No. 11-796

IN THE

Supreme Court of the United States

VERNON HUGH BOWMAN,

Petitioner,

v.

MONSANTO COMPANY, *et al*.,

Respondents.

On Writ of Certiorari to the United States Court of Appeals for the Federal Circuit

BRIEF OF ECONOMISTS AS *AMICI CURIAE* IN SUPPORT OF RESPONDENTS

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INTEREST OF THE *AMICI CURIAE* [1]

Amici are academic and professional economists specializing in agricultural economics, industrial organization, and the economics of innovation.

Dr. Kenneth G. Elzinga is the Robert C. Taylor Professor of Economics at the University of Virginia, where he specializes in the economics of industrial organization. He is the author of dozens of books and articles, four of which have been cited with approval by this Court.[2]

Dr. Dermot J. Hayes holds the Pioneer Chair in Agribusiness at Iowa State University, where he teaches in the areas of economics and finance. Among Dr. Hayes' dozens of books and articles are a number of works measuring the social benefits of intellectual property rights in the U.S. seed sector.

Dr. Vandy Howell is a vice president of Cornerstone Research, where she specializes in antitrust and intellectual property matters. Dr. Howell has

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[1] The written consents of all parties to the filing of this brief have been lodged with the clerk. No counsel for any party in this case authored this brief in whole or in part, and no person or entity other than *amici curiae* and their counsel made a monetary contribution to its preparation or submission.

[2] *See Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 226 (1993) (citing Professor Elzinga's article with David E. Mills regarding testing for predation); *Tex. Indus., Inc. v. Radcliff Materials, Inc.*, 451 U.S. 630, 636 n.8 (1981) (citing Professor Elzinga's 1976 book with William Breit on antitrust penalties); *United States v. Falstaff Brewing Corp.*, 410 U.S. 526, 551 (1973) (citing Professor Elzinga's 1971 article on the economics of the American beer industry); and *Ford Motor Co. v. United States*, 405 U.S. 562, 582 (1972) (citing Professor Elzinga's 1969 article on antitrust remedies).

also taught industrial organization and public policy at the University of California, Berkeley.

Dr. Anne Layne-Farrar is a vice president in the Antitrust & Competition Economics Practice of Charles River Associates, where she specializes in antitrust and intellectual property matters, especially where the two issues are combined. She has written on the economics of the patent exhaustion doctrine, and her papers have appeared in journals including *Antitrust Law Journal*, *International Journal of Industrial Organization*, and the *Journal of Competition Law and Economics*.

Amici are economists not lawyers and express no view regarding the interpretation of the Patent Act or this Court's precedents. However, *amici* do believe that their expertise can assist the Court in understanding how agricultural innovation increases consumer welfare and how a decision that the first sale of patented seed or of seed containing patented traits exhausts patent rights will undermine consumer welfare.

Specifically, *amici* are cognizant of the essential role of innovation in delivering better products at lower cost to consumers, thereby increasing the efficiency of markets and consumer welfare. Innovation has delivered enormous benefits to farmers as well as consumers, and patent protection plays a critical role in creating the incentives necessary for firms to make the substantial investments required to breed seed and invent new agricultural biotechnologies. While there are important debates among economists regarding the effect of the patent system on innovation in some industries, and while more and stronger patents do not necessarily lead to more innovation, the economic literature recognizes the centrality of

patent protection in creating incentives for innovation in industries such as biotechnology.

Amici favor efficient market structures that bring consumers more choices and lower prices. As experts in the field, *amici* believe that they can assist the Court in understanding the effects of denying agricultural biotechnology innovators relief under the Patent Act after the first sale of a patented seed. Forcing innovators to rely solely on cumbersome and ineffective contractual remedies will not only reduce incentives to innovate, but will also likely lead to higher prices for patented seeds and traits and less efficient, less competitive industry structures.

SUMMARY OF ARGUMENT

At stake in this case is the continued vitality of agricultural innovation, which is indispensable to feeding the burgeoning world population. Advances in plant breeding have led to substantial increases in crop yields, and the application of biotechnology has enabled scientists to insert genes from other organisms into plant seeds, producing crops that, among other things, are resistant to insects, drought and herbicides. Corn yields have doubled and soybean yields have grown 50% since the 1970s. The innovations delivered through the tools of agricultural biotechnology have likewise yielded dramatic gains in farmers' income—a $3.3 billion increase in 2010 for soybeans alone—and lowered prices for consumers. Other innovations under development will improve the nutritional value and health benefits of soybeans and other crops.

Intellectual property rights have provided the incentives that fueled these innovations. Particularly in agriculture, protecting those rights is crucial to

future advances. To develop new traits for seeds, innovators must invest significant time and money. Once those traits are developed, however, others can cheaply reproduce them, particularly in varietal crops such as soybeans in which the progeny of a plant is identical to the seed used to grow the plant. Without adequate patent protection, inventors could not obtain a return on their investments, and there would be little, if any, incentive to innovate. Allowing the inventor only one sale to recoup the entire cost of an agricultural invention would not provide adequate incentives, reducing incentives to innovate, undermining competition, and harming consumers.

The patent system is essential because other mechanisms do not sufficiently protect incentives to innovate. That is especially true with regard to seeds and traits. If the first sale of a genetically modified seed exhausted all patent rights, innovators could not rely on contracts to ensure that they were adequately compensated. The innovator would have a contract remedy only against those to whom it sold seed, that is, the other parties to the contract. Although every entity in the chain of distribution of soybeans could potentially provide seeds to others for replanting, it would be impossible for an innovator to effectively or efficiently with each entity in the distribution chain. Moreover, even if the innovator could contract with each grower, trucking company, grain elevator, railroad, and soybean processor across the distribution chain, the innovator would have no effective way to identify the entity that breached its contract by providing soybeans for replanting, and no effective way to proceed against them.

