The American Antitrust Institute

BEFORE THE SENATE JUDICIARY COMMITTEE

"CONSOLIDATION AND COMPETITION IN THE U.S. SEED AND AGROCHEMICAL INDUSTRY"

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I would like to thank the Chair, Senator Grassley, and the members of the Committee for holding this hearing on consolidation and competition in the U.S. seed and agrochemical industry. I appreciate the opportunity to appear here today. The American Antitrust Institute (AAI) is a non-profit education, research, and advocacy organization. AAI's mission is to promote competition that protects consumers, businesses, and society.[1] The AAI has long advocated for competition in U.S. agriculture with independent analysis and commentary on, among other issues, mergers affecting agricultural input markets such as fertilizer, biotechnology, seed, and chemicals.[2]

I. THE PROPOSED MERGERS WOULD REDUCE THE "BIG 6" TO THE "BIG 4"

Recent merger proposals in the agricultural biotechnology, seed, and chemicals sectors follow two previous waves of consolidation—one in the mid-1980s and a second from the late 1990s through the late 2000s.[3] In the second wave, Monsanto alone acquired almost 40 companies, including agricultural biotechnology firms and independent seed companies that had historically held the substantial base of germplasm needed by bio-

[1] The American Antitrust Institute (AAI) is an independent and nonprofit education, research, and advocacy organization devoted to advancing the role of competition in the economy, protecting consumers, and

[2] See Letter from Am. Antitrust Inst, Food & WaterWatch, and National Farmers Union to Renata Hesse, Principal Deputy Assistant Att'y Gen. in re: The Proposed Dow-DuPont Merger (May 31, 2016). *See also,* Diana Moss, *Competition, Intellectual Property Rights, and Transgenic Seed*, 58 S.D. L. Rev. 543 (2013). *See also Commentary on Bowman v. Monsanto*, Randy L. Stutz, AAI Senior Counsel and Director of Special Projects (2013), available at http://www.antitrustinstitute.org/content/commentary-bowman-v-monsanto.

[3] The second wave brought a number of large mergers, including the formation of Syngenta from AstraZeneca and Novartis Seeds (2000), Bayer's acquisition of Aventis Crop Sciences (2002) and BASF's takeover of Cyanamid (2000). Seed companies such as Pioneer, DeKalb, Trojan, Northrup-King, Cargill and Golden Harvest were also acquired during this period. *See* Diana L. Moss, *Transgenic Seed Platforms: Competition Between a Rock and a Hard Place?* American Antitrust Institute (Oct. 23, 2009), http://antitrustinstitute.org/sites/default/files/AAI_Platforms%20and%20Transgenic%20Seed_102320091053.pdf. *See also* Gregory D. Graff, Gordon C. Rausser & Arthur A. Small, *Agricultural Biotechnology's Complementary Intellectual Assets*, Calif., mimeo at 19-20 (Aug. 2001).

technology developers to breed new varieties.[4] Between 1985 and 2000, the Big 6 firms—Monsanto, Syngenta, Bayer, DuPont, Dow and BASF—acquired about 75 percent of small to medium-size enterprises engaged in biotechnology research.[5]

Now come the proposed mergers of Dow-DuPont and Monsanto-Bayer in what would be a third wave of consolidation.[6] In 2014, the ranking of the Big 6 in total global agriculture-related revenue was: Monsanto ($16 billion), Syngenta ($14 billion), Bayer ($12 billion), DuPont ($11 billion), Dow ($7 billion) and BASF ($7 billion).[7] The proposed merger of Dow and DuPont would combine the 4th and 5th largest rivals.[8] A Monsanto-Bayer combination would combine the 1st and 3rd largest firms. The two mergers together would therefore create a Big 4, dominated by a Monsanto-Bayer and Dow-DuPont duopoly with almost 70% of the global market.

The proposed mergers occur against a complex industry backdrop, marked by concentrated agricultural biotechnology and seed markets, increasingly high prices paid by farmers for technology, reduced seed choices and growing evidence of flagging innovation. The proposed mergers are likely to substantially lessen competition in markets in the U.S., to the detriment of farmers and consumers. Two farmers succinctly described their concerns in interviews cited in a May 31, 2016 joint letter by AAI, Food & Water Watch (F&WW), and the National Farmers Union (NFU) to the U.S. Department of Justice (DOJ) regarding the Dow-DuPont merger: *"We need more competition to keep prices down"* and *"We don't like to see more consolidation; it means higher [input] prices for farmers."*

The proposed mergers of Dow-DuPont and Monsanto-Bayer are likely to adversely affect competition in three ways. First, they will eliminate head-to-head competition in markets for certain crop seed and chemicals. Second, consolidation will eliminate competition in agricultural biotechnology innovation markets and reduce opportunities for pro-competitive research and development (R&D) collaborations. Third, the combinations would create substantial vertical integration between traits, seeds and chemicals. The re-

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[4] Monsanto acquired biotechnology firms and seed companies such as Agrecetus, Calgene, Holdens, Asgrow and Delta & Pine Land. *See* Carl Pray, James F. Oehmke & Anwar Naseem, *Innovation and Dynamic Efficiency in Plant Biotechnology: An Introduction to the Reaserachable Issues*, 8 AgBioForum 52, 60 (2005); U.N. Conf. on Trade and Dev., *Trading the Trend Towards Market Concentration: The Case of the Agricultural Input Industry*, 5, 9-10 (Apr. 2006).

