile source of innovation would not persist even in a setting where vertical integration is pervasive.

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[206] Context Consulting, *Biotech Traits Commercialized 2000*, at SOY34 ("Sulfonylurea tolerant Soybeans (STS) were first launched by Asgrow in 1993."); Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 37 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[207] Context Consulting, *Biotech Traits Commercialized 2000*,at CORN9; Jorge Fernandez-Cornejo, "The Seed Industry in U.S. Agriculture," Agriculture Information Bulletin at 31 (Feb. 2004), *available at* http://www.ers.usda.gov/publications/AIB786/.

[208] *See* Appendix 1.

[209] *See* Maxygen Press Release, "DuPont To Acquire Maxygen Subsidiary Verdia" (June 3, 2004), *available at* http://www.maxygen.com/newsview.php?listid=206.

XI. WHO HAS CAPTURED THE VALUE OF BIOTECH TRAITS?

The AAI paper summarizes academic research that has documented the benefits of transgenic seed and reports that "[w]elfare-based studies confirm the notion that there are substantial economic gains associated with transgenic seed."[210] It adds that "[i]t is generally thought that transgenic seed has contributed significantly to increased productivity of farmers in the U.S. through higher yields and the need for fewer inputs."[211]

Given this value, it is not a surprise that growers would be willing to pay more for seed with these technologies than seed that does not contain them. But farmer adoption of high value seed is instead characterized by the AAI paper as a "First Sign of Trouble"[212] for competition. AAI suggests both that farmers do not benefit from the traits as priced, and that trait innovators profit too much. For example, AAI suggests, without support, that these patented technologies should not experience a "[s]ustained high price" because they are "mature technologies."[213]

First, it is puzzling how agricultural biotechnology could be called a mature technology. The first transgenic seeds to achieve marked success were marketed in 1996.[214] The first cellular phone was sold in 1983.[215] To suggest that the business of selling transgenic seeds was mature in 2009 would be like suggesting that the cell phone business was mature in 1996. Like cell phones in 1996, the current generation of traits promises to be eclipsed by what will follow.

In spite of remarkable progress in plant genetics, numerous aspects of plant biotechnology remain unexplored or elusive. That our knowledge in this field is anything but mature is shown by the November 20, 2009 issue of *Science*, which features The Maize Genome on its cover and contains five articles on new insights gleaned from a just completed 15 year effort to map the maize genome and make high quality data on it available. The magazine reports on "breakthroughs in understanding a fundamental phenomenon of plant biology [that] are leading the way to identifying the genes or small RNAs with the prospect of improving heterosis in maize and other crops." Analyses based on these recent breakthroughs "set up the next goals for maize, including overcoming recombinational constraints that limit the full exploitation of the genetic diversity present in the maize gene pool" and "will have a broad impact on plant breeding and provide far-reaching benefits for humans and animals." Indeed, the authors suggest this work will "open the floodgates" for work on other plants.[216] This is not how one describes "mature technologies."

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[210] AAI at 7.

[211] *Id.* at 9.

[212] *Id.* at 5,

[213] *Id.* at 9.

[214] *See* Appendix 1.

[215] Marguerite Reardon, "Cell Phone Industry Celebrates Its 25th Birthday," *CNET News.com* (Oct. 11, 2008), *at* http://news.cnet.com/8301-1035_3-10064633-94.html.

[216] Catherine Feuillet and Kellye Eversole, "Solving the Maze," *Science*, vol. 326, pages 1071-72 (Nov. 20, 2009).

Second, the calculation used to conclude that traited seed prices are too high is misguided. The AAI paper compares the annual growth rate in seed prices to the annual growth in crop yield multiplied by crop prices, concluding that "growth in seed costs has outstripped the growth in what farmers receive for their crops" and that there is a "'squeeze' on farmers brought about by more rapid in [sic] increases in seed costs relative to crop values" which "likely reveals other forces at work, including supra-competitive price increases for transgenic seed and/or a declining rate of productivity improvement."[217] This concept and calculation is flawed.

The difference in the rates of growth of seed costs and crop yield does not measure whether or not farmer profits are being "squeezed" away by seed cost increases, nor does it measure whether or not there is an anticompetitive environment for providing biotech traits and/or seeds to the farmers. The measure is inappropriate because the change in seed costs does not account for the savings that growers achieve in the cost of chemicals and labor. These are major benefits of herbicide-tolerant and insect-resistant crops. According to a study by the National Center for Food and Agriculture Policy, farmers that planted Roundup Ready soybeans in 2006 reduced their weed control cost by more than $22/acre (including savings in both herbicide cost and application expense).[218] The same study estimates that during years of high corn borer infestation, U.S. corn growers could put an extra $361 million in their pockets (because of higher yields, higher quality crops and reduced pesticide expenditures) from planting corn with transgenic traits to control corn borers.[219] In addition U.S. farmers that had adopted seed with the YieldGard rootworm trait in 2005 were estimated to have gained on net another $185 million.[220] It follows that any comprehensive analysis of farmer welfare over time must include these cost savings. In addition, looking only at seed costs ignores not just chemical savings, but also non-pecuniary factors such as operator and worker safety, convenience, time savings, and environmental benefits, though agricultural economists have attempted to put a value on these factors as well.[221]

Third, even if one were to ignore these points, the calculation in the AAI paper is faulty. Seed costs are a small fraction of the cost of growing a crop, and thus as a matter of rudimentary math grower profits could increase even if seed costs were to rise at a much higher rate than the growth rate of overall crop value (i.e. a 5% increase in 10% of production costs

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[217] AAI at 9 - 10.

[218] National Center for Food and Agriculture Policy, "Quantification of the Impacts on US Agriculture of Biotechnology-Derived Crops Planted in 2006," at p. 54 (Feb. 2007), *available at* http://www.ncfap.org/documents/2007biotech_report/Quantification_of_the_Impacts_on_US_Agriculture_of_Biotechnology.pdf.

[219] On average across high and low infestation years, the net benefit of corn borer resistant traits is estimated to be $185 million. *Id*. at 60-61 and 65.

[220] *Id*. at 69, 72.

[221] *See, e.g.*, Michele C. Mara, et al., "The Net Benefits, Including Convenience, of Roundup Ready® Soybeans: Results From A National Survey," (Sept. 2004) ("The role non-pecuniary factors play in the decision to plant Roundup Ready soybeans is clear. In particular, adopting farmers place significant value on operator and worker safety, environmental benefits, and convenience characteristics of Roundup Ready soybeans."), *available at* http://cipm.ncsu.edu/cipmpubs/marra_soybeans.pdf.

translates to a 0.5% increase in total costs). We illustrate below that comparing the percentage increase in seed costs with percentage increases in yield says nothing about a "squeeze."

We take a concrete example: Assume gross revenue per acre is $100, costs other than seed are $70, and seed costs are $10. It follows that the grower's profit is $20 per acre. The calculation is simple:

Gross revenue:		**$100**
Costs except seed :	$70	
Seed cost:	$10	
Total cost:		**$80**
Net profit:		***$20***

Assume that the next year commodity prices remain the same, but the grower switches to traited seed that costs (after considering all other factors) 10% more (going from $10 to $11.00) but carries only a 5% yield benefit. The AAI report would compare the 10% seed cost to a 5% yield gain and conclude that where "growth in seed costs has outstripped the growth in what farmers receive for their crops" there is a "squeeze" that hurts farmers.[222] The problem is that this math is wrong.

How bad was this farmer hurt when seed costs went up 10% and yield went up only 5%? *Not at all*. Profits go *up* by *20%*. Here are the numbers.

Gross revenue:		**$105.00**	(reflecting 5% yield gain)
Costs except seed :	$70.00		
Seed costs:	$11.00		(reflecting a 10% greater cost)
Total cost:		**$81.00**	
Net profit		***$24.00***	

Basic arithmetic thus shows that there need be no "squeeze."

AAI's proposition that trait providers are profiting too much, and farmers benefiting too little, is based on faulty analysis. But it is important to recognize that even if the industry were mature, and even if a better yard stick were proposed to measure pricing and it showed that the price of the technologies had risen over time, the AAI logic still fails. High prices and the exercise of patent-derived market power are *not* a surprise *nor* a sign of trouble in industries characterized by high research and development costs. As now-Deputy Assistant Attorney General Carl Shapiro testified before the Antitrust Modernization Commission:

> [I]t is an error to infer genuine antitrust market power based on the gap between price and marginal cost. This error may be more common or more pronounced in innovative industries, but it is not confined to such industries. The gap between price and marginal cost provides a necessary return to cover various fixed costs, including R&D costs in innovative industries and the "first-

[222] AAI at 10.

> copy" costs in content-based markets. The key point to bear in mind here is that the competitive price can easily and significantly exceed marginal cost.[223]

Competition in such industries occurs in the race to bring new products to market, but the "winners" of the innovation race are allowed to profit from their invention. This provides the incentive needed for companies to continue to invest in the research and commercialization of new products.

The AAI report argues that "in competitive markets, technologies that enjoy widespread and rapid adoption typically experience precipitous declines in cost as innovators learn-by-doing and competitive pressures drive prices down."[224] This may be true in industries in which manufacturing costs are a large component of the cost of a product and these costs fall with experience (for example Blu-Ray Disc players), but would not be expected to be the case with transgenic seed.

A more apt analogy would be the book industry. Similar to books, the cost of creating transgenic seed is largely incurred in the initial stages. First, the R&D expense to identify and optimize the transgenic trait is incurred, followed by selection of an event and submission for regulatory review. The selected event and the trait it carries are bred into various varieties of seed in order to sell to the market. Once a biotech trait has been bred into any given specific variety, the cost of producing more of that seed is not significantly more than producing more conventional seed. In this environment, if companies like Monsanto set price equal to marginal cost (as AAI suggests) it would not allow them to recoup their cost, much less compensate future researchers for the risk that they may never develop a valuable product even after investing significant resources. It is no more a sign of market power than is the fact that one of many economics texts used in the highly competitive market of college textbooks (in this case one written by the author of the AAI study) carries a list price of $180[225] even though marginal costs are low and the concepts are not unique. The text is protected intellectual property and pricing at marginal cost would leave the author in a loss situation.