Other proposed alternatives to patent protection would be no more effective. "Terminator technol-

ogy"—traits that would prevent second generation seeds from growing—is not commercially available. Even if it were, there are serious doubts whether the public would accept or governments would approve the sale of food with a sterility gene.

The suggestion by one *amicus*, the American Antitrust Institute, that innovators simply stop selling traits in varietal seeds, conflicts with the very purpose of the intellectual property laws. The Constitution authorized a system of patents to "promote the Progress of Science." U.S. Const. art. 1, § 8, cl. 8. To propose the alternative of not innovating and not commercializing innovations as a substitute for patent protection stifles rather than promotes the progress of science.

Given these inadequate alternatives, a ruling that the first sale of a patent trait or seed exhausted all patent right would cause significant economic harm—higher prices, lower output, and decreased competition. Seed and trait innovators would have to charge a price for the first sale that captured the full value of the invention. Such high upfront costs would be problematic for farmers with highly variable income, requiring long-term borrowing at higher interest rates. Moreover, that upfront investment would lock farmers into a particular seed choice for years, stifling the competition—and the resulting stimulus to innovation—that occurs as farmers seek out the best new seed varieties from season to season.

In addition, if a first sale exhausted all patent rights, licensing seeds or traits to a university for research or to a small competitor would pose the same commercial risks as licensing them to a large competitor. Subsequent generations of seeds could still flood the market, whatever their source, with no

incremental payment to the innovators. Currently, universities receive a price break based on the intensity of their commercial use of the product and smaller competitors pay only for the licensed seed that they actually sell. Application of the first sale doctrine would lead to higher prices to and less complementary innovation by universities and smaller firms.

The same problems do not arise for hybrid seeds, such as corn. Unlike varietal seeds like soybeans, hybrid crops do not produce seeds that can be replanted without dramatic yield loss. A ruling that the first sale of a patented seed exhausts patent rights in succeeding generations thus would not affect hybrid seeds. The resulting disparity in the ability of innovators to recoup their investments would skew incentives for research and development, shifting resources away from varietals to hybrids in a manner that would otherwise not make economic sense.

Finally, ruling that a first sale of seed exhausts patent rights would artificially increase vertical integration in the seed market. One business model in that market, which Monsanto has adopted, is to license traits broadly to many seed companies. Another approach, which some companies have adopted, is to limit distribution to seed companies owned by the inventor. If a first sale of seed exhausted patent rights, companies would have enormous incentives to reduce the risks posed by inefficient and insufficient contract remedies by refusing to out-license their technology. While vertical integration is not inherently anti-competitive, thwarting a choice between that approach and broad licensing

would undermine competition and efficiency in the market.

In sum, a decision that the first sale of patented seed exhausts all patent rights would impede innovation, undermine competition, and harm consumers.

ARGUMENT

I. ENCOURAGING AGRICULTURAL INNOVATION IS CRITICALLY IMPORTANT, AND INTELLECTUAL PROPERTY PROTECTION IS ESSENTIAL TO CREATE INCENTIVES TO INNOVATE.

The Constitution authorizes Congress to "promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." U.S. Const. art. 1, § 8, cl. 8. To this end, Congress has enacted the Patent Act, 35 U.S.C. §§ 1 *et seq.*, affording innovators that disclose novel and useful inventions the exclusive right to make, use, and sell them. "The federal patent system . . . embodies a carefully crafted bargain for encouraging the creation and disclosure of new, useful and nonobvious advances in technology . . . in return for the exclusive right to practice the invention for a period of years." *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 150-51 (1989). In the words of Abraham Lincoln inscribed over the door of the former home of the Patent and Trademark Office (now the Department of Commerce), through this patent bargain "the Patent System adds the fuel of interest to the fire of genius."

A. Innovation, Particularly Agricultural Innovation, Delivers Enormous Economic Benefits.

The transformative gains in productivity enabled by innovation deliver enormous economic benefits. Indeed, the social rate of return from investments in innovation can be double the private rate of return. *See, e.g.*, Charles I. Jones & John C. Williams, *Measuring the Social Return to R&D*, 113 Q. J. ECON. 1119 (1998); Bronwyn H. Hall, *The Private and Social Returns to Research and Development*, in TECHNOLOGY, R&D, AND THE ECONOMY (B.L.R. Smith and C.E. Barfield, eds., 1996); Edwin Mansfield, *Microeconomics of Technological Innovation*, in TECHNOLOGY AND GLOBAL INDUSTRY 311 (Bruce R. Guile & Harvey Brooks, eds., 1987).

Innovation in agriculture has occurred in a number of forms, including both seed breeding and biotechnology. Both are at issue in this case because patents can protect the products of both types of innovation. *See J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124 (2001) (sexually reproduced plants eligible for utility patents); *Diamond v. Chakrabarty*, 447 U.S. 303, 305 (1980) (genetically engineered organisms can be patented). Both forms of innovation have delivered substantial benefits to farmers and to consumers.

Application of scientific techniques to seed breeding and the incentives for innovation created by the passage of the Plant Variety Protection Act in 1970 have led to U.S. corn yields more than doubling between 1970 and 2011 (from 72.4 to 147.2 bushels/acre) and soybean yields increasing by more than 50% (from 26.7 to 41.9 bushels/acre) in the same

time period. *See* USDA NATIONAL AGRICULTURAL STATISTICS SERVICE, *available at* http://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS.

