Hearing on

Intellectual Property – Driver of Innovation

Making Our Lives Healthier, Safer, and More Productive

United States Senate Committee on the Judiciary

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Written Statement of Neal Gutterson, PhD

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Good morning Chairman Grassley, Ranking Member Feinstein, Senator Coons, and Members of the Committee. My name is Neal Gutterson and I am vice president of Research & Development for DuPont Pioneer, a multi-billion dollar, advanced seed and genetics business of DuPont. Thank you for the opportunity to testify today about an issue of critical importance to food and farming as we celebrate World IP Day this week.

DuPont is the birthplace of a diverse array of innovations that touch every aspect of our lives. Our long line of innovation includes well-known technologies and products from Kevlar® and Tyvek® to seed and crop protection. These products reached the market as a result of ingenuity, many years of dedication, and strong intellectual property (IP) protections.

As an innovator, DuPont generates a range of IP from patents to trade secrets. Realizing the full potential of our innovation often includes knowledge-building that can span decades. At every step in the innovation process and in all aspects of our business, we depend on IP protection – particularly in agriculture.

I want to express my gratitude to our government and this Committee for their active engagement in promoting public policies that encourage innovation and protect IP. Last year, the Committee voted in support of the Defend Trade Secrets Act to strengthen federal safeguards for a critical form of intellectual property known as trade secrets – the know-how and expertise developed over time that enable companies of all sizes to bring an innovation developed in the laboratory and the field to the commercial marketplace.

I have seen firsthand the importance of the intellectual property protections guaranteed by the work of this Committee and others in government. From larger companies like DuPont Pioneer, to smaller companies to agricultural organizations like The International Maize and Wheat Improvement Center, known internationally as CIMMYT, each plays an integral role in advancing the vision of innovation that drives the food and farming industry. The IP safeguards advanced by this Committee offer stability to all players in food and farming, large and small, who can operate with the assurance that they are protected from economic loss due to IP theft. This keeps the United States competitive in the global economy and allows our scientists and researchers to do what they do best – offer American farmers the tools and products they need to meet global demand for high-quality, nutritious food, as well as feed, fuel and materials.

As many of you know, agriculture is in a period of transformation. We are challenged with global food security and increasingly pressured by pests, disease and resource scarcity, yet empowered with the know-how, skill and technology needed to prevail under any circumstances. The three areas that I will discuss with you today - Seed and Germplasm Protection, Digital Agriculture and Genome Editing (CRISPR-Cas) - reflect the past, present and future of agricultural innovation. I am honored to represent DuPont Pioneer, the company I believe is best positioned to help solve the challenges facing agriculture around the world.

Seed and Germplasm Protection

DuPont Pioneer invests approximately half of its research and development (R&D) budget in seed innovation. This year, our company will offer North American growers 53 new top-yielding corn hybrid products, all cultivated from the DuPont Pioneer global germplasm collection. These products are genetic hybrids that serve as vehicles for insect, disease and additional pest traits that protect grower crops against agricultural and environmental pressures in their fields.

In 2015, we invested $91.6 million to develop 140 new lines of inbred corn seed, or over half a million dollars per new inbred line. Let me share with you some perspective into what this substantial

investment means to DuPont Pioneer and our customers. Each year, Pioneer develops new base inbreds. Each base inbred is an essential building block of a final hybrid product that is delivered to growers. Pioneer then further enhances these base inbreds with native or biotechnology traits, and uses these enhanced inbred lines to develop the best hybrid combinations to deliver maximum value to growers. Improved yield potential and improved grain obtained through this ongoing process is essential for farmers as well as the societies that depend upon their grain output.

Equally important are IP safeguards that protect this investment in innovation. For example, in 2013, DuPont Pioneer security staff detected suspicious activity at one of its breeding sites and alerted the Federal Bureau of Investigation (FBI). DuPont Pioneer fully cooperated with the FBI, the Assistant Attorney General for National Security and the Acting U.S. Attorney of the Southern District of Iowa throughout the investigation and prosecution of a Chinese national for the theft of inbred corn seeds. In January 2016, this Chinese national pleaded guilty to conspiracy to steal trade secrets and admitted to participating in a long-term conspiracy to steal trade secrets from DuPont Pioneer and Monsanto. He further admitted to participating in the theft of inbred corn seeds from fields in the Southern District of Iowa for transporting those seeds to China.