Thus, as demonstrated above, the "squeeze" analysis offered by the AAI paper is uninformative on either the state of competition or the value captured by growers from these traits. Yet this does not deter AAI from confidently concluding that "it likely reveals other forces

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[223] Carl Shapiro, "Antitrust, Innovation, and Intellectual Property," Testimony Before the Antitrust Modernization Commission, at 7 (Nov. 8, 2005), *available at* http://faculty.haas.berkeley.edu/SHAPIRO/amcinnovation.pdf. *See also* Richard J. Gilbert, "New Antitrust Laws for the 'New Economy'?," Testimony Before the Antitrust Modernization Commission, at 9 (Nov. 8, 2005) ("A high gross margin is a natural feature of dynamic, innovation-driven industries and its mere existence is not a basis to conclude that there is unlawful monopolization."), *available at* http://govinfo.library.unt.edu/amc/commission_hearings/pdf/Statement_Gilbert.pdf.

[224] AAI at 9.

[225] D. Moss, ed., Network Access, Regulation and Antitrust, which lists for $180 (with free super saver shipping), *available at* http://www.amazon.com/Network-Regulation-Antitrust-Economics-Relationships/dp/0415700795.

at work, including supra-competitive price increases for transgenic seed and/or a declining rate of productivity improvement."[226]

If biotech traits did not benefit growers, they would not pay the price premium charged for seed with these traits. This choice is made clear in one of the articles cited in the AAI paper: "Other things being equal, transgenic crops reduce production costs or increase yield (expected yield, at least). Thus farmers have an incentive to adopt these crops and, when given the chance, they have done so."[227] Indeed, before asserting that "it is unclear whether farmers (and the ultimate consumers of transgenic seed products) benefit," AAI quotes a study that says just the opposite: that 26 percent of the total benefits go to producers (i.e. farmers), 14 percent to consumers, and there are irreversible benefits to farmers such as reduced erosion and pesticide or fuel use.[228]

XII. THERE IS NO CONFLICT BETWEEN ADVANCING INNOVATION AND PROTECTING COMPETITION

A. THE SUPPOSED PATENT THICKET

The fundamental message of the AAI paper is a call to gut the patent system as it applies to biotechnology. AAI asks rhetorically if patent protection is not just a strategy for blocking competition: "Patent Protection – Strategy for Creating and Maintaining Platforms?"[229] AAI argues that patents "could" block innovation, either because new entrants will not be able to get the clearance needed to use fundamental technologies protected by multiple patents or because innovators may fraudulently extend their patents through the addition of inconsequential changes.[230]

AAI suggests that these hypotheticals apply with greater force to biotechnology than to the patent system as a whole by citing to what it claims is "substantial anecdotal evidence pointing to delays in commercialization resulting from hold-up" and "some evidence to suggest that the difficulty associated with accessing an entire package of plant transformation technologies necessary to develop transgenic seed products has prevented entry into genetic engineering."[231] The paper AAI cites for this proposition does not support the conclusion AAI

[226] AAI at 10.

[227] GianCarlo Moschini, "Biotech—Who Wins? Economic Benefits and Costs of Biotechnology,"2 *Estey Centre J. Int'l L. & Trade Pol.* 93, 98 (2001),, *available at* http://ageconsearch.umn.edu/bitstream/23862/1/02010093.pdf.

[228] AAI at 11, 7, and 9.

[229] *Id.* at 20.

[230] *Id.* at 22-3.

[231] *Id.* at 21-2.

proffers. Indeed, the cited paper comes out exactly the other way.[232] In the cited paper, Carl E. Pray and Anwar Naseem first describe the benefits of patent protection and then weigh them against specific incidents in which firms were likely delayed in bringing new genetically modified crops to market.[233] Their conclusion: "the benefits in terms of improved technology to farmers have outweighed the few examples of holdups that we were able to find."[234]

It is true that invalidating licenses and forcing companies to give up their intellectual property rights can in the short run lead to lower prices of the previously patented technology. Monsanto's rivals would surely be pleased to use Monsanto's traits without paying to license them or having to invest in the R&D to create them. But this phenomena is not limited to patents in biotechnology.

In any innovative industry consumers and rivals can benefit in the short-run by removing the patents that protect innovations held by the leading firm. The patent system was created in recognition of the harm this sort of appropriation of others' ideas could do to long-run incentives to innovate and bring new products to market. According to AAI, "concerns over anticompetitive practices under antitrust law come into direct contact with the goal of protecting innovation under patent law,"[235] but both patent law and antitrust law are designed to promote consumer welfare. Questions regarding the legitimacy of Monsanto's patents can and have been addressed in courts, which have been called on to clarify the rights over multiple biotechnology patents. Patents should not be invalidated simply because one firm is too innovative for its competitors' comfort.

B. HISTORY OF LITIGATION

The AAI paper discusses the volume of patent-related litigation brought by and against Monsanto as though the fact of being involved in litigation is itself evidence that Monsanto has

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[232] Carl E. Pray and Anwar Naseem, "Intellectual Property Rights on Research Tools: Incentives or Barriers to Innovation? Case Studies of Rice Genomics and Plant Transformation Technologies," *AgBioForum*, 8(2&3): 108-117 (2005), *available at* http://www.agbioforum.org/v8n23/v8n23a07-pray.htm.

[233] Their first example is a case of hold-up by DuPont, which sponsored the AAI paper:

> Did patents on transformation techniques slow down the development of new genetically modified crops? Officials from American Cyanamid claimed that they were delayed in their attempt to make herbicide-tolerant maize and rice by Cornell's exclusive licensing of the particle gun to DuPont. Negotiations between DuPont and Cyanamid were protracted because the two were competitors in one of the herbicide markets. The companies were never able to come to a deal that they both felt was acceptable, and Cyanamid had to spend several more years in research before it could produce herbicide-tolerant crops.

Id.

[234] *Id.* at 108-117, 116. It bears noting that the AAI paper characterizes the authors' "few examples of holdups" as "substantial anecdotal evidence."

[235] *Id.* at 21.

used its patents improperly to block competitors.[236] But the mere fact of litigation over intellectual property rights has nothing to do with potential impairment of competition in seed. First, nothing AAI says is inconsistent with the obvious fact that companies with the most successful innovations will likely be involved in more lawsuits. The incentive to sue DuPont claiming that Optimum GAT violates patents held by others is lessened by the fact that DuPont has yet to reap any revenues.

But of course, it is not just Monsanto that is involved in patent litigation. Now that other developers have successfully launched traits, they are suing each other as well.[237] Presumably all successful trait developers (and holders of trait patents) would need to be subject to the compulsory licensing remedy proposed in the AAI paper.

Nor is it a basis to conclude that antitrust action should be taken because allegations were made, but never upheld, against Monsanto in private law suits. AAI does not conduct an independent analysis of the merits of these claims nor does it point to a single case where Monsanto was found to have undertaken anticompetitive behavior.

In a similar vein, the AAI paper notes that the Department of Justice reviewed Monsanto's acquisitions of DEKALB and Delta and Pine Land, and required concessions from Monsanto such as divestiture of seed and patent holdings. The result of these reviews, however, was that the Department of Justice approved Monsanto's acquisitions, even after detailed scrutiny.[238]

XIII. CONCLUSION

The AAI paper fails to accurately portray the agriculture business. The facts demonstrate that competition and innovation in agriculture are alive and well. According to the public pronouncements of Monsanto and its competitors, new product pipelines are as promising as they have ever been in the short history of agricultural biotechnology. There is thus no factual basis for the AAI claim that there is an "intractable" problem with competition that must be remedied by rewriting the intellectual property laws and through antitrust enforcement based on untested new theories.

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[236] AAI begins its discussions of litigation in the biotechnology arena broadly, stating that "concerns underlying highly concentrated innovation and genetic traits markets are revealed in patent infringement and antitrust litigation involving transgenic seed" and that "antitrust complaints revolve around claims that biotechnology developers' practices have harmed competition, either through anticompetitive agreements or monopolization of the markets for genetic traits and/or traited seed." AAI at 23 - 24. The AAI paper's examples of litigation focus almost entirely, however, on allegations leveled against or brought by Monsanto.

[237] For example, in *Syngenta Seeds, Inc. v. Bayer Bioscience NV*, 1:09-cv-2370 GK (D.D.C. filed Dec. 15, 2009), Syngenta seeks a declaratory judgment of invalidity and noninfringement of three Bayer patents relating to Bt insect resistance.

[238] AAI at 26.