Beginning in the early 1990s, seed companies began to bring to market seeds improved not just through seed breeding, but through the use of the tools of biotechnology to insert genes that do not naturally occur in the plant. Through these techniques, a gene from one organism that causes it to express a useful protein is identified, modified as necessary for expression in a plant, and inserted in the genome of a plant. These genes carry:

- traits that allow plants to produce their own natural insecticide by creating insecticidal proteins found in *bacillus thuringiensis* (a bacteria long used by organic farmers as an insecticide),
- traits that improve the quality of the oils produced by plants (optimizing them for use in food, agricultural feed, or in the production of ethanol),
- traits that improve resistance to drought, and
- traits that allow plants to tolerate the application of more environmentally friendly and lower-cost herbicides, such as the Roundup Ready trait affording resistance to glyphosate herbicide in the soybeans Petitioner Bowman saved and replanted.[3]

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[3] *See generally* NATIONAL RESEARCH COUNCIL, IMPACT OF GENETICALLY ENGINEERED CROPS ON FARM SUSTAINABILITY IN THE UNITED STATES 4 (2010) ("Glyphosate kills most plants without substantial adverse effects on animals or on soil and water quality, unlike other classes of herbicides.").

Agricultural biotechnology has delivered these traits that protect crops from yield-robbing weeds, insects, and environmental stresses (such as drought) while allowing farmers who plant genetically engineered crops to save time and energy as well as improve safety. *See* NATIONAL RESEARCH COUNCIL, IMPACT OF GENETICALLY ENGINEERED CROPS ON FARM SUSTAINABILITY IN THE UNITED STATES 9 (2010) ("Farmers who have adopted GE crops have experienced lower costs of production and obtained higher yields in many cases because of more cost-effective weed control and reduced losses from insect pests.") [henceforth NATIONAL RESEARCH COUNCIL]; *id*. at 10 ("Adopters of GE crops experience increased worker safety and greater simplicity and flexibility in farm management, benefitting farmers even though the cost of GE seed is higher than non-GE seed.").

The benefits of these technologies versus conventional farming can be seen in what economists call "revealed preference"; farmers would not have shifted to planting more than 80% of all acres of corn, soybeans, and cotton with new inventions of agricultural biotechnology if they did not receive substantial benefits from doing so. *See, e.g.*, *id*. at 9 ("The rapid adoption of GE crops since their commercialization indicates that the benefits to adopting farmers are substantial and generally outweigh additional technology fees for these seeds and other associated costs."); NATIONAL CENTER FOR FOOD AND AGRICULTURE POLICY, QUANTIFICATION OF THE IMPACTS ON US AGRICULTURE OF BIOTECHNOLOGY-DERIVED CROPS PLANTED IN 2006, at 46 (2007) ("The simplicity, flexibility, safety, and economics of weed management programs based on the glyphosate-resistant varieties have had a significant influence on the adoption in the US."), *available at* http://www.ncfap.org/documents/

2007biotech_report/Quantification_of_the_Impacts_on_US_Agriculture_of_Biotechnology.pdf.[4]

According to one study, the global annual income gain to farmers from planting herbicide tolerant soybeans like those Mr. Bowman planted was $3.3 billion in 2010, and the incremental farm income to growers of all genetically modified crops was $14 billion. *See* Graham Brookes & Peter Barfoot, *The Income and Production Effects of Biotech Crops Globally 1996–2010*, 3 GM CROPS & FOOD 265, 269 (2012).[5]

The benefits of agricultural biotechnology extend beyond the innovators that created the technology and to the farmers that apply it. Some studies show that consumers capture more than half the total benefits. *See, e.g.*, NATIONAL RESEARCH COUNCIL at 161 (collecting data from multiple studies). Consumers benefit when competition causes the output-enhancing benefits of higher yields and lower costs to be passed down the value chain, leading to lower prices. According to the National Research Council, "The effect of adoption of HR soybean varieties on

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[4] The simplicity of biotech crops allows growers to reduce their time spent farming and enables them to earn additional outside income. *See* USDA ECONOMIC RESEARCH SERVICE, THE FIRST DECADE OF GENETICALLY ENGINEERED CROPS IN THE UNITED STATES, at iv (2006), *available at* http://www.ers.usda.gov/media/255908/eib11_1_.pdf ("[T]he adoption of herbicide-tolerant soybeans is associated with increased off farm household income, suggesting that farmers adopt this technology because the simplicity and flexibility of the technology permit them to save management time, allowing them to benefit from additional income from off-farm activities.").

[5] *See also, e.g.*, 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.

soybean price ranged from a decline of 0.17 percent in 1997, when adoption had only occurred in the United States, to about a 2-percent decline following further adoption in the United States and Argentina and a 2.6-percent decline for world adoption in 2001." *Id.* at 159.

Continuing agricultural innovation is vital. In addition to delivering returns to farmers and consumers, innovation enables higher yields and reduces the use of pesticides. The global population continues to grow and per-capita demand for protein is growing as standards of living rise around the world. As a result, global food demand is forecast to double by 2050, and technological innovation will be required to meet that demand without negative environmental consequences. *See, e.g.*, David Tilman, *et al.*, *Global Food Demand and the Sustainable Intensification of Agriculture*, 108 PROCEEDINGS OF THE NAT'L ACAD. OF SCI. 20260–64 (2011).

Norman Borlaug, the winner of a Nobel Peace Prize for yield-improving innovations that saved millions of people from starvation, has described how essential agricultural biotechnology is to continuing the mission of his "green revolution." As he notes, "[b]y 2025, we will have to nearly double current production again. This increase cannot be accomplished unless farmers across the world have access to current high-yielding crop production methods as well as new biotechnological breakthroughs that can increase the yields, dependability, and nutritional quality of our basic food crops." Norman E. Borlaug, *Ending World Hunger: The Promise of Biotechnology and the Threat of Antiscience Zealotry*, 123 PLANT PHYSIOL. 487, 490 (2000).