The United States is one of very few countries that provides utility patent protection for seeds. We rely heavily on this type of IP to protect our investment in seed and crop quality enhancement. However, in the example above, the seeds that had been stolen were early in the product development process and had not yet been patented. That's why the spectrum of protection offered by patents, Plant Variety Protection (PVP) and trade secret laws are so critical. In a paper by Hayes et al.[1] used three separate case studies to demonstrate that the "greater the amount of effective IP protection (as measured by the ability of seed companies to profit from successful research), the greater the genetic

[1] Dermot J. Hayes, Sergio H. Lence, and Susan Goggi. 2009. "Impact of Intellectual Property Rights in the Seed Sector on Crop Yield Growth and Social Welfare: A Case Study Approach," *AgBioForum* 12(2): 155-171.

gain" (yield gain based on available genetic resources). In short – stronger IP protections both incentivize innovation by and protect the investment of seed companies.

In the absence of adequate IP protection, investment into agriculture could find itself shifted to other areas. As a business, DuPont Pioneer supports the opportunity to obtain patents for plant-related inventions worldwide. Published patent documents offer a vast accessible source of cutting edge global technological information. Patents in our industry encourage high levels of investment and innovation leading to significant improvements in agricultural productivity and thereby increase access to a broader base of germplasm diversity.

We support and encourage critical assessments and establishments of trade agreements to continue to ensure strong IP protection. DuPont Pioneer remains committed to encouraging the mobilization of industry groups and to working with governments around the work to ensure strong IP protection.

Digital Agriculture

I would now like to turn to how DuPont Pioneer uses digital agriculture. Digital agriculture is made up of the digital information and digital systems we use to leverage our expertise in seed and germplasm, across crops and across geographies to interface crop models and advanced analytics to help growers make more insightful, real-time decisions in their farming operations. In this highly technical agricultural profession, sensors collect data from satellites, unmanned aerial vehicles (UAVs) and weather stations. Tractors capture real-time data that are fed into analytics platforms, starting with yield prediction at the time of planting. Weather, pest and pathogen data collection continues through the season.

This data enables DuPont Pioneer and our growers to calculate real-time yield predictions and allows decisions to be made, at critical times throughout the cropping season. The complex data sets are used to enable end-to-end prediction of product performance and maximize yields, year over year. The data-driven analytics are used to predict and create superior products for specific environments. Today, we are investing heavily in new field sensing technologies and analytic methodologies to enhance these data-driven technologies.

Field monitoring using UAVs is one of many tools used in data collection at DuPont Pioneer, but often results in the most interest from the public due to increased familiarity with UAV technology as it becomes more widespread. To give you a sense of the growth in this area, in 2014, we collected data using UAVs from approximately 25 research locations. In 2017, we will collect data using UAVs on more than 20 times the number of research locations and will collect millions of data points. This technology allows us to collect more data, more efficiently, positively increasing productivity and product development for growers.

Beyond R&D, other DuPont Pioneer teams use data to make decisions about product placement, test customer agronomic management recommendations, and modernize our supply chain. Digital agriculture fuels improvement in planning, risk management, and inventory utilization, as well as in the manufacturing and delivery of seed.

On the customer-facing side, we use individual and aggregated data to give growers better insights into their fields, into their crops, and to help them mitigate risks. Through DuPont Pioneer service products like Encirca™, our teams work with growers to use a web-based dashboard to manage elements that are part of their growing operations. With this service and technology package, growers can more precisely determine farming input needs like seed, nitrogen fertilizer, and fertility inputs like phosphorus, potassium and lime. They can also analyze harvest results to understand, in detail, what happened in their fields during the growing season, when, and why.

All aspects of agriculture benefit from the ability to sharpen insights into food, feed, fuel and materials production and optimize and predict best practices to meet the needs of a growing population. Sustainability and measurability will improve as a direct result of our investments in digital agriculture. Analytics will have an immediate benefit on water conservation and fertilizer management. Our product development timelines will be shortened, and our product lifecycles will be precisely managed due to new insights and understanding of exactly which genetics result in the best products for our growers in the United States and around the world.

Data collection at the local, regional, and national levels provides us with real-time information to responsively and dynamically predict the yields of crops at the macro and micro level, ultimately creating a more stable operating environment with predictable outcomes that drive results and insights for the growers we serve. At the same time, we understand that there is an increased public interest in data collection and privacy.

DuPont Pioneer respects data privacy and supports private industry and government protection of it. Even prior to the advent of digital agriculture and heightened attention to data privacy, DuPont Pioneer has been collecting and analyzing agronomic, yield, climatic, customer and other market and economic data since the inception of our company in the 1920s. We have a long history of carefully safeguarding this information and abiding by our Long Look ethical business principles and Core Values.