[5] Keith Fuglie, John King, Paul Heisey & David Schimmelpfennig, *Rising Concentration in Agricultural Input Industries Influences New Farm Technologies,* 10 Amber Waves 4, 4 (Dec. 2012), http://www.ers.usda.gov/media/960711/risingconcentration.pdf.

[6] *See*, e.g., Mike Verdin, *Bayer Unveils $62bn offer for 'perfect match' Monsanto*, Agrimoney.com (May 23, 2016, 11:14 UK), http://www.agrimoney.com/news/bayer-unveils-$62bn-offer-perfect-match-monsanto--9576.html.

[7] *DuPont and Dow to Combine in Merger of Equals*, (Dec. 15, 2015), at 8. Presentation can be found at http://www.dow.com/en-us/investor-relations/investor-presentations.

[8] *See* Lydia Mulvany, Sara Forden & Patrick Gower, *Dow-DuPont Merger Likely to Face Antitrust Scrutiny Worldwide*, Bloomberg (Dec. 11, 2015, 1:36 PM), http://www.bloomberg.com/news/articles/2015-12-11/dow-dupont-merger-likely-to-face-antitrust-scrutiny-worldwide; *see also* Jacob Bunge and Brent Kendall, *Merger of Dow, DuPont Likely to Get Close Antitrust Scrutiny* (Dec. 9, 2015), http://www.wsj.com/articles/merger-of-dow-dupont-likely-to-get-close-antitrust-scrutiny-1449709088.

sulting "platforms" will likely be engineered for the purpose of creating exclusive packages of traits, seeds and chemicals for farmers that do not "interoperate" with rival products. This will likely raise entry barriers for smaller innovators and increase the risk that they are foreclosed from access to technology and other resources needed to compete effectively.

The potentially significant reduction in competition resulting from proposed mergers could have a number of adverse effects, including less innovation, higher agricultural input prices and less choice for farmers, and higher food prices for consumers. The magnitude of these anticompetitive effects places a heavy burden on the merging parties to demonstrate that their mergers would produce countervailing, merger-specific and cognizable efficiencies. Moreover, these cost savings and benefits would have to be passed on to consumers of their products in the form of lower prices. There is a growing body of evidence that efficiencies claims in mergers have not materialized.[9] There is also evidence that managers find it difficult, if not impossible, to integrate large and complex organizations in order to achieve projected cost savings and to deliver benefits to consumers.[10]

II. THE CHALLENGES OF AGRICULTURAL BIOTECHNOLOGY

A. TRANSGENIC SEED AND TRAIT STACKING

Transgenic seeds have been genetically engineered to withstand or resist environmental or human factors, or to display enhanced qualities. Plants grown from transgenic seed can, for example, tolerate being sprayed by herbicides designed to kill weeds (herbicide-tolerance ("Ht")) or insects that ingest plant material (insect resistance (the most common of which is "Bt")). Often, the seed company sells the transgenic seed *and* the affiliated herbicide, inducing farmers to purchase both patented seeds and agrichemicals. Biotechnology firms are developing other similar "input" traits, including efforts to engineer drought resistance, as well as "output" or value-added traits such as corn with superior amino-acid balance and soybean oils with more shelf life.[11]

The percentage of acreage planted with transgenic seed has increased dramatically since its introduction in the 1990s.[12] In 2015, almost all corn, cotton and soybean acreage was planted with transgenic varieties (92%, 94% and 94%, respectively).[13] Even more notable is the rapid increase in acreage planted with seed containing multiple or "stacked" trans-

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[9] See, e.g., Diana Moss, *Delivering the Benefits? Efficiencies and Airline Mergers*, American Antitrust Institute, Nov. 21, 2013, http://antitrustinstitute.org/sites/default/files/AAI_USAir-AA_Efficiencies.pdf.
[10] Scott A. Christofferson, Robert S. McNish, and Diane L. Sias, *Where Mergers Go Wrong*, May 2004, http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/where-mergers-go-wrong.
[11] Marvin L. Hayenga, *Structural Change in the Biotech Seed and Chemical Industrial Complex*, 1 AgBioForum 43, 48 (1998).
[12] Jorge Fernandez-Cornejo, *The Seed Industry in U.S. Agriculture*, U.S. Dep't of Agric., Econ. Res. Serv., Agric. Info. Bull. No. 786 at 4 (2004).
[13] U.S. Dep't. of Agric., Nat'l Agric. Stat. Serv., Acreage, June 29, 2001 through June 30, 2015 Reports, http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1000.