Many new biotechnology traits are being developed and could extend the benefits delivered by agricultural biotechnology to date. Traits that would offer nutritional and other health benefits include high isoflavone soybeans (which offer increased health benefits); low phytate soybeans (which allow more absorption of zinc and iron); and increased omega-3 soybeans (which offer cardiovascular benefits usually associated with fish oils). *See* U.S. SOYBEAN EXPORT COUNCIL, THE BENEFITS OF BIOTECHNOLOGY: SCIENTIFIC ASSESSMENTS OF AGRICULTURAL BIOTECHNOLOGY'S ROLE IN A SAFER, HEALTHIER WORLD, *available at* http://www.ussec.org/wp-content/uploads/2012/09/The-Benefits-of-Biotechnology.pdf. Firms are also developing traits that afford improved tolerance to stresses like drought, cold, and soil salinity and that increase yield by, for example, enabling plants to use nitrogen more efficiently.

B. Intellectual Property Protection Is Essential for Agricultural Innovation.

Intellectual property rights are essential to create the incentives that have led to the innovations in seeds and traits thus far, and the promise of intellectual property protection has been a key driver of the investments that will lead to future innovations. Agricultural innovations, notably those involving seeds and traits, are "imperfectly appropriable, meaning that the innovation, or the knowledge embodied in the innovation, can be transmitted to, imitated by, or reproduced by prospective competitors with minimal difficulty or at a low cost, and with little or no obligation to compensate the innovators." USDA ECONOMIC RESEARCH SERVICE, THE SEED INDUSTRY IN U.S. AGRICULTURE 18 (2004), *available at* http://www.ers.usda.gov/media/260729/aib786_1_.pdf

[henceforth SEED INDUSTRY IN U.S. AGRICULTURE]. The innovations of plant breeders and trait developers can be readily copied both by competing trait developers and breeders and by growers such as Mr. Bowman. *Id*.

The combination of the high costs of developing seeds (and the far greater costs of developing traits) and the low cost of reproducing those inventions, makes the protection of intellectual property essential for inventors to recover their investment in innovation. *Id*. at 22 ("Both legislative and judicial action have contributed to an IPR regime in the United States that provides an extensive set of incentives to developing new plant varieties."). The work of agricultural economists has demonstrated the importance of patent protection in spurring innovation. *See, e.g.*, GianCarlo Moschini, *Biotech—Who Wins? Economic Benefits and Costs of Biotechnology Innovation in Agriculture*, 2 ESTEY CENTRE JOURNAL OF INTERNATIONAL LAW AND TRADE POLICY 93, 102 (2001) ("[P]atents can mitigate the market failure ascribed to the public good nature of inventions (which is thought to lead to underproduction of innovations). It is believed that the strengthening of IPRs in the United States over the last 20 years has had considerable impact on agricultural research, in particular by stimulating investment in biotechnology R&D.").

Lack of effective IP protection has very real consequences for investment in innovation, because for-profit firms will not invest in innovation without the prospect of a return. "The use of saved seeds to plant subsequent crops severely limited the extent to which innovators might realize the benefits of plant breeding efforts." SEED INDUSTRY IN U.S. AGRICULTURE at

17. The availability of utility patent protection, however, "has greatly increased the amount of private sector research since 1996 with the commercially successful introduction of glyphosate-resistant soybeans." Dermot J. Hayes, *et al.*, *Impact of Intellectual Property Rights in the Seed Sector on Crop Yield Growth and Social Welfare: A Case Study Approach*, 12 AGBIOFORUM 155, 158 (2009).

Amici recognize that there is an active debate regarding the net effect of the patent system on innovation, and that even if patents spur innovation by inventors, they may reduce the ability of follow-on firms to innovate. *See, e.g.*, Jerry R. Green & Suzanne Scotchmer, *On the Division of Profit in Sequential Innovation*, 26 RAND J. ECON. 20 (1995); Richard D. Levin, *et al.*, *Appropriating the Returns from Industrial Research and Development*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY 783, 788 (1987) ("Because technological advance is often an interactive, cumulative process, strong protection of individual achievements may slow the general advance."). *Amici* also recognize that there can be a tradeoff between the dynamic efficiency enabled by innovation and the short term static losses occasioned by the impact of the patent system's exclusive rights on competition. *Id*. at 787-88.

The appropriate balance—in particular, the need for patent protection to spur innovation—varies by industry and is determined by a number of factors, including the difficulty of copying inventions, the lead time required to commercialize an invention, and first-mover advantages. *Id*. at 799-802; *see also* Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1581-84 (2003). The mix in the pharmaceutical industry makes it the "poster

child" for patent protection because discovering and testing new drugs is costly, the need for testing shortens the effective patent term, and the cost of copying inventions is low. *See* Richard A. Posner, *Why There Are Too Many Patents in America*, THE ATLANTIC (July 12, 2012). These same factors apply to the biotechnology industry, where "the long development and testing lead time characteristic of pharmaceuticals is also evident in DNA-related innovation," and "once the [genetic] sequence is known, a follow-on competitor can quite easily replicate it." Burk & Lemley, 89 VA. L. REV. at 1624-25. Indeed, a research study by agricultural economists suggests there is currently *too little* IP protection for varietals such as soybeans and that "appropriability levels"—*i.e.* the ability of an innovator to capture the value its invention brings to others—"are far lower than the social optimum." Sergio H. Lence, *et al.*, *Welfare Impacts of Intellectual Property Protection in the Seed Industry*, 87 Am. J. Agric. Econ. 951, 966 (2005).