Appendix 1

Traits for Corn, Soybean, and Cotton

Source: **dmr**kynetec, Plant Biotech Traits Commercialized

Trait	Crop	Stacked With	Developer	Introduction	Description
IMI (Clearfield)	Corn	Also sold in stacks with Agrisure CB-LL, Herculex I-LL, LL, YGCB, and YGRW	American Cyanamid/ BASF	1991	Imidazolinone Tolerant
STS	Soybean	Also sold in stacks with RR	Asgrow/DuPont	1993	Sulfonylurea Tolerant
BXN	Cotton	Also sold in stacks with Bollgard	Rhone-Poulenc/ Calgene	1995	Bromoxynil Tolerant
Bollgard	Cotton	Also sold in stacks with BXN and RR	Monsanto	1996	Insect Resistant
Knockout and NatureGard	Corn	-	Novartis and Mycogen	1996	Lepidopteran Resistant
Roundup Ready (RR)	Soybean	Also sold in stacks with STS	Monsanto	1996	Glyphosate Tolerant
Bt-Xtra	Corn		DeKalb	1997	Lepidopteran Resistant
Liberty Link (LL)	Corn	Also sold in stacks with IMI, RR2, and YGCB	Agr-Evo/ Aventis/Bayer	1997	Glufosinate Tolerant
NK YieldGard Corn Borer-LL and Agrisure CB-LL[1]	Corn	Also sold in stacks with Agrisure GT, Agrisure RW, and IMI	Northrup King and Syngenta	1997 and 2007	Lepidopteran Resistant and Glufosinate Tolerant
Roundup Ready (RR)	Cotton	Also sold in stacks with Bollgard, Bollgard II, and WideStrike	Monsanto	1997	Glyphosate Tolerant
YieldGard Corn Borer (YGCB)	Corn	Also sold in stacks with GT, IMI, LL, RR, RR2, YGRW and YGVT RW-RR2	Monsanto	1997	Lepidopteran Resistant
Roundup Ready (RR) and Agrisure GT[2]	Corn	Roundup Ready also sold in stacks with YGCB and YGRW Agrisure GT also sold in stacks with Agrisure CB-LL and Agrisure RW	DeKalb/Monsanto and Syngenta	1998 and 2005	Glyphosate Tolerant
StarLink	Corn	-	Agr-Evo/ Aventis/Bayer	1999	Lepidopteran Resistant
Bollgard II	Cotton	Also sold in stacks with LL, RR and RRFlex	Monsanto	2003	Insect Resistant
Herculex I-LL	Corn	Also sold in stacks with Herculex RW-LL, IMI and RR2, and part of SmartStax[3]	Dow AgroSciences	2003	Lepidopteran Resistant and Glufosinate Tolerant
YieldGard Rootworm (YGRW)	Corn	Also sold in stacks with IMI, RR, RR2, and YGCB	Monsanto	2003	Rootworm Resistant
Liberty Link (LL)	Cotton	Also sold in stacks with Bollgard II	Agr-Evo/ Aventis/Bayer	2004	Glufosinate Tolerant
Roundup Ready 2 (RR2)	Corn	Also sold in stacks with Herculex I-LL, Herculex RW-LL, YGCB, and YGRW	Monsanto	2004	Glyphosate Tolerant
WideStrike	Cotton	Also sold in stacks with RR and RRFlex	Dow AgroSciences	2005	Insect Resistant
Herculex RW-LL	Corn	Also sold in stacks with Herculex I-LL and RR2, and part of SmartStax	Dow AgroSciences	2006	Rootworm Resistant and Glufosinate Tolerant
RRFlex	Cotton	Also sold in stacks with Bollgard II, and Widestrike	Monsanto	2006	Glyphosate Tolerant
Agrisure RW	Corn	Also sold in stacks with Agrisure CB-LL and Agrisure GT	Syngenta	2007	Rootworm Resistant
YieldGard VT Rootworm-RR2 (YGVT RW-RR2)	Corn	Also sold in stacks with YGCB and YGVT Pro, and part of SmartStax	Monsanto	2007	Glyphosate Tolerant and Rootworm Resistant

Traits for Corn, Soybean, and Cotton

Source: **dmr**kynetec, Plant Biotech Traits Commercialized

Trait	Crop	Stacked With	Developer	Introduction	Description
Liberty Link (LL)	Soybean	-	Agr-Evo/ Aventis/Bayer	2009	Glufosinate Tolerant
RR2Y	Soybean	-	Monsanto	2009	Glyphosate Tolerant
Yieldgard VT Pro (YGVT Pro)	Corn	Also sold in stacks with YGVT RW-RR2, and part of SmartStax	Monsanto	2010	Lepidopteran Resistant
Optimum GAT	Corn	-	DuPont	In Progress	Glyphosate and ALS Tolerant
Optimum GAT	Soybean	-	DuPont	In Progress	Glyphosate and ALS Tolerant
VIP-Cot	Cotton	-	Syngenta	In Progress	Insect Resistant

Note:
[1] "The launch of the Agrisure CB Advantage brand differentiates Syngenta's Bt11 event (which has been marketed under the YieldGard name since 1997) from Monsanto's event, which contains the same Bt gene." Plant Biotech Traits Commercialized 2008 at CRN 47.
[2] GA21 was developed by DeKalb and launched in 1998, shortly after Monsanto's acquisition of DeKalb. Rights to the event were later transferred to Syngenta. Syngenta's 2005 launch of Agrisure GT signaled a revival of GA21. Plant Biotech Traits Commercialized 2008 at CRN 76–77.
[3] SmartStax comes from a joint venture between Dow AgroSciences and Monsanto and will be launched in 2010. The stack includes the following traits: Herculex I-LL, Herculex RW-LL, YGVT Pro, and YGVT RW-RR2.

Appendix 2

Stacked Traits in Corn, Soybeans, and Cotton[239]

Corn Trait Profiles
Source: **dmr**kynetec 2009

	BASF	Bayer	Dow AgroSciences		Monsanto			Syngenta				
Trait Profiles (including conventional)	Herbicide tolerant – imidazolinone	Herbicide tolerant – glufosinate	Rootworm resistant	Corn borer resistant	Rootworm resistant	Corn borer resistant	Herbicide tolerant – glyphosate	Herbicide tolerant – glyphosate	Rootworm resistant	Corn borer resistant	Number of trait providers contributing to this product includes Monsanto	Product includes a licensed trait from Monsanto
Agrisure 3000GT											2	
Agrisure CB-IMI-LL											3	
Agrisure CB-LL											2	
Agrisure CB-LL-GT											2	
Agrisure CB-RW-LL											2	
Agrisure GT												
Agrisure RW												
Agrisure RW-GT												
Conventional												
Herculex I-LL											2	
Herculex I-LL-IMI											3	
Herculex I-LL-RR2											3	X
Herculex RW-LL											2	
Herculex RW-LL-RR2											3	X
Herculex XTRA-LL											2	
Herculex XTRA-LL-RR2											3	X
IMI												
LL												
RR2												
YGCB												
YGCB-IMI											2	X
YGCB-RR2												
YGPlus												
YGPlus-IMI											2	X

[239] Reproduced from http://www.monsanto.com/pdf/monsanto_today/corn_and_soybean_agronomic_traits.pdf

	BASF	Bayer	Dow AgroSciences		Monsanto			Syngenta				
Trait Profiles (including conventional)	Herbicide tolerant– imidazolinone	Herbicide tolerant – glufosinate	Rootworm resistant	Corn borer resistant	Rootworm resistant	Corn borer resistant	Herbicide tolerant– glyphosate	Herbicide tolerant – glyphosate	Rootworm resistant	Corn borer resistant	Number of trait providers contributing to this product includes Monsanto	Product includes a licensed trait from Monsanto
YGPlus-RR2					■	■	■					
YGRW					■							
YGRW-RR2					■		■					
YGVT RW-RR2					■		■					
YGVT3					■	■	■					
YGVT3 Pro					■	■	■					

Soybean Trait Profiles
Source: **dmr**kynetec 2009

	Bayer	DuPont	Monsanto		
Trait Profiles (including conventional)	Herbicide tolerant –glufosinate	Herbicide tolerant – sulfonylurea	Herbicide tolerant –glyphosate	Number of trait providers contributing to this product includes Monsanto	Product includes a licensed trait from Monsanto
Conventional					
LL					
RR					
RR2Y					
RR-STS				2	X
STS					

Cotton Trait Profiles
Source: **dmr**kynetec 2009

	Bayer	Dow AgroSciences	Monsanto					
Trait Profiles (including conventional)	Herbicide tolerant – glufosinate	Bollworm, Budworm, armyworms and loopers protection	Bollworm and Budworm protection	Bollworm, Budworm, armyworms and loopers protection	Herbicide tolerant– glyphosate	Herbicide tolerant—glyphosate with wider application window	Number of trait providers contributing to this product includes Monsanto	Product includes a licensed trait from Monsanto
BG-RR								
BGII								
BGII-LL							2	X
BGII-RR								
BGII-RR Flex								
Conventional								
LL								
RR								
RR Flex								
WideStrike							2	X
WideStrike-RR							2	X
WideStrike-RR Flex							2	X

Appendix 3

Corn and Soybean Sales by Independent[1] Seed Companies

Source: **dmr**kynetec

Crop		1998	2008
Soybeans			
	Share of Acres Planted	32%	31%
	Count of Independent Seed Companies[2]	194	146
Corn			
	Share of Acres Planted	17%	24%
	Count of Independent Seed Companies[2]	217	172

Note:
[1] "Independent" seed companies are defined to include all non-vertically-integrated companies. Seed companies owned by Monsanto, DuPont, Syngenta, Dow, and Bayer are excluded. Pioneer is included in 1998 but excluded in 2008.
[2] Count excludes all companies with zero acres planted in a given year.

Appendix 4

Corn, Soybean, and Cotton Seed Company HHI
1997 – 2009

Source: **dmr**kynetec; USDA Cotton Varieties Planted, 1997 – 2002, 2008, 2009

Year	Corn	Soybean	Cotton
1997	1671		5566
1998	1581	1215	5392
1999	1888	1137	6164
2000	1695	1104	6387
2001	1569	1187	5892
2002	1501	1125	4607
2003	1500	1141	4429
2004	1591	1333	3708
2005	1731	1359	3513
2006	1925	1597	3631
2007	1959	1726	3951
2008	2176	1689	3962
2009	2219	1819	3763

Note: Company names vary slightly across years within **dmr**kynetec data. Observations in which seed company is unspecified are not included in market share calculations.

Observations on Competition in the U.S. Seed Industry

Introduction

The U.S seed industry experienced two main periods of technology-driven change in the 20th century, first with the development of hybrid seeds in the 1920s, then with the introduction of seeds improved through modern biotechnology in the 1990s. American Cyanamid (now part of BASF) launched herbicide-tolerant corn in 1991 and DuPont launched herbicide-tolerant soybeans in 1993. Both of those traits were developed through chemical mutagenesis. The first transgenic crops followed shortly thereafter – herbicide-tolerant cotton from Rhone-Poulenc (now part of Bayer) in 1995 and insect-protected corn from Novartis (now part of Syngenta) and Mycogen (now part of Dow) in 1996. Monsanto launched herbicide-tolerant soybeans and insect-protected cotton also in 1996.