genic traits. The U.S. Department of Agriculture (USDA) predicted several years ago that "stacking traits will become increasingly complex as multiple GM traits from a variety of firms are inserted into individual varieties."[14]

Seed companies promote stacking to address a number of concerns. One is to generate higher yields from multiple modes of action (e.g., Bt and Ht, or Ht and Ht). Another is to combat growing resistance of weeds and insects to an aging mode of action, addressed through "refuge" requirements, whereby growers must plant both conventional and non-transgenic seed. Between 2000 and 2015, the percentage of U.S. acreage planted with stacked gene varieties increased remarkably, from 1% to 77% for corn and from 20% to 79% for cotton.[15]

B. MARKET CONCENTRATION, BIOTECHNOLOGY PRICES, AND INNOVATION

Advances in biotechnology have come with a high price tag. The U.S. Government Accountability Office (GAO) observed significant price differentials between transgenic and conventional seed over 15 years ago, noting that "Monsanto's U.S. patents for Roundup Ready soybean seeds have given it and the companies to whom it has licensed the technology greater control over seed prices and has enabled them to restrict the availability and use of seeds."[16] This has been a troubling feature in the U.S. agricultural biotechnology markets, where competition can be shaped by strategic decisions about how, when and to whom to license IP.[17]

It is accepted that concentrated markets are more conducive to the exercise of market power. Relative to other agricultural input sectors, the level of concentration and increases in concentration over time are the highest in crop seed.[18] For example, the market share of the four largest firms more than doubled to 54% between 1994 and 2009.[19] In 2007, the four largest companies accounted for an estimated 72% of the U.S. market for corn seed and 55% of soybean seed, with Monsanto's share in corn and soybeans close to 65%.[20] In 2009, the top four companies held 95% of the U.S. market for cottonseed, with Monsanto and Bayer accounting for the lion's share.[21] In the traits markets in 2009, the

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[14] Keith O. Fuglie, et al., *Research Investments and Market Structure in the Food, Processing, Agricultural Input and BioFuels Industries Worldwide,* U.S. Dep't of Agric., Econ. Res. Serv. Rep. No. 130 (Dec. 2011), http://www.ers.usda.gov/media/193646/eib90_1_.pdf.
[15] *Supra* note 13.
[16] *See* U.S. Gen. Acct. Off., *Information on Prices of Genetically Modified Seeds in the United States and Argentina* 12 (Jan. 2000), http://www.gao.gov/products/GAO/T-RCED/NSIAD-00-228.
[17] *See* Peter Carstensen, *Post-Sale Restraints via Patent Licensing: A "Seedcentric" Perspective*, 16 Fordham Intell. Prop. Media & Ent. L.J. 1053, 1073 (2006) and Diana L. Moss, *Competition, Intellectual Property Rights and Transgenic Seed*, 58 S. Dakota L.R. 543 (2013). *See also* U.S. Dep't of Agric., Econ. Res. Serv., Adoption of Genetically Eng'r Crops in the U.S., http://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us.aspx and *supra* note 3.
[18] USDA (2011), *supra* note 15 at vi.
[19] *Id.* at 14.
[20] *Id.* at 35 and Moss, *supra* note 2 at 13-14.
[21] *Id.*

Big 6 held greater than 95% of trait acres for corn, soybeans and cotton in the U.S., with Monsanto alone accounting for 90% of these acres.[22]

Technology fees represent a significant proportion of seed costs. USDA notes that the prices of farm inputs, led by crop seed, generally have risen faster over the last 20 years than the prices U.S. farmers have received for their crops and livestock.[23] Were that not enough, seed price increases have outpaced yield increases over time—the very problem that biotechnology is purportedly designed to solve.[24] The disconnect between increases in biotechnology prices and crop yields is particularly concerning in light of more recent evidence on R&D trends.

For example, USDA observed in 2012 that spending on R&D in crop seed and biotechnology between 1994 and 2010 grew 138%—the most significant rate observed across major agricultural input sectors.[25] USDA noted that R&D intensity (measured as a percentage of industry sales) increased from the late 1990s to early 2000s as biotechnology crops were introduced. But by the late 2000s, R&D intensity had dropped to the mid-1990s level, leading the agency to note that increasing levels of concentration in agricultural input markets are no longer generally associated with higher R&D or a permanent rise in R&D intensity.[26] This conclusion calls into question long-standing arguments that concentration is needed to generate economies of scale in R&D.[27]

C. FARMERS ALREADY BEAR THE BRUNT OF LIMITED COMPETITION

Interviews with U.S. farmers cited in the May 31, 2016 joint AAI-F&WW-NFU letter to the DOJ indicate that high prices and the waning effectiveness of biotechnology weigh heavily on them. Farmers highlighted a number of concerns that are highly relevant to the potential adverse effects of further consolidation in biotechnology. First, the costs of early generation corn technologies remain high, despite farmers' perception that biotechnology companies should already have recouped their R&D investments. Farmers also see little price transparency. Technology fees, which in the past were a line item on the bill, are now rolled into the total cost of the seed. This makes it difficult for farmers to compare seed costs over time and is exacerbated by the variability in traits offered and the complex rebate system used by large firms.