While there remains economic work to be done to determine the optimum level of intellectual property protection, it is clear that the optimum patent term for seeds and traits must be longer than the time it takes to make a single sale and that the optimum reward for seed and trait innovation must be more than an inventor can obtain from a single sale. A rule that all patent rights are exhausted after the first sale of a patented seed or trait would lead to a reduction of seed and trait innovation and would thus harm competition and consumers.

II. ALTERNATIVES TO PATENT PROTECTION ARE INFERIOR AND INEFFICIENT.

Petitioner and its *amici* purport to identify a variety of ways in which Monsanto and other seed and trait inventors could protect their interests even if patent rights were exhausted after the first sale. These techniques would be ineffective, inefficient, or both. Rules that raise the costs and decrease the effectiveness of enforcement would both decrease innovators' incentives to license and raise the costs of licensees and consumers, as the innovators' costs of enforcement are passed through as a cost of doing business.

A. Innovators Cannot Effectively or Efficiently Rely Upon Contracts.

Amici supporting Petitioner suggest that Monsanto could effectively rely on contract law as a substitute for patent protection by requiring farmers who buy seed to sell their crop only to grain elevators that agree to obtain promises from purchasers not to allow the seed to be replanted. *See*, *e.g.*, Pet. Br. 55-56, Center for Food Safety Br. 25, American Antitrust Institute Br. 20. This suggestion is wrong.

1. Innovators have no remedy against purchasers that are not in contractual privity.

As the United States correctly states, "[c]ontractual remedies are not effective against downstream purchases who are not in privity with the patent holder." United States Br. 18. A person could readily obtain and plant the progeny of an authorized Roundup Ready soybean crop without ever purchas-

ing Roundup Ready soybean seed directly from Monsanto or a licensed seed company, and contractual remedies would be ineffective against such persons. *See* Herbert Hovenkamp, *Post-sale Restraints and Competitive Harm: The First Sale Doctrine in Perspective*, NYU ANNUAL SURVEY OF AMERICAN LAW 101, 116 (Feb. 15, 2011).

While the lack of contractual privity would prevent innovators from enforcing their rights against those that never signed a contract, there would be enormous practical obstacles to enforcement of contractual rights against those that *did* sign contracts. Seeds and traits are not labeled "originally sold to Farmer Jones," and an innovator that discovers the unlicensed use of its seed has no reliable way to know which authorized recipient of its patented seed breached its agreement by supplying that seed to others. While Petitioner Bowman acknowledged obtaining seed from an elevator, if he had claimed that he had found the seed abandoned ("it fell off the back of a truck"), or that he could not remember who provided the seed, Monsanto would have had no recourse against those who had provided the seed to him, even if they were bound by contract not to do so.

2. It is impossible for an innovator to contract with every potential recipient of its patented seeds.

Taken literally, the only way to avoid the privity problem is for the innovator to contract with every potential recipient of its patented seeds. Speaking practically, this would be impossible.

Petitioner and its *amici* would require that Monsanto contract with every entity in the soybean production and distribution chain to protect its rights,

extracting agreements from each not to save and replant patented seed and not to sell patented seed to anyone unless the buyer had likewise entered into an agreement with Monsanto not to save and replant seed or sell to anyone who could. That would mean contracting not only with every grower, but with every trucking company that brings soybeans to elevators, every grain elevator, every railroad and railcar owner that transports seed from the elevator to the processor, and every food processor that buys soybeans.

Because commodity soybeans grown in the United States are sold worldwide, seed and trait innovators would also need to contract with every foreign customer, foreign transportation company, and foreign processor dealing in U.S. soybeans, to prevent those soybeans from being reexported to the United States for planting.[6] Moreover, the US Agency for International Development distributes bags of U.S.-grown soybeans around the world as emergency food aid. *See, e.g.*, USAID, SOYBEAN COMMODITY FACT SHEET, *available at* http://www.usaid.gov/what-we-do/agriculture-and-food-security/food-assistance/resources/soybeans-commodity-fact-sheet. According to the most recent USAID report, bags of soybeans were distributed to hundreds of thousands of needy recipients in Liberia and Afghanistan. *See* USAID, U.S. INTERNATIONAL FOOD ASSISTANCE REPORT 2010, *available*

[6] This Court has never addressed the application of the first sale doctrine to patented items first sold outside the United States. But because we are addressing the foreign sale of seed first sold in the United States, to which exhaustion might otherwise apply, innovators would need to contract with these foreign entities to protect their rights.

at http://pdf.usaid.gov/pdf_docs/PDACT300.pdf.[7] It goes without saying that it is not feasible to require a seed or trait innovator to protect its rights by prohibiting the sale of soybeans to the United States government unless the government in turn agrees to extract a contractual commitment not to resell soybeans for reexport to the United States from each of the hundreds of thousands of impoverished recipients of U.S.-grown soybeans provided as food aid.

3. It would be infeasible to enforce contract rights.

Even if all of the required contracts could be negotiated and executed—and, of course, they could not be—it would be difficult and expensive to enforce contractual rights. It is doubtful that innovators could obtain effective relief.[8]

Beyond the obvious difficulties in enforcing a contract barring resale in the United States against Afghan and Liberian recipients of bags of U.S. soybeans as food aid, innovators are unlikely to have

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[7] Many other recipients receive soybean meal rather than whole soybeans. While it might be possible to extract patented genetic material from soybean meal, we focus here on the sale of whole soybeans.