The 1990s also saw the acquisition of some of the larger independent seed companies by companies that had invested in the research and development of biotechnology traits. For example, in 1998 Monsanto acquired DeKalb Genetics Corporation, which accounted for about 11% of U.S. corn seed sales in that year, and in 1999 DuPont acquired the much larger Pioneer Hi-Bred International, which had accounted for about 39% of U.S. corn seed sales the previous year.[i] Additional acquisitions by these and other companies have since occurred, along with numerous cross-licensing agreements between most of the leading technology providers. As a result, many biotech trait providers are vertically integrated with seed companies, enabling them to directly take on the risk of quickly introducing new traits in the seed they sell, and many of those seed companies also offer traits developed by someone other than their owner.

On the farm, biotech seeds have been rapidly adopted, especially in the major row crops such as corn, soybeans and cotton, due to the significant benefits they provide to growers. These include improved weed and insect control, greater yield, convenience, environmental sustainability, and increased profits. In 2008, there were approximately 156 million acres of biotech-improved crops planted in the United States.[ii]

Along with this period of rapid technological innovation and change have come questions about competitiveness in the industry. Specifically, it has been asked if trait providers have abused their market position to constrain farmers' ability to choose a range of seed products at different price and quality levels. In this discussion, it is important to distinguish *what* products farmers actually choose from *whether or not* they have robust, meaningful choices. In other words, the fact that farmers purchase high performing products that may cost more does not mean that they were forced to make those decisions; based on the data presented, it appears that farmers had many choices along the price/quality spectrum.

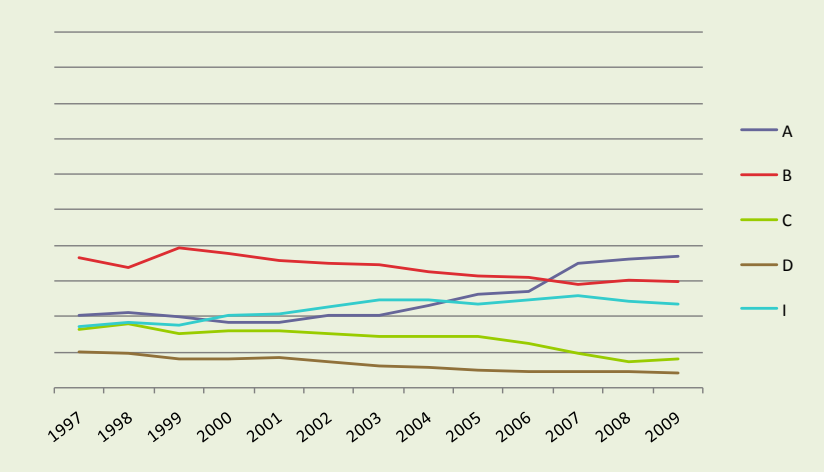
This paper examines the question of competition through the lens of three large-scale row crops that have been improved through modern biotechnology: corn, soybeans and cotton. These three crops account for the vast majority of the 150-million-plus acres of biotech-improved crops planted in the United States last year. Four propositions appear to be true and will be defended: 1) the seed market for these crops is competitive today in terms of company shares, number of choices, and prices paid by farmers; 2) farmer choice is increasing with time; 3) farmers have benefited economically as a result of change and innovation in the seed industry; and 4) the leading seed companies are continuing to invest in new products that they plan to offer to farmers in the future. The four sections below address each of these propositions and, for the benefit of readers with limited time, each section ends with a bullet point summary of its conclusions.

I. The seed market is competitive today[iii]

Shifting Shares

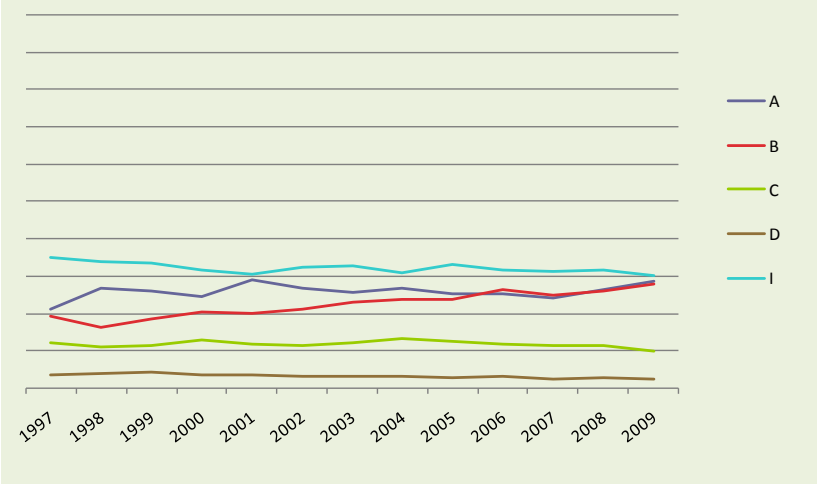
A look at the three charts below showing shares of U.S. sales of corn, soybean and cotton seed from 1997-2009 (2000-2008 for cotton[iv]) reveals these industries were diversified and dynamic. There is substantial movement in shares, with no single player achieving a dominant position. Note that where several companies or brands are currently owned by a single large company – including as the result of an acquisition – share has been combined and assigned to that company for all the years represented.[v]

Historic Share, U.S. Corn Seed: 1997-2009
Source: dmrkynetec



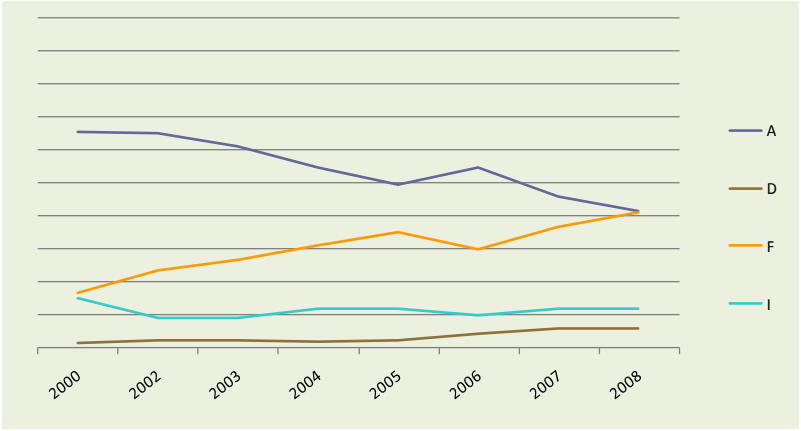
The corn seed data represented above illustrates the share held by the four largest companies (Lines A, B, C and D) and 169 smaller, independently owned seed companies (Line I). Company A and Company B exchanged position between 2006 and 2008. Company C has lost share overall but shows a small increase in 2009. Of particular note is line I, the independently owned seed companies, which grew from 1997 to 2007 and still have significant share.

Historic Share, U.S. Soybean Seed: 1997-2009
Source: dmrkynetec



The soybean seed data shown above depicts the share held by the four largest companies (Lines A, B, C and D) and approximately 153 smaller, independently owned companies (Line I). Company A has increased its share and now enjoys roughly the same share of the market as Company B and the independent seed companies (I), which have lost some share but have largely held their own. Company C and Company D have smaller shares and have been relatively unchanged.

Historic Share, U.S. Cotton Seed: 2000, 2002-2008
Source: dmrkynetec



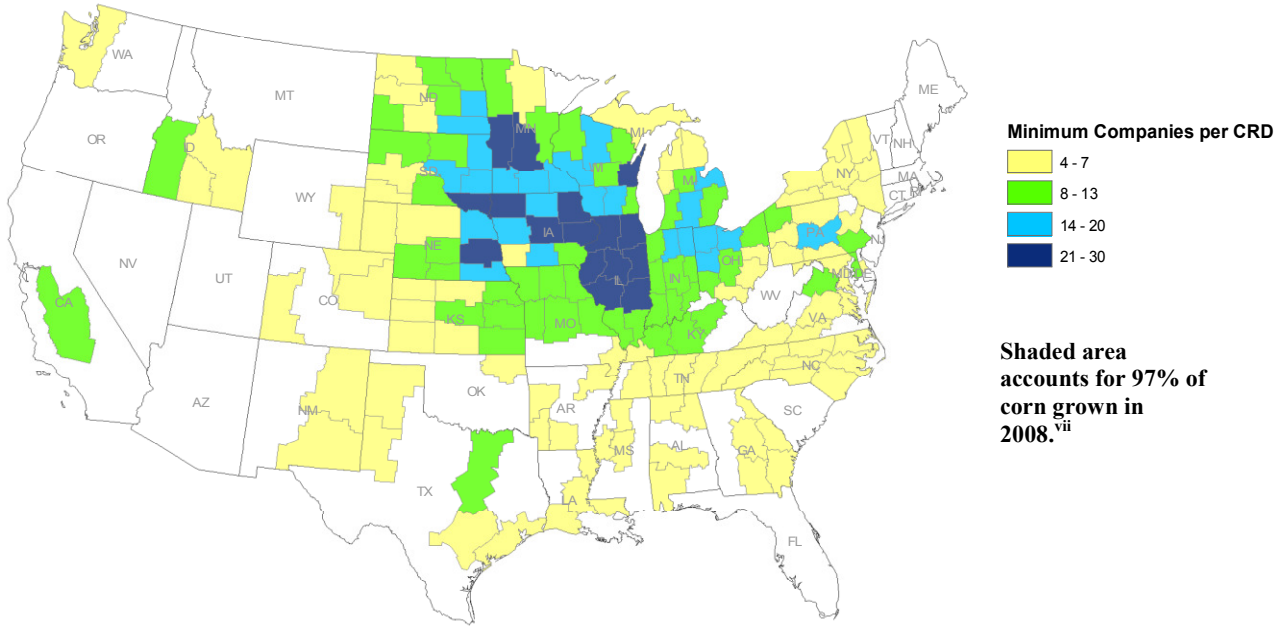
In cotton seed, shares of the two largest players, Company A and Company F, have converged, while the independent seed companies (I) have maintained share over the time

period following initial share loss between 2000 and 2002. Company D has also seen steady share growth over the time period.