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[22] USDA (2012), *supra* note 5 at 4.
[23] *Id.* at 12-13.
[24] See Moss *supra* note 18. Data are derived from U.S. Dep't of Agric., Econ. Res. Serv., Commodity Costs and Returns, http://www.ers.usda.gov/data-products/commodity-costs- and-returns.aspx and U.S. Dep't of Agric., Nat'l Agric. Stat. Serv., Quick Stat., http://quickstats.nass.usda.gov. While the yield data is for all crop seed, penetration rates for transgenic varieties are high and provide a fairly accurate indication of transgenic yields.
[25] USDA (2011), *supra* note 15 at 16.
[26] *Id.* at 2, 15. USDA examined whether market concentration was correlated with the share of industry revenues invested in R&D.
[27] *See e.g.*, Nicholas Kalaitzandonakes, *Biotechnology and the Restructuring of the Agricultural Supply Chain*, 1 AgBioForum 40, 40 (1998); Rachel E. Goodhue, et al., *Biotechnology, Intellectual Property and Value Differentiation in Agriculture, Department of Agricultural and Resource Economics*, Calif., Working Paper 901R at 15 (2002); Graff, et al., *supra* note 3; USDA (2012), *supra* note 15 at 16 and 36.

Second, farmers expressed significant concern about the reduction in innovation due to a lack of competition. For example, they are considerably frustrated that as a result of evolving Roundup-resistant weeds, the herbicide Roundup is no longer as effective as it once was. Farmers are now dependent on seed and chemical cropping systems with declining effectiveness and the industry's response has been to develop newer and more expensive traits. The declining performance of some of these biotechnology traits appears largely related to the widespread adoption of herbicide-tolerant and insect-resistant crops that has fostered growing and expensive emergence of weeds and insects that have developed resistance to these traits.

The industry response to growing resistance has been to promote a new generation of crops tolerant to different herbicides that will ultimately foster resistant weeds. Because of consolidation in the seed industry, there are few alternatives for farmers other than patented seeds and affiliated patented herbicides. As a result, farmers now spend more time and money on weed control. And while newer generation technology such as SmartStax (corn) addresses the Roundup resistance problem, farmers note that it does not produce a yield bonus over that. They also explain that it sometimes takes years for the promises of a new technology to catch up with reality. Even then, some of the yield boosts are a result of harvesting practices rather than the technology itself.

Third, reductions in seed options weigh heavily on producers' minds. For example, while Dow and DuPont have extensive portfolios of seed corn traits, those traits are not available in all geographic areas due to differences in growing season length, weed and pest pressure, soil types, and moisture availability. The same is true for Monsanto and Bayer in traited cotton seed. But there may be very limited competition in seed suitable for certain areas, magnifying the effect of the mergers in eliminating competition.

III. THE PROPOSED MERGERS WILL ELIMINATE COMPETITION IN CORN, SOYBEANS, AND COTTON SEED

Dow, DuPont, Monsanto, and Bayer sell seeds containing their own biotechnology traits as well as traits cross-licensed from other firms. Both Dow and DuPont identify corn, soybean and cotton seeds as markets in which they have "established strengths."[28] A Dow-DuPont merger would eliminate competition in corn and soybean seeds. Monsanto currently holds 35% of the market for corn, while DuPont has 35%, and Dow, Syngenta and AgReliant have about 6%.[29] The merger would therefore give Dow-DuPont about 41% of the market for corn seed. The pre- to post-merger increase in concentration is just over 400 HHI points, for post-merger concentration of over 3,000 HHI. In soybeans, Monsanto has a 28% share, while DuPont has 33%, Dow has 5%, Syngenta has about 10%, and AgReliant has about 3%. The merger would give Dow-DuPont about 38% of the market for soybean seed. The increase in concentration is about 350 HHI points, for a post-merger level of about 2,700 HHI.

[28] *Supra* note 7 at 7.
[29] Verdant Partners, *Seed Competition Heats* Up, (July 28, 2015), http://www.verdantpartners.com/seed-competition-heats-up/.

The Monsanto-Bayer merger would significantly eliminate competition in cotton seed. For upland cotton planted in the U.S., Monsanto has a 33% share, Bayer has about 25%, Americot has 22%, Dow has 13%, and AllTex/Dyna-Gro has about 6%.[30] The merger would give Monsanto-Bayer about 58% of the market for cotton seed and increase concentration by over 1,600 HHI points, for a post-merger level of about 3,750 HHI. The proposed merger would recombine the very cotton seed asset (Stoneville) that the DOJ required Monsanto to divest as part of its merger with Delta & Pine Land in 2007.