[8] Monitoring and transaction costs already make it difficult and expensive to enforce current contractual rights with parties in privity with Monsanto. *See* Jeremy P. Oczek, *In the Aftermath of the "Terminator" Technology Controversy: Intellectual Property Protections for Genetically Engineered Seeds and the Right to Save and Replant Seed*, 41 B.C. L. REV. 627, 646 (2000) (noting that "licensing agreements pose problems for seed developers who seek to reinforce the patent and PVPA protection available for seeds," in particular, that "the effectiveness of these agreements is severely limited by the enormous monitoring costs that they demand.").

effective remedies even against parties in the United States that breach their agreements to resell seed only to buyers that have themselves agreed with the innovator not to replant saved seed. Saving and replanting the seed produced from a single bag of seed can yield 36 bags the following season, and the progeny of a single bag of seed can plant more than 46,000 acres (36^3) after three years. Given average farm net worth of $576,000, USDA ECONOMIC RESEARCH SERVICE, AGRICULTURAL INCOME AND FINANCE OUTLOOK 1 (Dec. 2011), *available at* http://www.ers.usda.gov/media/246635/ais-91_3-1-12.pdf, many farmers are likely to be judgment proof if they resell a substantial volume of seed in violation of their agreement with the trait developer. Rather than concentrating liability on parties who, if they could be identified at all, would be unable to cover the trait developer's loss, it would more be effective for the developer to sue each recipient of the seed for patent infringement, collecting from that infringer only the damages accruing from the infringer's use on his own land.

B. Introducing "Terminator" Technology is Not a Viable or Desirable Solution.

Some *amici* suggest that Monsanto could implement a technological solution to protect its investment in developing genetically-improved crops. *See, e.g.*, American Antitrust Institute Br. 33; Knowledge Ecology International Br. 13 n.2. Gene Use Restriction Technology (GURT) includes a range of technologies employed at the genetic level to limit the use or spread of specific genetic material in agriculture. One type of GURT is sterile seed technology in which seed produced by a crop will not grow, and

has been dubbed "terminator technology" in the popular press.

There is no commercially available "terminator technology," and there may never be. The U.N. Food and Agriculture Organization has recommended that GURT technologies not even be approved for field testing by parties to the Convention on Biodiversity (to which the United States is a signatory). *See* SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY, HANDBOOK OF THE CONVENTION ON BIODIVERSITY 332 (3d ed. 2005). Even if such technologies became available, there would be significant concerns regarding public acceptance of the product, which could reduce demand and make commercialization infeasible. As a result of these concerns, Monsanto committed in 1999 not to commercialize sterile seed technology in food crops and continues to stand by this commitment. *See* MONSANTO COMPANY, IS MONSANTO GOING TO DEVELOP OR SELL "TERMINATOR" SEEDS?, *available at* http://www.monsanto.com/newsviews/Pages/terminator-seeds.aspx; OPEN LETTER FROM MONSANTO CEO ROBERT B. SHAPIRO TO ROCKEFELLER FOUNDATION PRESIDENT GORDON CONWAY AND OTHERS (Oct. 4, 1999), *available at* http://www.monsanto.com/newsviews/Pages/monsanto-ceo-to-rockefeller-foundation-president-gordon-conway-terminator-technology.aspx.

C. Ceasing the Sale of Traits in Varietal Seeds Would Harm Consumers.

Amici American Antitrust Institute *et al.* suggest that innovators could simply stop selling traits in varietal seeds: "From the beginning [Monsanto] could have abstained from using its technology to create the glyphosate tolerant soybean seed or other inbred

seed lines and instead confined its applications to hybrid seeds that do not produce true copies of themselves." Br. 33.[9]

Every innovator could avoid patent exhaustion (or any other limitation on its ability to exploit its patent rights) simply by not innovating. But this "destroy the village to save it" approach would have truly devastating consequences, and it is difficult to imagine that *amici* intend this proposal to be taken seriously. More than 90% of U.S. soybean acres are planted with patented varieties or unpatented varieties that contain patented traits. *See* USDA, RECENT TRENDS IN GE ADOPTION, http://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/recent-trends-in-ge-adoption.aspx. These soybean acres are critical for the world's food supply and the American economy, and cannot simply be planted with something else or left fallow. Even if *amici* are instead suggesting that these acres be planted with unpatented varieties that do not contain patented traits, this step would deny farmers and consumers the enormous benefits of the patented technology that we have described above.

III. APPLYING THE PATENT EXHAUSTION DOCTRINE TO PATENTED SEED WOULD HAVE NEGATIVE ECONOMIC EFFECTS.

Because there are no viable contract or other alternatives to the use of patent protection, applying

[9] Because varietal seeds are patentable, *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124 (2001), it is not clear whether the American Antitrust Institute and those that joined its brief are proposing that breeders stop selling patented varietal seeds as well.

patent exhaustion to the first sale of a patented plant seed would produce economic inefficiencies and distortions. If this were the law, authorized sale of even a *single* varietal seed would exhaust all patent rights. The progeny of that seed could be replanted for crop use or used by a rival seed company for breeding without any payment to the innovator. As described above, reproduction from a single soybean seed is exponential—all patented Roundup Ready soy grown in the United States is the descendant of a single seed transformed by Monsanto's researchers to include a particular genetic sequence in a particular location in the soybean genome. The progeny of that single seed are now planted on over 90% of US soy acres. If Monsanto were unable to prohibit this type of exponential reproduction, it would lose the ability to protect its patented technology as soon as the first generation of the product was introduced into the market.

A. Application of Exhaustion Would Lead to Higher Prices for Patent-Protected Seeds and Traits, Less Efficient Markets, and Less Innovation.