Many Seed Companies to Choose From

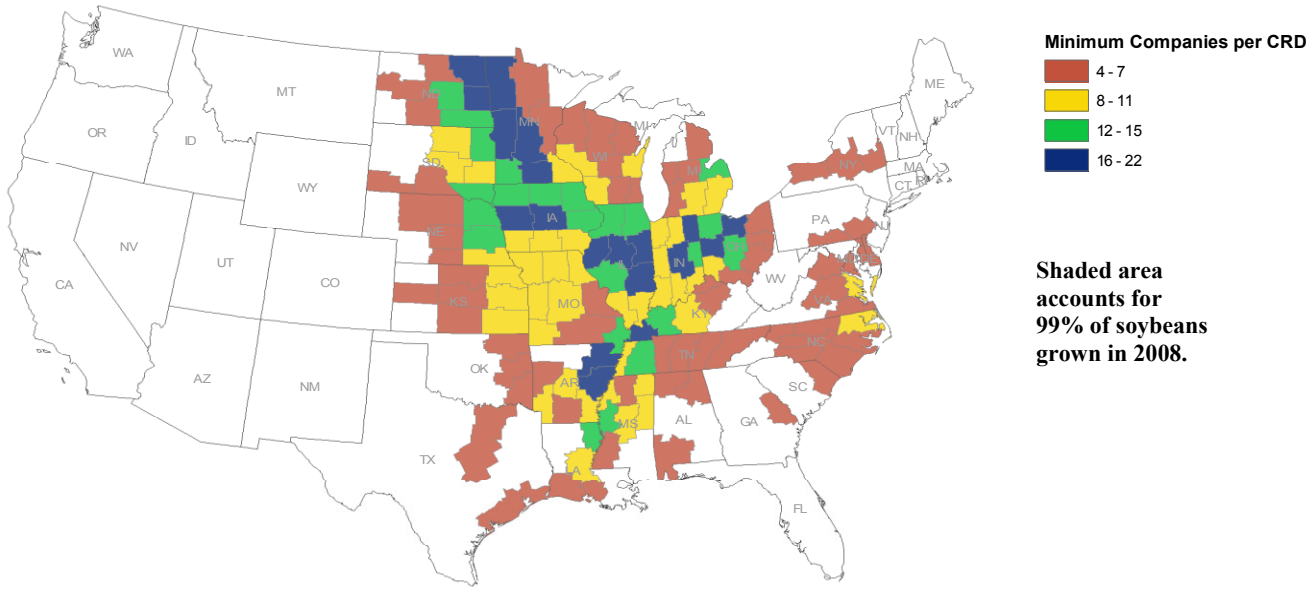
Competition for the farmer's seed dollar is robust at the local level as well. In 2008, farmers were likely[vi] able to buy corn seed from at least four different companies in most USDA Crop Reporting Districts (CRDs). In some CRDs in Illinois, Iowa, Minnesota, Nebraska, South Dakota and Wisconsin, farmers could probably buy corn seed from as many as 30 different seed companies. Again, seed companies with common ownership are treated as a single company.

Farmer Options for Corn Seed: 2008



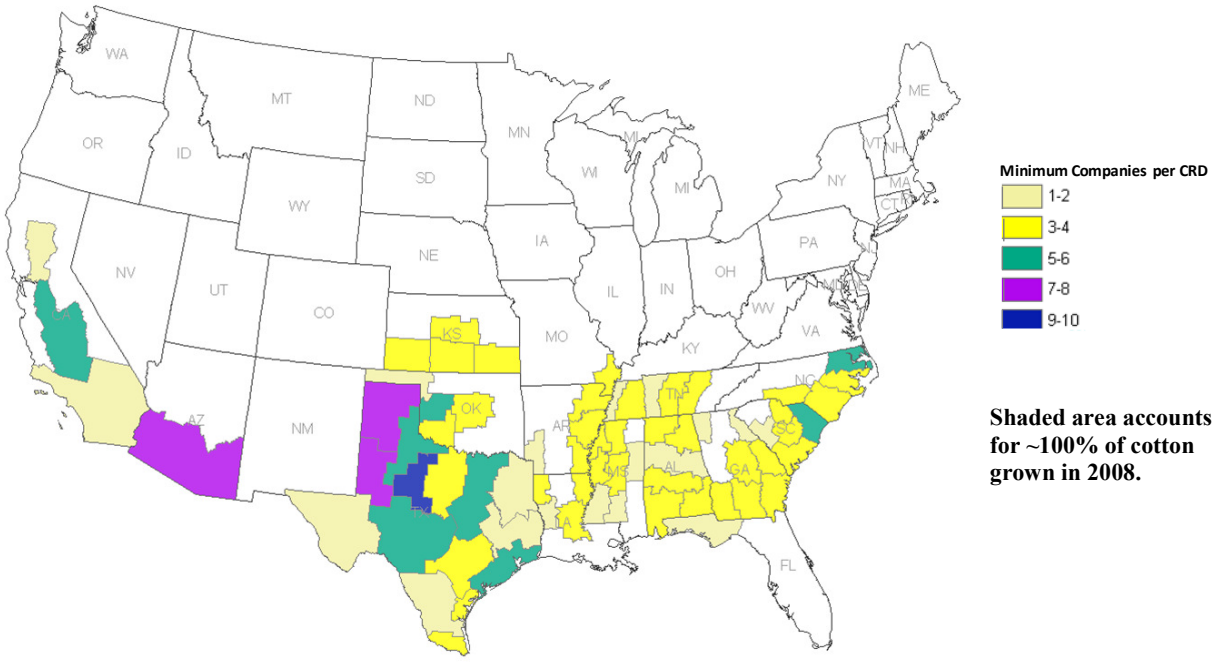
A very similar picture is seen for soybeans, where farmers could probably purchase seed from at least four different seed companies in most CRDs in 2008. In some CRDs in Arkansas, Illinois, Iowa, Indiana, Kentucky, Minnesota, Ohio and North Dakota, farmers could probably buy soybean seed from as many as 22 companies.

Farmer Options for Soybean Seed: 2008



Farmers in most cotton CRDs could probably purchase seed from at least three cotton seed companies in 2008 and farmers could probably buy seed from as many as seven or more seed companies in some CRDs in Arizona and Texas.

Farmer Options for Cotton Seed: 2008



Many Seeds to Choose From

The competition in the corn, soybean and cotton seed business is further evidenced by the large number of brands, hybrids and varieties that farmers reported buying from seed companies in 2009 (corn and soybean) and 2008 (cotton, where 2009 data are not available).

Farmer Reported Seed Choices: 2008-2009

	Corn ('09)	Soybeans ('09)	Cotton ('08)
Companies	173	157	10
Brands	202	183	12
Hybrids/Varieties[viii]	4,381	2,126	169

The hybrids and varieties purchased in 2008-2009 featured not only a wide array of germplasm and maturity groups but also a number of traits developed through both biotechnology and traditional breeding.

For example, in corn, farmers reported buying hybrids with 30 different trait profiles[ix] in 2009. This included a mix of herbicide tolerant traits, rootworm protection traits and corn borer protection traits. There were 22 different "stacks" that combined herbicide tolerance and/or insect protection traits often supplied by different companies. Stacks have been on the majority of U.S. corn acres since 2007. Approximately 10% of the corn seed farmers said they bought in 2009 was conventional, non-traited seed.

The chart below illustrates the aforementioned products, including those developed through licensing agreements.

Corn Trait Profiles
Source: dmrkynetec and Monsanto 2009

Trait Providers	BASF	Bayer	Dow AgroSciences		Monsanto			Syngenta				
Trait Profiles (including conventional)	Herbicide tolerant--imidazolinone	Herbicide tolerant --glufosinate	Rootworm protection	Corn borer protection	Rootworm protection	Corn borer protection	Herbicide tolerant--glyphosate	Herbicide tolerant --glyphosate	Rootworm protection	Corn borer protection	Number of trait providers contributing to this product	Product includes a licensed trait from Monsanto
Agrisure 3000GT											2	
Agrisure CB-IMI-LL											3	
Agrisure CB-LL											2	
Agrisure CB-LL-GT											2	
Agrisure CB-RW-LL											2	
Agrisure GT												
Agrisure RW												
Agrisure RW-GT												
Conventional												
Herculex I-LL											2	
Herculex I-LL-IMI											3	
Herculex I-LL-RR2											3	X
Herculex RW-LL											2	
Herculex RW-LL-RR2											3	X
Herculex XTRA-LL											2	
Herculex XTRA-LL-RR2											3	X
IMI												
LL												
RR2												
YGCB												
YGCB-IMI											2	X
YGCB-RR2												
YGPlus												
YGPlus-IMI											2	X
YGPlus-RR2												
YGRW												
YGRW-RR2												
YGVT RW-RR2												
YGVT3												
YGVT3 Pro												

In soybeans, farmers purchased varieties with six different trait profiles in 2009, including herbicide-tolerance traits and one "stack" with tolerance to two different herbicides. These traits were developed using transgenic and non-transgenic breeding. Interestingly, the reported number of acres planted in conventional, non-traited soybeans grew from 3.8% of the total in 2008 to 5.3% in 2009 – one out of every 19 soybean acres.

The chart below illustrates the aforementioned products, including those developed through licensing agreements.

Soybean Trait Profiles
Source: dmrkynetec and Monsanto 2009

Trait Providers →	**Bayer**	**DuPont**	**Monsanto**		
Trait Profiles (including conventional)	Herbicide tolerant -- glufosinate	Herbicide tolerant -- sulfonylurea	Herbicide tolerant – glyphosate	Number of trait providers contributing to this product	Product includes a licensed trait from Monsanto
Conventional					
LL					
RR					
RR2Y					
RR-STS				2	X
STS					

In cotton, farmers reported purchasing seeds with 12 different trait profiles in 2008. The biotech seed choices included herbicide tolerant and insect protection traits. There were six "stacks" purchased. Conventional, non-traited cotton accounted for 3.7% of reported seed purchases.

The chart below illustrates the aforementioned products, including those developed through licensing agreements.