Under the government's HORIZONTAL MERGER GUIDELINES (GUIDELINES), post-merger markets in corn, soybeans, and cotton would be considered highly concentrated. Merger-related increases in concentration exceed levels that are "presumed to be likely to enhance market power."[31] More important, the mergers would fundamentally restructure the seed markets. Together, Monsanto-Bayer and Dow-DuPont would control 76% of the market for corn and 66% of the market for soybeans. This concentration of market share in the hands of two companies would create a duopoly between Monsanto-Bayer and Dow-DuPont. In cotton, the merger would create a dominant firm in Monsanto-Bayer, with control of almost 60% of the market.

IV. THE MERGERS WILL REDUCE IMPORTANT COMPETITION IN BIOTECHNOLOGY INNOVATION

The GUIDELINES take seriously the potential adverse effect of a merger on innovation competition. They note that competition "often spurs firms to innovate" and that a merger may diminish innovation competition through curtailment of "innovative efforts below the level that would prevail in the absence of the merger."[32] The GUIDELINES go on to explain that adverse effects on innovation competition are particularly likely when the merging firms are each other's close competitors. In other words, a merger is more likely to harm innovation competition "by combining two of a very small number of firms with the strongest capabilities to successfully innovate in a specific direction."[33]

The antitrust agencies have opposed mergers on the basis of eliminating innovation competition. In the proposed merger of Applied Materials and Tokyo Electron, for example, the DOJ noted that the deal "would have combined the two largest competitors with the necessary know-how, resources and ability to develop [next-generation] and supply high-volume non-lithography semiconductor manufacturing equipment."[34] Similarly, Dow,

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[30] U.S. Dept. Agriculture, Agriculture Marketing Service, *Cotton Varieties Planted 2016 Crop*, Sept. 14, 2016,
https://www.ams.usda.gov/mnreports/cnavar.pdf.
[31] U.S. Dep't of Justice & Fed. Trade Comm'n, Horizonal Mergers Guidelines, §5.3 (Aug. 2010).
[32] Guidelines, §6.4.
[33] *Id.*
[34] *See* Press Release, U.S. Dep't of Justice, Applied Materials Inc. and Tokyo Electron Ltd. Abandon Merger Plans After Justice Department Rejected Their Proposed Remedy (Apr. 27, 2015), https://www.justice.gov/opa/pr/applied-materials-inc- and-tokyo-electron-ltd-ab andon-merger-plans-after-justice-department; *see also* Andrew Barlow, *Mergers that Diminish Innovation Present Deal Risk*, Antitrust Lawyer Blog (May 7, 2015 11:40 AM), http://www.antitrustlawyerblog.com/mergers-that-raise-future-competition-concerns-present-deal-risk/.

DuPont, Monsanto, and Bayer are four of a very small number of rivals in the market for agricultural biotechnology. This feature is exacerbated by the fact that strategic competitive incentives affect firms' decisions to make essential inputs and resources available to rivals. These include seed germplasm for breeding new traited varieties and licensing patented technology for the purposes of stacking traits.

A. ELIMINATION OF "PARALLEL PATH" R&D

Some of the parties divert attention from the likely adverse effects of their merger on competition, farmers, and consumers with the claim that the deal will package "complementary" product offerings.[35] The companies' own documents refute these claims. For example, the Dow and DuPont innovation pipelines compete head-to-head. They contain overlapping traits in development for corn, soybeans and cotton, as well as crop protection.[36] It is also clear that the Monsanto-Bayer R&D pipelines also show overlaps in major areas of traits, seeds, and crop protection.[37]

Maintaining standalone competition in R&D is essential for ensuring that incentives remain strong to continue existing and prospective product development programs. Such competition is particularly crucial for innovation in an industry where the probability of commercial success is relatively low. The time and cost associated with performing R&D and field-testing and obtaining regulatory approvals create a long pipeline to commercialization. And once through the pipeline, biotechnology firms must market new technology to farmers where crop planning and switching costs increase the time associated with adoption of new technology on a larger scale. In innovation markets, therefore, the importance of maintaining multiple parallel in R&D paths is paramount.[38] As one farmer put it: *"The more people you have researching, the better off you are at finding something."*

The unique nature of collaborative R&D across firms and crops makes measuring concentration in biotechnology innovation markets difficult. Economic analysis indicates that traditional HHI measures may understate concentration in biotechnology innovation markets.[39] To illustrate the importance of overlaps in biotechnology innovation between Dow and DuPont and Monsanto and Bayer, we collected data from the GM Crop Database for

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[35] *Supra* note 7 at 9.

[36] Dow, Seed & Traits Pipeline, http://www.dowagro.com/en-us/innovation/our-pipeline/seeds-pipeline; DuPont, Specific Sheets, https://www.pioneer.com/home/site/about/research/pipeline/specification-sheets/. *See also* Jim Borel, *Bank of American Merrill Lynch Global Agriculture Conference 2015*, DuPont (Feb. 26, 2015), http://s2.q4cdn.com/752917794/files/doc_presentations/2015/BAML-Conference-2015-FINAL.pdf.