Without data, part of our research engine would be crippled; the absence of data decreases the responsiveness of our science and decreases the efficiency of our solutions. Each Pioneer employee has a vested interest in data privacy and supports the judicious management of its use as it relates to them personally, as it relates to the protection of their family members who own and operate farming establishments, and as it relates to the protection of the citizens of our country. We partner with them and take data privacy very seriously.

Globally we see a very diverse spectrum of approaches to regulation and interpretation of data collection. Certain governments have grounded UAV technology. Others sit suspended in adapting their

current policies as they wait for key global players to determine their respective laws. DuPont Pioneer confidently stands behind the remote sensing data collection, the responsible and safe use of UAVs, and the protection of data they collect as we pledge to uphold data privacy. We are committed to protecting our customer data and promote the collection of data to deliver superior products and services.

Genome Editing and CRISPR-Cas

Building upon on our solid foundation of hybrid development, our business is paving the way for continued advancements in plant breeding innovations. At DuPont Pioneer, we are committed to helping growers produce more and better food, with fewer resources, through improved plant genetics. We have been fulfilling this mission over the past 90 years, beginning with the commercialization of the first corn hybrids in the 1920s, with co-developing one of the first biotech traits with Dow AgroSciences in the 1990s and, now, as an early adopter of one of the most exciting biological breakthroughs of the 21st century – *CRISPR-Cas* – one of the most advanced in many genome editing techniques.

Growers face real challenges because plants are under constant stress from climate change, drought and disease. These challenges, coupled with rapid population growth and changing diets, requires agricultural innovation to keep pace. CRISPR-Cas helps our scientists to develop innovative and sustainable solutions for growers like those realized through conventional plant breeding practices, but with even greater quality and accuracy, and with more efficient development timelines.

For example, DuPont Pioneer is working toward bringing a next generation of waxy corn hybrids to the United States market by the end of the decade as our first commercial product developed with CRISPR-Cas advanced breeding, pending field trials and regulatory reviews. We intend to continue to develop seed products with CRISPR-Cas and have several product concepts under way focused on disease resistance, drought tolerance and improved hybrid systems. The technology has applicability for all Pioneer crops of interest.

DuPont Pioneer acquired rights to this advanced plant breeding technology through collaboration with several institutions. In addition, the DuPont patent estate comprises multiple patent applications related to the use of CRISPR-Cas and other gene editing technologies. We believe that we are building a competitive position and we continue to add to our portfolio.

This advanced breeding technology is also a foundational element to the DuPont Pioneer strategy for Open Innovation. The global scientific community does their best work when we all collaborate. We will be sharing our expertise and resources to help elevate and advance the research of smaller companies doing incredible work around the world.

For example, DuPont Pioneer and CIMMYT have formed a public/private partnership to jointly develop improved crops using CRISPR-Cas advanced plant breeding to address the needs of smallholder farmers around the world. A range of potential product targets are under consideration by the newly formed Pioneer-CIMMYT Steering Committee. The first project will apply CRISPR-Cas to address the devastating maize lethal necrosis disease in Sub-Saharan Africa.

Pioneer welcomes the opportunity to collaborate with others to realize the full potential of the CRISPR-Cas advanced breeding technology in developing innovative solutions for production agriculture and society. We believe that the true value of this important plant breeding innovation will be achieved through active engagement with customers, academia, governments, NGOs and public research institutes to develop new solutions to the toughest agricultural challenges. We will continue to expand innovations with our Open Innovation model and collaborate with small companies of all sizes to deliver results for growers.

Conclusion

I am hopeful and eager to see the future of agriculture through the lens and products of our company and in partnership with others in the agricultural sector. On behalf of DuPont Pioneer, I'd like to thank Chairman Grassley, Ranking Member Feinstein, Senator Coons, and the Members of this

Committee for your continued support of the IP protections that allow us to deliver critical innovation to growers in the United States and around the world.

All of agriculture benefits when we have stronger IP protection. I urge the Committee to continue to take an active role in influencing the global playing field to create an appropriate governance framework for stronger germplasm protection, agricultural research data collection including using UAVs and remote sensing, and the use of technologies like CRISPR-Cas enabled advanced breeding technology. As an industry, we use and need the same underlying technologies, benefit from the same advancements in genetics and new germplasm insights, and ultimately serve the same audience: growers and ultimately, consumers.

Again, thank you for the opportunity to testify today. I will be pleased to answer questions you may have or supply additional information for the record.