Cotton Trait Profiles
Source: dmrkynetec and Monsanto 2009

Trait Providers ➡	**Bayer**	**Dow AgroSciences**	**Monsanto**					
Trait Profiles (including conventional)	Herbicide tolerant -- glufosinate	Bollworm, Budworm, armyworms and loopers protection	Bollworm and Budworm protection	Bollworm, Budworm, armyworms and loopers protection	Herbicide tolerant-- glyphosate	Herbicide tolerant—glyphosate with wider application window	Number of trait providers contributing to this product	Product includes a licensed trait from Monsanto
BG-RR			■		■			
BGII				■				
BGII-LL	■			■			2	X
BGII-RR				■	■			
BGII-RR Flex				■		■		
Conventional								
LL	■							
RR					■			
RR Flex						■		
WideStrike		■						
WideStrike-RR		■			■		2	X
WideStrike-RR Flex		■				■	2	X

Many Prices to Choose From

With such a large number and extensive array of seed products, average price ranges are, to a certain extent, meaningless. They would be of no use to someone actually wanting to make a purchase decision. However, when considering the level of competition in the marketplace, this information becomes significant. With thousands of seed products (hybrids and/or varieties), hundreds of companies and brands, dozens of traits (both individual and stacked), and enormous variation in plant genetics, one would expect to see huge variations in the average price of corn, soybean and cotton seed. As the chart below shows, this is indeed the case.

Farmer Reported Average Price per Bag of Seed: 2008/2009

	High	Low	Variation
Corn ('09)	$250.00	$ 26.00	961%
Soybean ('09)	$ 50.27	$ 16.25	309%
Cotton ('08)	$333.17	$ 71.66	465%

Growers are able to compare higher-priced seed and lower-priced seed in order to evaluate whether the higher-priced seed offers additional value, such as higher yield or the ability to reduce other inputs, which would justify the higher price. Farmers also have several information sources available to them as they make their purchase decisions, including the real-time data collected from their yield monitors (commonly included in harvest equipment such as corn and soybean combines, as well as cotton pickers) as well as varietal and hybrid yield data from third-party sources (e.g. universities, seed companies, etc). Based on such an evaluation they would be expected to choose the seed offerings that bring them the highest profitability on their farms.

Traits are Broadly Licensed

Patented traits developed through biotechnology are not available only through the seed companies that are owned by the developers of that trait. Monsanto, for example, has elected to pursue a strategy of broadly licensing its patented traits to competitors large and small. Other trait developers have come to follow Monsanto's lead and have also licensed traits to seed companies they do not own. In addition, the trait developers have many

cross-licenses that enable their seed companies to use each other's traits in combination with traits developed by others. As the number of traits has grown, many seeds include (or are "stacked" with) more than one trait and it is common to find seeds stacked with traits from two and sometimes three separate companies.

Several things should be kept in mind with respect to this situation. First, traits are only a part of the total value of the seed, which is why there is substantial competition and variation in price even among seeds that contain the same trait combination. (While the traits may be identical, the underlying genetics of the seed are not, and the quality of the underlying genetics is the most important component of the value of a seed.) Second, even though the patent holder can keep others from commercializing its discovery for the duration of the patent, broad licensing can facilitate competition by enabling a much larger number of competitors to offer the new technology. Third, the farmer benefits from this arrangement by virtue of the larger number of product choices presented to him than would otherwise be the case. In sum, a business climate that encourages broad licensing achieves a desirable balance between the rights of the innovator (the patent holder) and the benefits of increased variety in the marketplace.

Conclusions

- No single company has a dominant share of seed sales in corn, soybean or cotton. Shares have changed over time. Independent seed companies, numbering in the hundreds, have held their own and have significant share in corn, soybeans and cotton.
- Farmers have the choice of several seed companies at the local level. Corn and soybean growers were able to purchase seeds from a minimum of four companies in most Crop Reporting Districts (CRDs) in 2008. In several corn CRDs, farmers were probably able to purchase seed from more than 20 companies.
- Farmers can choose from among hundreds of seed companies, hundreds of brands, and thousands of hybrids and varieties. These choices include seeds with individual and stacked biotech traits, traits developed through traditional breeding, and conventional seeds.

- As would be expected in such a diversified marketplace, average prices paid by farmers per bag of seed vary enormously, as much as nine-fold in some cases. Farmers may prefer the higher-value seeds but they still have a multitude of choices at many quality and price levels.
- The broad licensing strategy pursued by Monsanto and, to a lesser extent, by other companies with patented traits has facilitated competition and brought greater choice to the farmer.

II. Grower choice is increasing[x]

Seed Offerings Are Large and Include Both Traited and Conventional Seed

The chart below shows the total number of seeds with one or more traits (including those developed by non-transgenic breeding) and the total number of conventional seeds offered to the market in 2005 and 2009/10. The chart below is based on a broad review of seed company catalogs and marketing materials for those years.

Despite the smaller number of corn and/or soybean seed companies included for 2010 (i.e. 178 companies in the 2010 data set vs. 252 companies in the 2005 data set), the number of traited corn seeds offered increased. The number of traited soybean and cotton varieties declined. Conventional seeds for all three crops also declined but still accounted for 12.8 percent of the total in 2009/10. The number of offerings is broadly consistent with the figures presented above regarding farmer reported seed choices, and overall, as was reflected in the ranges in the pricing data described earlier, these data suggest farmers do, in fact, have a wide range of seed choices.

Seed Catalog Offerings: 2005 and 2009/10

		-2005-	-2009/2010-
Corn	Traited	5,695	6,079 (‘10)
	Conventional	3,226	1,062 (‘10)
Soybean	Traited	3,731	3,501 (‘10)
	Conventional	706	343 (‘10)
Cotton	Traited	114	95 (‘09)
	Conventional	19	14 (‘09)

Trait Mix Becoming More Diversified

The chart below shows which trait providers had at least one trait[xi] in the seeds offered in catalogs in 2005 and 2009/10. For example, at least one trait from Company A was present in 81% of the 6,079 traited corn hybrids offered in 2010, at least one from Company C was present in 11%, and so forth. (The number totals to greater than 100 because multiple traits appear on "stacked" products.) Note that despite the fact that the seed companies in this analysis are Monsanto licensees, their offerings do include traits from other technology providers. It is also important to note that licensing agreements enable seed companies to use the trait provider's technology in their seed offerings, but do not (at least in the case of Monsanto's licenses) require such use.

The table shows significant changes in the "trait mix" between 2005 and 2009/10, with greater diversification and increasing presence for many trait providers.

In corn, the leading trait provider had at least one trait in 86% of the hybrids offered in 2005; this declined 5 percentage points in 2010. Company F's percentage more than tripled to approximately 24%, Company D went from three to 13%, and Company C went from one to 11%.

In soybeans, the picture changes somewhat less, although the leading trait provider's presence has declined by 5 percentage points, while Company F has entered the market with at least one trait in 7% of the biotech varieties offered. Company B's presence has grown from five to nine percent.

In cotton, there are fewer varieties offered which may reflect the significant decline in the number of cotton acres planted in the United States. However, there has been a steady change in the trait mix as all of the trait providers have grown.

Changes in Trait Mix in Seed Catalogs: 2005 and 2009/10

-2005-		-2009/2010-	
Traited Corn		**Traited Corn ('10)**	
Company A:	86%	Company A:	81%
Company B:	0%	Company B:	0%
Company C:	1%	Company C:	11%
Company D:	3%	Company D:	13%
Company E:	7%	Company E:	1%
Company F:	7%	Company F:	24%
Traited Soybean		**Traited Soybean ('10)**	
Company A:	97%	Company A:	92%
Company B:	5%	Company B:	9%
Company C:	0%	Company C:	0%
Company D:	0%	Company D:	0%
Company E:	0%	Company E:	0%
Company F:	0%	Company F:	7%
Traited Cotton		**Traited Cotton ('09)**	
Company A:	85%	Company A:	95%
Company D:	3.5%	Company D:	7%
Company F:	1%	Company F:	7%

Conclusions

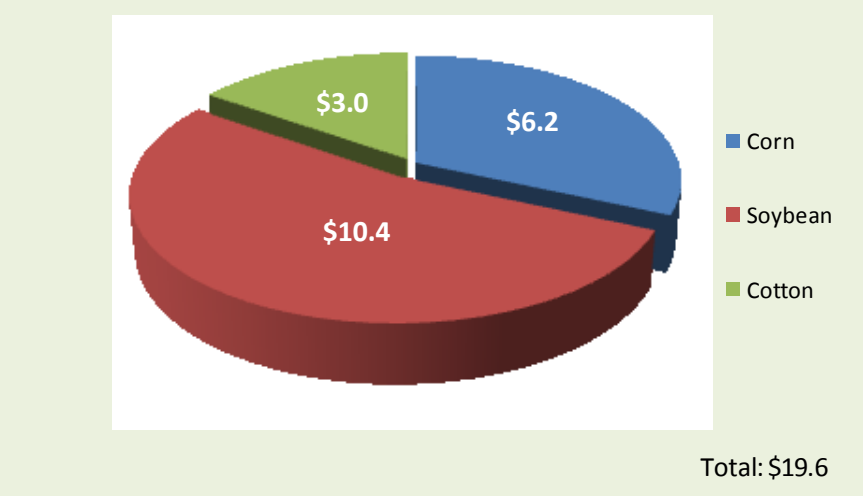
- Farmers had a wide range of choices offered to them in seed company catalogs in 2009 and 2010, for both biotech seeds and conventional hybrids/varieties. In corn alone, there were more than 6,000 traited hybrids and over 1,000 conventional ones offered for 2010 planting.
- There has been a change in seed company offerings of biotech traits, with greater diversification and increased presence for many trait providers.
- Conventional seeds continue to be offered and represent a meaningful choice for farmers.
- These data indicate a dynamic situation with new entry bringing new value propositions to farmers at a rapid pace.

III. Farmers have benefited from changes in the seed industry[xii]

The U.S. seed industry has undergone significant change since the introduction of the first genetically enhanced seeds in 1995. The data discussed above highlights that farmer choice in terms of the number of seed types is broad and has not fallen meaningfully, and the data discussed below suggest that the improved *quality* of the seed they buy has greatly benefited them economically. In total, biotech corn, soybeans and cotton are reported by Brookes and Barfoot[xiii] to have increased farm income by almost $20 billion between 1996 and 2007.