[37] Creating a Global Leader in Agriculture, Sept. 14, 2016, at 14, https://www.advancingtogether.com/en/home/.

[38] Leading economists note, for example, that: "Technological progress is best achieved in a field like pharmaceuticals when there is widespread dispersion of R&D initiatives both across companies and within them through the exploration of multiple technical paths." William S. Comanor & F.M. Scherer, *Mergers and innovation in the pharmaceutical industry*, 32 J. of Health Econ., 106, 108 (2013).

[39] James F. Oehmke & Christopher A. Wolf, *Measuring Concentration in the Biotechnology R & D Industry: Adjusting for Interfirm Transfer of Genetic Materials,* AgBioForum (2003), http://www.agbioforum.org/v6n3/v6n3a07-oehmke.htm.

genetic corn, soybean and cotton "events" approved in the U.S. over the 24-year period from 1991 to 2014.[40] A total of 33 genetic events were approved for corn, 19 for soybeans and 18 for cotton.[41]

Over the period 1991-2014, DuPont accounted for 12% of corn events, while Dow accounted for 6%. DuPont accounted for 16% of soybean events and Dow accounted for 5%. DuPont accounted for 6% of cotton events, and Dow for 22%. Together, Dow and DuPont introduced 18% of genetic events for corn, 21% for soybeans, and 28% for cotton. Similarly, Monsanto accounted for 39% of corn events, while Bayer accounted for 12%. Monsanto accounted for 32% of soybean events and Bayer for 37%. And in cotton, Monsanto accounted for 33% of events, and Bayer for 28%. Together, Monsanto and Bayer claimed 51% of genetic events for corn, 68% for soybeans, and 61% for cotton.

These data clearly illustrate that the four companies account for a significant portion of innovation in important traits. It is also clear that they compete head-to-head in these markets as independent rivals. Eliminating "parallel path" R&D programs is far more likely to have anticompetitive effects in innovation markets that to produce efficiencies. Dow-DuPont assert, for example, that the elimination of "duplicative R&D programs including breeding, traits and chemical discovery" are a key component of the $1.3 billion in cost synergies.[42]

B. REDUCED OPPORTUNITIES FOR PRO-COMPETITIVE R&D COLLABORATIONS

Innovation in biotechnology depends critically on maintaining a "field" of rivals, each with strong pro-competitive incentives to collaborate to form new stacked trait profiles. In eliminating two of six competitors in biotechnology markets, the proposed mergers will therefore reduce opportunities for pro-competitive collaborations between rivals in developing stacked trait profiles. As of 2009, there were 44 total profiles for corn, soybeans and cotton on the market, almost 70% of which were stacked traits.[43] Trait stacks are created through "intra-firm" stacking, or a single innovator combining its own traits, and "inter-firm" stacking, or rival innovators combining traits through joint R&D programs and cross-licensing agreements. About 60% of all stacks on the market in 2009 were inter-firm stacks, highlighting an important avenue for generating new biotechnology products.[44] For example, WideStrike-Roundup Ready cotton stack is a collaboration

[40] Ctr. for Envtl. Risk Assessment, GM Crop Database, http://cera-gmc.org/GMCropDatabase. Database queried for corn, soybeans and cotton.
[41] *Id.*
[42] *Supra* note 7 at 7. Agrochemicals and seeds are estimated to account for the major portion of the Dow and DuPont R&D budgets. *See* John Abbink, *Dow DuPont Do What? The Outlook for the Post-Merger Companies*, The Motley Fool (Dec. 25, 2015, 6:10 PM), http://www.fool.com/investing/general/2015/12/25/dow-dupont-do-what-the-outlook-for-the-post-merger.aspx.
[43]Corn, Cotton and Soybean Trait Profiles, DMRKYNETEC and Monsanto (2009), http://www.monsanto.com/newsviews/documents/corn_and_soybean_agronomic_traits.pdf.
[44] Intra-firm stacking is inherently limited by the ability of a single innovator to combine its own traits into commercially viable stacks. No biotechnology innovator possesses a full portfolio of traits comparable to Monsanto's. Monsanto traits appear in 72 percent of intra-firm stacks because of the firm's dominance in

between Dow and Monsanto, which combines worm resistance and glyphosate herbicide resistance. [45]

Farmers benefit most when there are competing stacks to choose from. Competition maximizes the potential for numerous collaborations and minimizes incentives to refuse to license or to impose discriminatory restrictions in technology licensing agreements. Moreover, competition limits incentives for just a few large players in a tight oligopoly to tacitly or even explicitly "agree" not to compete. Such agreements could range from deciding which firms specialize in certain crops or traits, to coming to agreement on market "rules," such as anticompetitive cross-licensing terms and conditions.[46]