Monsanto's current Roundup Ready license terms prohibit farmers from saving and replanting seed and authorize farmers to use Monsanto's technology to grow only a single commercial crop, and Monsanto's license fee is set in a way that reflects the limited rights conveyed. *See* Resp. Br. 34-35. If the exhaustion doctrine prevented developers of patented seeds and traits from limiting their licensees to growing a single commercial crop, prices would increase, output would decline, and intellectual property owners would be forced to use less efficient business

models as they attempted to obtain a return on their investment in innovation.

1. Seed and trait prices would rise as innovators set prices to capture the full value of the use of their inventions over many generations of seed.

If the exhaustion doctrine applied, seed and trait innovators would need to price seed to capture not just the value of a single use, but the value of using the seed and trait for many generations in the future, as well as the value of the right to breed with the seed. This price for perpetual rights to use and reuse the patented technology would necessarily be far higher than the price to use the technology a single time.

This price increase would reduce the welfare of farmers for several reasons. While there might superficially appear to be no economic difference between charging annual license fees and charging a single perpetual license fee that is the discounted present value of those annual payments, the analysis is not so simple. Given the choice, different farmers would engage in seed saving to different degrees. In fact, even before transgenic traits emerged, most soybean farmers did not save seed but instead purchased new seed of whatever variety each believed was likely to produce the greatest yield in a particular environment. *See, e.g.*, SEED INDUSTRY IN U.S. AGRICULTURE at 36 ("About 25% of soybean seed in 1997 was estimated to be farmer saved."). In a world where seed and trait patents were exhausted after the first sale, the higher up-front cost of seeds and traits (that included saved seed rights) would push farmers to

save seed when they would otherwise prefer not to do so. The majority of farmers that would prefer to take advantage of new seed varieties each year rather than save seed would experience a loss in welfare from the inability to cost-effectively purchase the best new seed varieties each year, even if the cost of a perpetual license were financially equivalent to the cost of buying new seed each year.

Farmers would also suffer because, even if the price for a perpetual license were set at the present value of annual license fees, farmers are not indifferent to high up-front costs. Many individual farmers borrow to buy seed, paying back the loan when the crop is harvested. If farmers faced a higher up-front cost, loans would need to be larger, have longer terms, and would be riskier and subject to higher interest rates.

This harm to farmers would translate into consumer harm in several ways. Farmers that lost the practical ability to buy new and improved varieties each year would suffer from reduced crop yield, reducing output and raising prices to consumers. Farmers' increased financing costs for longer term loans would also be reflected in higher prices passed along to consumers. Finally, smaller farmers with less access to capital are likely to be disproportionately harmed by a shift from annual license fees to an upfront pricing model. These farmers will face higher costs and be less effective competitors.

2. Applying exhaustion could lead to a reduction in procompetitive outlicensing.

As discussed above, if the first seed sale exhausts patent rights, absent viable contractual protections a

seed or trait developer would need to charge the full value of its traits up front. Currently developers are able to price the use of their traits or seed germplasm differently for different kinds of rights and different intensities of use. For example, the fee charged to a university for a research license will differ from the fee charged to a competing seed company for the right to incorporate a patented trait in their seed or breed with patented germplasm, and both of these fees will differ from the license fee paid by a farmer who wishes to grow a single commercial crop. Such price discrimination based on intensity of use is generally considered pro-competitive since the licensee values use of the patent in rough proportion to the benefit it gains.

Difficulty in metering the intensity of use by commercial licensees will act as a disincentive to outlicense. If a first sale exhausts rights in traits or germplasm, outlicensing to a small competitor or university poses the same commercial risks to the licensor as outlicensing to a large competitor, because any of these licensees will be able to flood the market with seed containing the innovator's intellectual property without incremental payments to the inventor. In such a world, a rational innovator will raise prices to small firms or universities that seek a license, thus reducing the ability of small firms and universities to engage in complementary innovation.

3. Applying exhaustion could raise barriers to entry and reduce the competitiveness of seed and trait markets.

A shift from an annual licensing model for seeds and traits to a higher single upfront fee will likely

lead to increased concentration in the seed and trait markets, leading to higher prices and reduced output.

Forcing farmers to choose a perpetual license would tend to create a "lock-in" effect that would make seed markets less competitive. After farmers have paid their upfront fee for a perpetual license, their incremental cost to save and replant seed would be quite small, particularly in comparison to the large upfront fee that another seed company would demand for the perpetual right to plant its competing seed.

This price disparity would deter farmers from doing business with a new seed company after the initial choice of seed, raising barriers to new entry and tending to lock in place the current market positions of seed companies. It is difficult for firms to compete with the "almost free" cost of planting the incumbent's soybeans after a farmer has paid the initial license fee, even if they have developed superior new varieties and priced them aggressively. *Cf.* Richard Gilbert & Carl Shapiro, *Antitrust Issues in the Licensing of Intellectual Property: The Nine No-Nos Meet the Nineties*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY: MICROECONOMICS 283, 310-11 (1997) (describing economic theory underlying Department of Justice challenge to Microsoft's use of per-processor license fees, in which OEMs paid for Microsoft software whether they used it or not).

4. Application of patent exhaustion would distort incentives for future crop research toward hybrid seeds and away from varietal crops.

Applying patent exhaustion to authorized sale of a patented seed would distort incentives for future seed

research and innovation. Hybrid seeds, such as corn seed, cannot be saved because the crop produces seeds that lack vigor and have reduced yield compared to the parent seeds. The single-use character of hybrid corn protects the ability of seed breeders and trait developers to recover research and development costs for development of new hybrid seed varieties and traits. *See* A. Bryan Endres, *State Authorized Seed Saving: Political Pressures and Constitutional Restraints*, 9 DRAKE J. AGRIC. LAW 323, 324 (2004) (citing SEED INDUSTRY IN U.S. AGRICULTURE at 2, 19-20, 25).