Brookes and Barfoot: U.S. biotech crop farm income benefits - 1996-2007

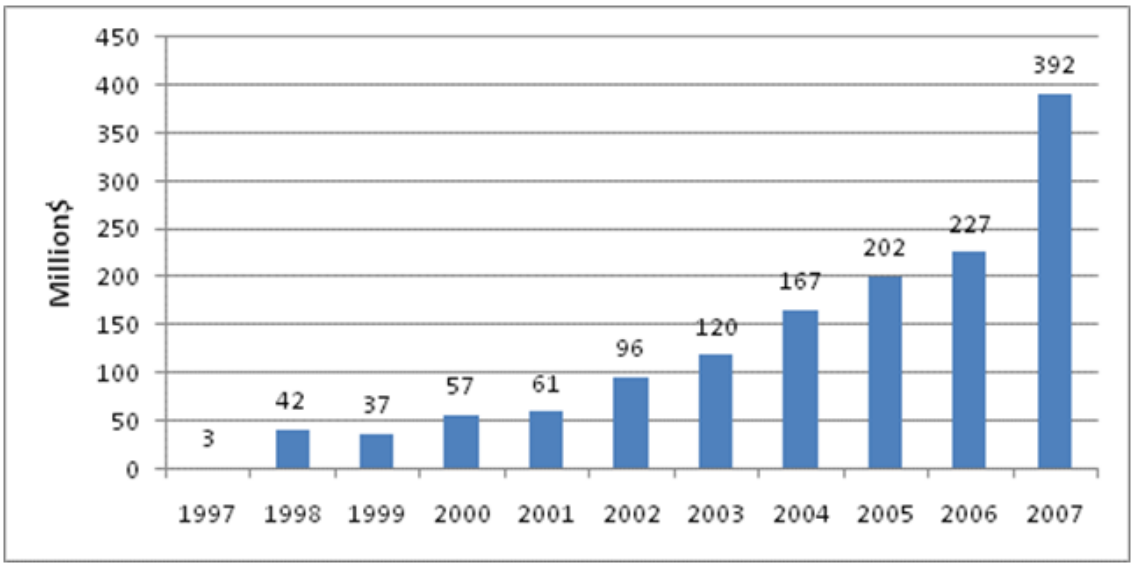
- In billions of dollars -



Herbicide tolerant corn

The authors state that the main economic benefit to farmers has been to reduce costs and thereby improve profitability levels. Average profitability improved by $49-$62/acre, resulting in a net gain to farm income in 2007 of $392 million. Cumulatively, since 1997 the farm income benefit has been about $1.4 billion. In added value terms, the increase in farm income in just 2007 was equivalent to an increase in production of 0.81%.

Brookes and Barfoot: National farm income impact of using biotech herbicide-tolerant corn in the United States - 1997-2007



Corn borer protected corn

According to the authors, the primary impact has been increased average yields of about 5%. The annual total national farm income benefit from using insect-protected corn has risen from $8.76 million in 1996 to $1.14 billion in 2007. The cumulative farm income benefit between 1996-2007 was about $3.9 billion. In added value terms, the increase in farm income in just 2007 was equivalent to an increase in production of 2.28%.

Brookes and Barfoot: Farm level income impact of using biotech insect-protected corn in the United States - 1996-2007

Year	Cost saving ($/ha)	Cost savings (net after cost of technology) ($/ha)	Net increase in gross margins ($/ha)	Increase in farm income at a national level ($ million)	Increase in national farm income as a % of farm level value of national production
1996	24.71	-9.21	29.20	8.76	0.03
1997	24.71	-9.21	28.81	70.47	0.27
1998	20.3	-4.8	27.04	167.58	0.77
1999	20.3	-4.8	25.51	206.94	1.04
2000	22.24	-6.74	24.32	148.77	0.71
2001	22.24	-6.74	26.76	155.87	0.72
2002	22.24	-6.74	30.74	240.45	0.96
2003	22.24	-6.74	31.54	291.00	1.14
2004	15.88	-6.36	33.82	363.41	1.32
2005	15.88	-1.42	34.52	399.91	1.60
2006	15.88	-1.42	55.78	707.23	1.86
2007	15.88	-1.42	61.22	1,136.21	2.28

Corn rootworm protected corn

Corn rootworm protected (CRW) corn has been planted commercially in the United States since 2003. The authors state that the main farm income impact has been higher yields of about 5% relative to conventional corn. At the national level, farm incomes increased by $4.6 million in 2003, rising to $548 million in 2007. Cumulatively since 2003, the total farm income gain from the use of CRW technology in the U.S. corn crop has been nearly $900 million.[xiv]

Herbicide tolerant soybeans

According to Brookes and Barfoot, the annual total national farm income benefit from using biotech soybeans has risen from $5 million in 1996 to $1.36 billion in 2007. The cumulative farm income benefit between 1996-2007 was $10.4 billion. In added value terms, the increase in farm income in recent years was equivalent to an annual increase in production of between 5-10%.

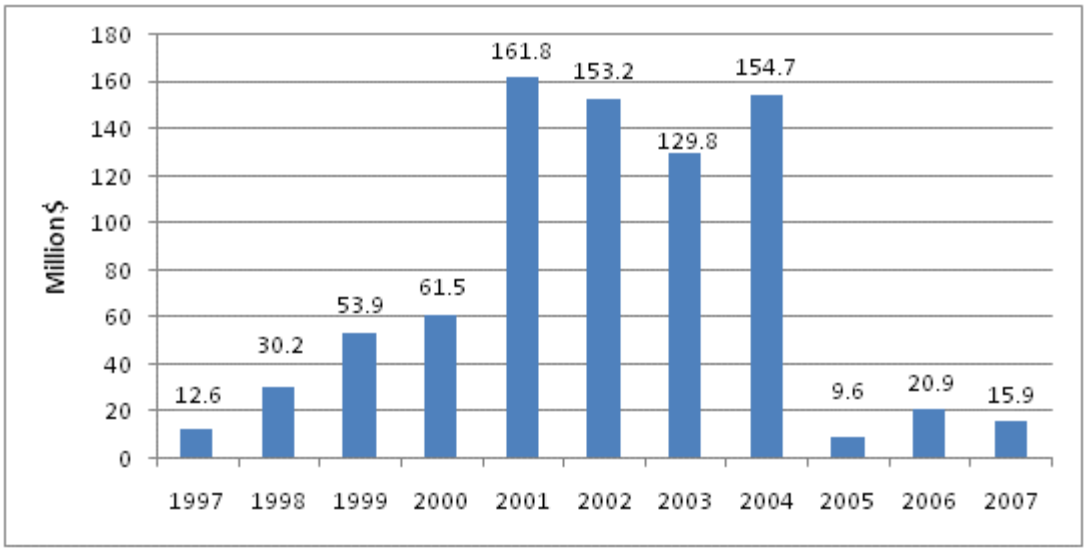
Brookes and Barfoot: Farm level income impact of using biotech herbicide-tolerant soybeans in the United States - 1996-2007

Year	Cost Savings ($/ha)	Net cost saving/increase in gross margins, inclusive of cost of technology ($/ha)	Increase in farm income at a national level ($ million)	Increase in national farm income as a % of farm level value of national production
1996	25.2	10.39	5.0	0.03
1997	25.2	10.39	33.2	0.19
1998	33.9	19.03	224.1	1.62
1999	33.9	19.03	311.9	2.5
2000	33.9	19.03	346.6	2.69
2001	73.4	58.56	1,298.50	10.11
2002	73.4	58.56	1,421.70	9.53
2003	78.5	61.19	1,574.90	9.57
2004	60.1	40.33	1,096.80	4.57
2005	69.4	44.71	1,201.40	6.87
2006	81.7	56.96	1,549.40	7.51
2007	82.7	57.96	1,358.20	5.76

Herbicide tolerant cotton

The authors state that the primary economic benefit to farmers has been to reduce costs and thereby improve profitability, with annual average profitability increasing by between $7-121/acre, resulting in a net gain to farm income in 2007 of $16 million. Cumulatively since 1997 the farm income benefit has been $800 million. In added value terms, the effect of increased farm income in just 2007 was equivalent to an increase in production of 0.31%.

Brookes and Barfoot: National farm income impact of using biotech herbicide-tolerant cotton in the United States - 1997-2007



Insect-protected cotton

Brookes and Barfoot state that the primary economic benefit has been increased yields (from 9-11%), although small net savings in costs of production have also been obtained (reduced expenditure on insecticides being marginally greater than the cost of the technology). This resulted in a net gain to farm income in 2007 of $274 million. Cumulatively, since 1996 the farm income benefit has been $2.2 billion. In added value terms, the effect of the increased yields and reduced costs of production on farm income in just 2007 was equivalent to an increase in production of 5.1%.