Trait profile data show stacking between a number of the Big 6 firms, including: Bayer-Syngenta, Bayer-Dow, BASF-Monsanto, DuPont-Monsanto, Bayer-Monsanto, Dow-Monsanto, BASF-Bayer-Syngenta, BASF-Bayer-Dow, and Bayer-Dow-Monsanto. Traits innovated by these four companies account for over 80% of the total number of traits appearing in inter-firm stacks. Moreover, since the mid 2000s, biotechnology innovators have agreed in numerous instances to cross-license their technologies in corn, soybeans, cotton and canola.[47] This includes collaborations among the Big 6 and with a few smaller biotechnology innovators. Opportunities for pro-competitive collaborations in biotechnology will shrink with the elimination of competition between Dow and DuPont and Monsanto and Bayer as standalone rivals, with the likely effect of raising prices for biotechnology and reducing choices for growers.

V. THE PROPOSED MERGERS WOULD CREATE VERTICALLY INTEGRATED PLATFORMS OF TRAITS, SEEDS AND CHEMICALS, POTENTIALLY FORECLOSING SMALLER RIVALS

Past mergers in biotechnology have increased vertical integration among traits, seeds and chemicals. Current merger proposals involving the Big 6 are arguably even more motivated by the drive to develop "integrated" portfolios of traits, seeds and chemicals.[48] The proposed mergers would vertically integrate traits, seeds and chemicals currently produced independently by Dow and DuPont and Monsanto and Bayer. The result will be more tightly integrated platforms of components that are bound together both economically and technologically for the potential purpose of creating exclusive packages of traits, seeds and chemicals that do not "interoperate" with rival products. One farmer we interviewed highlighted the constraints of being locked into a single traits-seeds-chemicals platform *"[I] can't mix chemicals with other companies' products to remedy Roundup resistance."*

The genesis of integrated traits-seed-chemicals "platforms" was evident as early as first-

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biotechnology markets. For the same reason, Monsanto traits appear in 91 percent of inter-firm stacks. *All* stacked traits in soybeans and cotton involve a Monsanto trait whereas 50 percent of corn stacks involve Monsanto traits.

[45] *Supra* note 38.

[46] *See, e.g.*, Robert H. Lande and Howard P. Marvel, *Collusion Over Rules*, 16 Antitrust 36 (2002).

[47] AAI-F&WW-NFU letter to DOJ, *supra* note 2, at note 43.

[48] *Supra* note 36, at 11-12.

generation transgenic soybean technology. Monsanto's glyphosate herbicide Roundup and Roundup Ready 1 (RR1) soybeans are a case in point. So lucrative are platforms of traits, seeds and chemicals that long before RR1 soybeans went off patent in 2014 and the window opened for generic competition, Monsanto attempted to switch farmers to Roundup Ready 2 (RR2) soybeans. This "hard switch" strategy met with some resistance, but apparently was successful. One generic soybean using the RR1 trait was introduced in 2015.[49] Monsanto has plans to extend the RR2 soybean platform to encompass more complex traits and herbicides.[50]

Vertically integrated Dow-DuPont and Monsanto-Bayer traits-seeds-chemicals platforms would likely raise entry barriers for smaller rivals and increase the risk that they are foreclosed from access to technology and other resources needed to compete effectively. This type of hurdle is similar to the requirement of multi-level entry described in the government's non-horizontal merger guidelines.[51] Moreover, economic evidence from soybeans and cotton indicates that seed prices under vertical integration tend to be higher than under licensing arrangements across firms. This suggests that vertical integration by biotechnology firms may increase the exercise of market power and firms' ability to extract economic benefits from seed dealers and farmers.[52] This evidence should bear importantly on an analysis of the vertical effects of the proposed mergers. Claims that the mergers will simply package "complementary" assets divert attention from the likely adverse impact of integration on competition, farmers and consumers. There is decidedly insufficient competition *between* platforms to ameliorate these concerns.

VI. THE PROPOSED MERGERS WOULD BE DIFFICULT TO REMEDY

The DOJ has permitted two major biotechnology mergers in the last decade—Monsanto's mergers with *DeKalb* and cotton giant *Delta & Pine Land*. These transactions arguably enhanced Monsanto's dominant platforms in corn and cotton. In crafting remedies in both cases, the DOJ recognized the importance of innovation markets and the importance of licensing patented technologies.[53] The proposed mergers of Dow-DuPont and Monsanto-