In contrast, varietal seeds such as soybeans self-pollinate and may be saved and replanted by farmers from season to season without a significant decrease in yield (as Petitioner Bowman has demonstrated). Beyond the issue of farmer saved seed, competing seed breeders can easily appropriate and integrate improved self-pollinating varieties into their own product lines. *Id.* at 324-25 (citing SEED INDUSTRY IN U.S. AGRICULTURE at 18).

As a result, seed and trait developers are much more dependent on both intellectual property and contractual mechanisms to restrict seed saving and replanting to protect their research investments in improved varietals seeds than is the case for hybrid crop seeds. *Id*. at 325. Because application of patent exhaustion to the first seed sale would limit the ability of those holding intellectual property rights to prevent the saving of varietal seed, it would be much more difficult for seed breeders and trait developers to recover investments in intellectual property covering innovative new varietal seeds, while the cost-benefit calculation for hybrid seed innovators would remain unchanged. The unavoidable result would be

to distort current incentives for investing in varietal versus hybrid seed research, shifting R&D investment from varietal seeds and traits for such seeds to hybrid seeds and the traits for those seeds. *See* Dermot J. Hayes, *et al.*, *Impact of Intellectual Property Rights in the Seed Sector on Crop Yield Growth and Social Welfare: A Case Study Approach*, 12 AgBioForum 155 (2009) (case studies of impact on private research funding and crop yields of intellectual property protection suggesting ability to save seed and transactional and reputational costs of enforcing intellectual property rights in US wheat has undercut significant private research in seed improvements; whereas in hybrid corn, private sector investment is very strong). It would be poor policy to discourage investment in varietal seed innovation research while increasing in a relative sense the incentives to innovate in corn and other hybrids.

B. Applying Exhaustion Could Lead to Increased Vertical Integration, Which Could Reduce Efficiency and Competition.

Companies historically have chosen from two basic models to extract the value of intellectual property. Some companies choose to keep their intellectual property entirely within the organization by vertically integrating and engaging in all aspects of the design and production process in-house. Other companies adopt a strategy of performing certain functions in-house but also licensing others to enable the development of other products that are complementary to the patent holder's technology, thus potentially increasing the demand for the rights holder's invention. For example, Apple's iOS operating system for phones and tablets is available only on hard-

ware that Apple provides. Google, in contrast, has broadly licensed its Android operating system, which is available on phones and tablets from Google's competitors as well as from Google itself.

Both models have been used in the seed and trait business. For example, Dow's Herculex® insect protection trait was originally available almost exclusively in seed sold by Pioneer (Dow's development partner) and in Dow's Mycogen® brand. *See New Bt Trait Launched by Pioneer, Mycogen*, CORN & SOYBEAN DIGEST (June 21, 2001), *available at* http://cornandsoybeandigest.com/new-bt-trait-launched-pioneer-mycogen. In contrast, Monsanto has espoused broad licensing: its strategy has been to make its traits available in the germplasm of as many different seed companies as possible. *See, e.g.*, GianCarlo Moschini, *Competition Issues in the Seed Industry and the Role of Intellectual Property*, CHOICES, *available at* http://www.choicesmagazine.org/magazine/print.php?article=120 (discussing Monsanto's broad licensing strategy).

One of the reasons that firms integrate vertically is to lower transaction costs involved in negotiating, monitoring and enforcing contracts. *See, e.g.*, Dennis W. Carlton & Jeffrey M. Perloff, MODERN INDUSTRIAL ORGANIZATION 380 (3d ed. 2000). Accordingly, a rule that seed and trait patents are exhausted by a first sale could push inventors to a vertical integration model for a number of reasons. First, both traits and varietal parent seed are supplied to seed companies in germplasm that the licensees use to breed their own soybeans. Because the sale of that breeder stock would exhaust the innovator's rights in its invention, the innovator would need to rely on contract remedies rather than patent infringement claims against

the licensee, with all of the costs and risk that we have described above.

Additionally, a rule of exhaustion would reduce incentives to outlicense traits and germplasm because, by outlicensing, innovators take a risk that a licensee will destroy the innovator's business model by selling to customers who save and replant seeds without adequate contractual protection of the innovator.

Because the core of an intellectual property right is the right to exclude, innovators are not required to license their inventions to competitors. *See, e.g.*, *Hartford-Empire Co. v. United States*, 323 U.S. 386, 432 (1945) ("A patent owner is not in the position of a quasi-trustee for the public or under any obligation to see that the public acquires the free right to use the invention. He has no obligation either to use it or to grant its use to others."). But there is no efficiency justification for policies that *prohibit* the broad licensing of intellectual property rights. While vertical integration is not inherently inferior to a broad licensing model, denying innovators the choice to license broadly is inefficient and anticompetitive.

Providing incentives for seed and trait developers to create closed systems would harm growers by reducing competition to supply soybeans containing a particular trait. Broad trait licensing means that traits can be available in soybeans offered by dozens of soybean seed companies, instead of just companies affiliated with the trait developer. Farmers benefit from the competition among seed suppliers this incentive structure enables. The alternative model—where Monsanto traits are available only in Monsanto germplasm and Dow traits are available only in

Dow germplasm—would lead to higher prices and less innovation.

CONCLUSION

For the reasons described in this brief, the judgment of the court of appeals should be affirmed.

Respectfully submitted,

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