Brookes and Barfoot: Farm level income impact of using biotech insect-protected cotton in the United States - 1996-2007

Year	Cost savings (net after cost of technology) ($/ha)	Net increase in gross margins ($/ha)	Increase in farm income at a national level ($ million)	Increase in national farm income as a % of farm level value of national production
1996	4.98	115.32	94.69	1.19
1997	4.98	103.47	87.28	1.3
1998	4.98	88.54	80.62	1.47
1999	4.98	65.47	127.29	2.89
2000	4.98	74.11	162.88	3.1
2001	4.98	53.04	125.22	3.37
2002	4.98	69.47	141.86	3.11
2003	5.78	120.49	239.98	4.27
2004	5.78	107.47	261.23	4.82
2005	24.48	117.81	332.41	5.97
2006	-5.77	86.61	305.17	4.86
2007	-5.77	106.02	274.08	5.09

Benefits to non-adopters

In addition to the financial benefits enjoyed by farmers who adopt biotech seeds, economic studies have indicated that significant benefits also accrue to farmers who choose *not* to adopt them. The case of glyphosate tolerant soybeans is illustrative. From 1995-2000, the percentage of U.S. soybean acres treated with each herbicide class except glyphosate declined. During this period, use of imazethapyr decreased by 32%, use of trifluralin by 16%, and use of chlorimuron by 6%. Prices declined as well: chlorimuron and imazethapyr declined by 40-50% in 1997 and 1998. The conclusion reached by two economists who studied this phenomenon was: "Release of a GM [genetically modified] variety impacts prices of competing pesticides used on the conventional varieties, making the conventional variety less costly than prior to introduction of the GM variety. This causes an increase in surplus for those farmers who adopt the GM variety, as well as those who plant the conventional variety…."[xv]

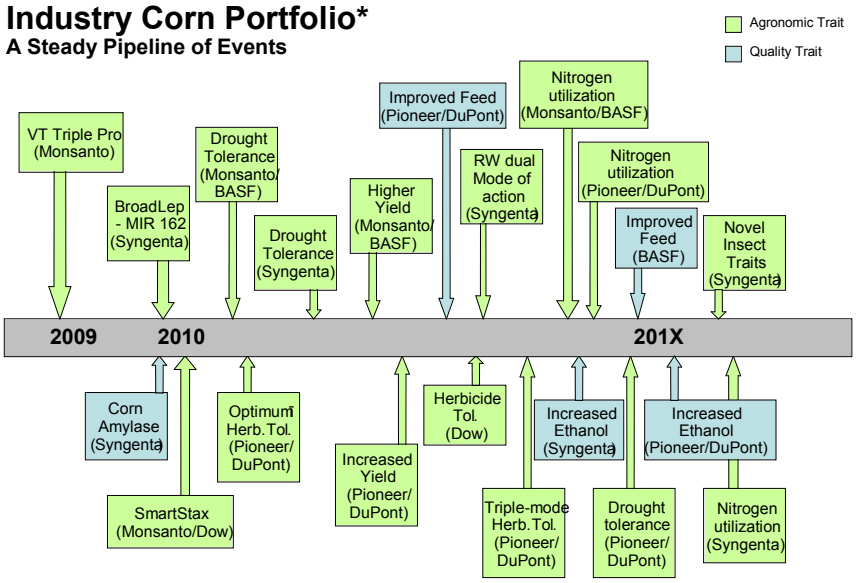
Conclusions

- Farmers in the United States have enjoyed great benefits from the introduction of biotech seeds – research has calculated that use of biotech corn, soybeans and cotton increased U.S. farm income by nearly $20 billion in the period 1996-2007.
- Even non-adopters of biotech seeds have benefited as competition has led to a decrease in the prices of pesticides used on conventional varieties.

IV. Investment is driving a competitive pipeline

As noted at the beginning of this paper, the U.S. seed industry entered a period of intense technology-driven change during the mid-1990s with the introduction of seeds improved through modern biotechnology. This period was preceded by many years of research and development, involving hundreds of millions of dollars and a high degree of risk.

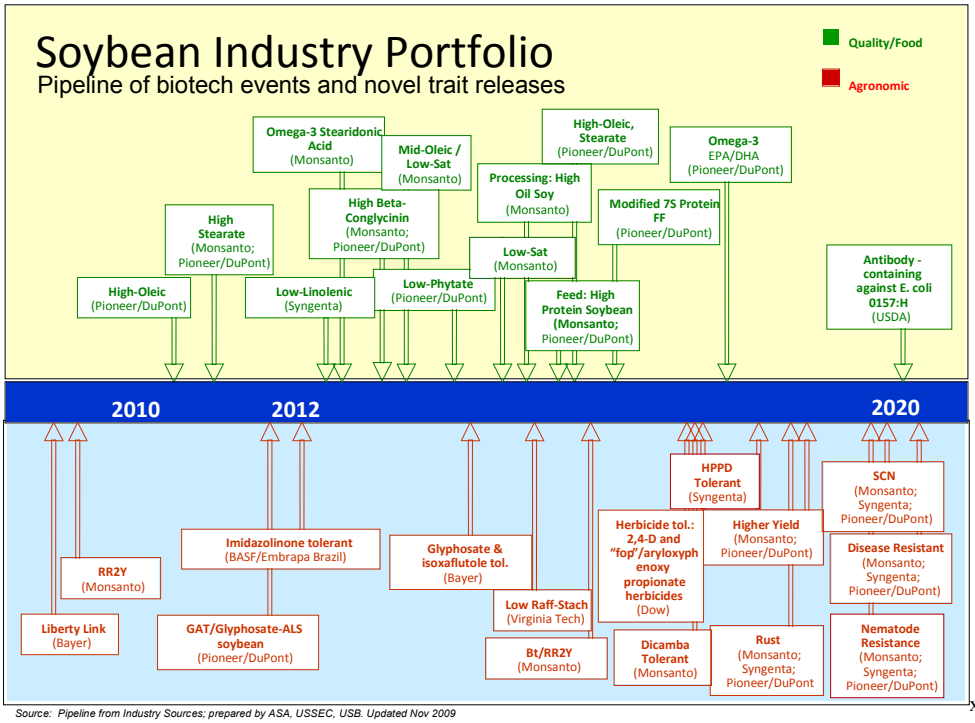
This investment has continued. The available evidence suggests a clear expectation of future profits from new products on the part of trait developers. The charts below depict the wide array of new products that have advanced far enough to be identified by grower organizations as part of the "pipeline" of traits they are anticipating. As noted, commercialization depends on many factors, including successful completion of the regulatory process. But the pipeline is sufficiently robust as to virtually guarantee many new product offerings over the next decade – many of which, if successful, will bring great value to farmers, the environment, and society at large.



[*Estimated commercialization pipeline of corn biotech events prepared by the U.S. Grains Council 2/2009
Commercialization dependent on many factors, including successful conclusion of regulatory process]

xvi

The U.S. Grains Council has identified a total of 20 new products in the corn pipeline starting in 2010, ranging from various new forms of insect protection and herbicide tolerance to "breakthrough" applications like drought tolerance, improved nitrogen utilization, and improved feed quality. The major technology providers are all well represented, both alone and in collaboration with each other.



[xvii]

Soybean industry associations have identified 27 new products in the soybean pipeline starting in 2010, including a wide range of both quality and agronomic traits. Similar to the industry's corn pipeline portfolio, the major technology providers have all invested in one or more of these products, either alone or in collaboration. Note also the involvement of trait developers from the public sector (Virginia Tech, USDA).

Conclusion

- Ongoing investment on the part of trait developers is reflected in a robust new product pipeline featuring a wide array of traits coming from diverse developers. The farmer will be the primary beneficiary of this increase in new product offerings as companies compete with each other to bring him increasing value, but the environment and society at large will benefit as well.

Endnotes

[i] Nicholas Kalaitzandonakes and Marvin Hayenga, "Structural Change in the Biotechnology and Seed Industrial Complex: Theory and Evidence," presented at the International Consortium on Agricultural Biotechnology Research Conference (June 17–19, 1999), p. 219.
[ii] International Service for the Acquisition of Agri-Biotech Applications (ISAAA) Brief 39-2008.
[iii] The information in this section comes from **dmr**kynetec, the nation's leading provider of market research information for agriculture. The **dmr**kynetec data are obtained from farmer surveys in which respondents report what they purchased, how much they paid, how many acres they planted, etc. **dmr**kynetec treats the information as confidential and proprietary and only allows it to be cited with permission. **dmr**kynetec has placed restrictions on the manner in which this information can be presented; for example, specific company market shares may not be publicly disclosed. Information about how to obtain access to **dmr**kynetec data can be found at that company's website: www.dmrkynetec.com.
[iv] **dmr**kynetec data for cotton are only available for 2000 and 2002-2008.
[v] For example, Syngenta acquired Garst and Golden Harvest in 2004, so those companies would be aggregated under Syngenta in the data for the entire period covered, not just post-2004.
[vi] The **dmr**kynetec data represent purchases as reported by farmers, and so would reflect the minimum number of seed companies that a farmer could have reasonably turned to for seed in any given area. The corn and soybean maps have been adjusted to reflect Monsanto's assumption that at least three of the four major vertically integrated seed companies would have been available to the farmer in all CRDs even if, due to a small sample size, they were not always reported. The corn and soybean maps are available on Monsanto's website in interactive format showing which seed companies have been included in each CRD. See http://www.monsanto.com/maps/corn/default.asp and http://www.monsanto.com/maps/soybean/default.asp.
[vii] Percentages on all three maps are from **dmr**kynetec data.
[viii] Note that **dmr**kynetec does not determine whether hybrids/varieties offered by one seed company are the same as those offered by another and as such the figure cannot be understood as representing unique hybrids/varieties.
[ix] "Trait profile" as used in this section includes single traits, stacked traits and conventional, untraited seed.
[x] The information in this section comes from an analysis of company seed catalogs and other marketing materials conducted for Monsanto by Precision Agricultural Services, Inc. The analysis includes data from 252 corn and/or soybean seed companies and eight cotton seed companies in 2005, 178 corn and/or soybean seed companies in 2010, and seven cotton seed companies in 2009. Three things should be noted: 1) the data set does not include all seed companies; 2) the data set was based on the catalogs and marketing materials published by companies licensed by Monsanto and 3) the data reflect what was *offered* for sale by these seed companies, not (as with the **dmr**kynetec data in the previous section) what farmers actually reported *purchasing*.
[xi] Includes non-transgenic traits.
[xii] Other than as indicated in the subsequent notes, all data in this section are from Brookes and Barfoot, "GM crops: global socio-economic and environmental impacts 1996-2007." Originally published in *AgBioForum* 11(1):21-38 as "Global Impact of Biotech Crops: Socio-Economic and Environmental Effects, 1996-2006" and subsequently updated by authors.
[xiii] Brookes and Barfoot, op cit.
[xiv] Brookes and Barfoot did not publish a table summarizing these data.
[xv] Huso and Wilson, "Producer Surplus Distributions in GM Crops: The Ignored Impacts of Roundup Ready® Wheat," *Journal of Agricultural and Resource Economics* 31 (2):339-354
[xvi] U.S. Grains Council
[xvii] American Soybean Association, U.S. Soybean Export Council, United Soybean Board