[49] The University of Arkansas released UA 5414RR. See one.Seed World (June 2015), http://www.seedworld.com/flipbook_june2015//files/inc/c409c86a78.pdf.
[50] *See, e.g., Get Ready for Next Level Weed Control*, http://www.roundupreadyxtend.com/Pages/default.aspx.
[51] U.S. Department of Justice, Non-Horizontal Merger Guidelines, §4.2.1.1, https://www.justice.gov/atr/non-horizontal-merger-guidelines.
[52] Kyle W. Stiegert, Guanming Shi & Jean Paul Chavas, *Innovation, Integration and the Biotechnology Revolution in U.S. Seed Markets*, Choices Magazine (2nd Q. 2010), http://farmdoc.illinois.edu/policy/choices/20102/2010202/2010202.pdf.
[53] For example, in *DeKalb*, the agency required the divestiture of Monsanto's agrobacterium-mediated transformation technology for corn and required the company to enter into binding commitments to license corn germplasm to seed company customers for the purpose of introducing new transgenic traits in corn. *See* Press Release, U.S. Dep't of Justice, Justice Department Approves Monsanto's Acquisition of DeKalb Genetics Corporation: Divestiture of Transformation Technology Rights and Licensing of Corn Germplasm Implemented (Nov. 30, 1998), https://www.justice.gov/archive/atr/public/press_releases/1998/2103.htm. In *Delta & Pine Land*, the DOJ had similar concerns, requiring the divestiture of cotton seed assets, divestiture of several lines of cotton germplasm and the removal of restrictive provisions in Monsanto technology licenses that would prohibit rivals biotech developers from stacking Monsanto with non-Monsanto traits. *United States v. Monsanto Company, et al.*, No. 1:07-cv-00992, at 12-21 (D.C.Cir. 2007).

Bayer are an entirely different animal. They would reduce an already small field of large, integrated competitors. Such mergers would be difficult, if not impossible, to remedy. Dow-DuPont have, for example, proposed up-front to spin off their materials science and specialty products divisions.[54] But the company's seed and crop protection businesses would remain integrated in an agriculture division. Such a proposal completely fails to address competitive concerns relating to the agricultural input markets affected by the proposed merger.

Any remedy would require significant divestitures of a number of different assets in order to fully restore competition lost by the merger. But reallocation of shares within the large incumbents through divestitures would only result in a game of market concentration "musical chairs," or even further increase concentration. Such an approach would not effectively address potential harm to competition and consumers. Moreover, a viable buyer would be difficult to find outside the Big 6. Such a buyer would need to be national, if not global, in scale and scope in order to compete effectively post merger. Lack of scale and scope in R&D, financing, marketing and distribution would necessitate cobbling together a package of assets to create and potentially prop up a national competitor.

The importance of preserving competition, farmers and consumers should take precedence over trying to craft an ineffective remedy. Indeed, there is mounting evidence of remedies in previous merger consent decrees that have failed to fully restore competition, either because of the non-viability of the buyer of the divested assets or inadequacy of related relief.[55] These failures have been particularly apparent in highly concentrated markets, as is the case in Dow-DuPont. They include: UnitedHealth Group-Sierra (prices increased post-divestiture); Safeway-Albertsons (buyer Haggen filed for bankruptcy and stores were sold back to Albertsons); and Hertz-Dollar Thrifty (buyer Advantage filed for bankruptcy).[56] This expanding record on failed remedies should bear importantly on the analysis of both the Dow-DuPont and Monsanto-Bayer mergers.

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[54] *Supra* note 6 at 5.

[55] *See generally* John Kwoka, *Mergers, Merger Control, and Remedies: A Restrospective Analysis of U.S. Policy* (2014).

[56] Premium increases were observed relative to a control group. José R. Guardado et al., *The Price Effects of a Large Merger of Health Insurers: A Case Study of UnitedHealth-Sierra*, 1 Health Mgmt., Pol'y & Innov. 16 (2013); *see also* Press Release, UnitedHealth Grp., UnitedHealth Group Completes Acquisition of Sierra Health Services (Feb. 25, 2008), http://www.reuters.com/article/idUS17532+26-Feb-2008+BW20080226; Shannon Firth, *Health Policy Experts Fear the Worst with Payer Mergers*, MedPage Today (Oct. 9, 2015), http://healthleadersmedia.com/content/HEP-321488/Health-Policy-Experts-Fear-the-Worst-With-Payer-Mergers. The FTC allowed such a return in cases where there were no competing buyers for the particular store. Brent Kendall & Peg Brickley, *Albertsons to Buy Back 33 Stores It Sold as Part of Merger With Safeway*, Wall St. J. (Nov. 24, 2015), http://www.wsj.com/articles/albertsons-to-buy-back-33-stores-it-sold-as-part-of-merger-with-safeway-1448411193; *see also* Brent Kendall, *Haggen Struggles After Trying to Digest Albertsons Stores*, Wall St. J. (Oct. 9, 2015, 1:06 PM), http://www.wsj.com/articles/haggen-struggles-after-trying-to-digest-albertsons-stores-1444410394 (reporting that soon after Haggen acquired 164 stores because of the merger, it filed for bankruptcy and closed 26 stores). Press Release, FSNA, Franchise Services of North America Inc. Announces Bankruptcy Filing by Simply Wheelz LLC (Nov. 4, 2013), http://www.fsna-inc.com/newspdfs/115201391920.PDF.