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AGRICULTURAL BIOTECHNOLOGY: 21ST CENTURY ADVANCEMENTS AND APPLICATIONS

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Good morning, Chairwoman Plaskett, Chairman Costa, Ranking Member Baird, Ranking Member Johnson, and members of the Subcommittees. I am Jack Bobo, CEO of Futurity, a food foresight company. Prior to joining Futurity, I served for four years as the Chief Communications Officer and Senior Vice President for Global Policy for Intrexon Corporation, a synthetic biology company, which has since rebranded as Precigen. While you may not be familiar with the Intrexon name, you are likely familiar with some of the company's subsidiaries which included Okanagan Specialty Fruits, developer of the non-browning Arctic Apple, Oxitec developer of the genetically engineered mosquitoes that targeted the vector for zika and yellow fever, Viagen, the market leader in animal cloning, and Trans Ova Genetics, a market leader in animal genetics. I also previously served on the board of AquaBounty Technologies, which developed the AquAdvantage salmon.

Prior to joining Intrexon I served for 12 years as the senior advisor for global biotechnology at the U.S. Department of State under four secretaries and during two administrations. I also ran the Department's Biotechnology Division in the Economic Bureau. During that time, I traveled to approximately 50 countries meeting with ministers, parliaments, executives, scientists and students to discuss biotechnology policy and regulations. I also participated in and/or led numerous biotech trade negotiations. In 2015 I was recognized by Scientific American as one of the one hundred most influential people in biotechnology.

In my current role as CEO of Futurity I work with food technology startups and big food brands to help them understand what the future of food looks like and where consumer attitudes are going so they can navigate an ever more complex world. Earlier this year I published the report: 'The role of innovation in transforming the global food system.'[1] Most recently I published the book, 'Why smart people make bad food choices.'

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[1] https://www.agshowcase.com/the-role-of-innovation-in-transforming-the-global-food-system

I am pleased to be here today to discuss *Agricultural Biotechnology: 21st Century Advancements and Applications.*

There can be no more important topic than the future of agriculture because the future of the planet depends on the actions we take about the food we eat over the next three decades. Agriculture will either save the planet or destroy it.

Despite producing more food than ever, there are still nearly 800 million people undernourished and over 2 billion people facing moderate to severe food insecurity. The situation has grown more severe as COVID-19 has led to increasing unemployment, which disproportionately impacts lower income communities. Meanwhile, about 2 billion people are overweight or obese, contributing to a growing incidence of food related diseases. At the same time, an estimated one-third of all food produced globally is lost or goes to waste.

Climate change is creating more challenges to food production due extreme weather conditions, such as droughts, floods, and fires around the world. However, our global food system is also a part of the problem. The footprint of agriculture is enormous in terms of land, water, and climate change.

In fact, torty percent of all the land on earth that could be used for agriculture is being used for agriculture today. The amount of cropland is the size of South America and the amount of pasture land is the size of Africa. In terms of water, there is nothing more important than agriculture as well. Seventy percent of all freshwater is used for agriculture. The Colorado River, the fifth largest river in America no longer flows to the sea, largely because of agricultural withdrawals. Ten to fifteen percent of greenhouse gas emissions come from agriculture and another ten to fifteen percent from deforestation, eighty percent of which is caused by agriculture. As if that weren't bad enough, eighty percent of biodiversity loss is also caused by agriculture.

Unfortunately, the situation is likely to get worse before it gets better. The global population is expected to increase by an additional two billion people by 2050. Demand for food is expected to rise even faster as a result of increasing incomes. As a result, we will need fifty to sixty percent more food by 2050.

Despite this incredible challenge, there is also reason for hope. Over the last 50 years the global food system has managed to increase production faster than the growth in global population, leading to significant reductions in hunger as a percent of population. If we were farming today using 1960s technology, we would need an additional 1 billion hectares of land to produce the food we do today, which is more than a quarter of the 3.6 billion hectares of forest remaining on the planet.

Transforming the food system to be more sustainable and resilient provides one of the best opportunities to make change for the better. Counterintuitively, agriculture is both the biggest driver of deforestation and the biggest protector of forests through productivity gains. An improved food system will not only promote rich biodiversity and ecosystems, but people who are resilient and empowered as well.

Many organizations are waking to these challenges and calling for changes to how food is produced, processed, and consumed, from the United Nations to the World Economic Forum. By considering the food system as a whole, we are better positioned to understand problems and to address them, in a more connected and integrated way.

Decisions about how and what to grow inevitably result in tradeoffs. Over the last fifty years, advances in farming practices and technologies, such as the Green Revolution, dramatically reduced global hunger as well as deforestation, but they also had negative consequences, including eutrophication of waterways, reduced soil fertility, soil erosion and toxicity, diminishing water resources, and pollution of ground water. The alternative, of course, was greater hunger and starvation, which would have also had negative impacts on the environment.

To address the very real challenges faced by people and the planet we need all tools at our disposal. Initiatives aimed at transforming the food system cannot succeed in delivering the benefits desired without acknowledging the role innovation played in the past and ensuring that it plays an equally robust role in the future. This includes advances in food production that regenerate soil and sequester carbon, but also innovations that allow more food to be produced on the same land using fewer inputs.

My remarks today focus on the role of agricultural biotechnology in contributing to a more sustainable, just, and nutritious future, not because it is a silver bullet, but because it is an important tool. We could as easily spend our time discussing the critical importance of cover crops, field margins and intercropping, but those are topics for another day and other subcommittees.

My fellow panelists will provide more detailed examples of the contributions of plant and animal biotechnology to sustainability and health, but I would like to illustrate the importance with a few examples.

Thirty to forty percent of all food produced in America is wasted. Food waste exacts a terrible toll in terms of the environment. Potatoes and apples are the second and third most wasted food items (bread is number one). Non-browning versions of these products are already available. Wider adoption of these varieties would benefit the environment and consumers, as well as the bottom line of producers. Similar benefits will accrue from the deployment of animal biotech products such as the AquAdvantage salmon, which could add jobs domestically and reduce U.S. dependence on $3 billion in Atlantic salmon imports.

Globally, the picture is quite diverse. We see some countries forging ahead with deployment of genetically engineered and gene-edited products, while others continue to put in place regulatory barriers to adoption.

In Asia, Japan has traditionally taken a cautious approach agricultural biotechnology. However, the country has taken a great leap forward this year with the placing on the market of the first plant and animal gene-edited products—a tomato with a healthier nutrient profile and a meatier fish. Japanese regulations allow such products to be marketed without the regulatory

hoops required of a genetically engineered food product, though they must be registered with the Ministry of Health.

On the other hand, the European Union took a step in the other direction last week with the Parliament's adoption of the Commission's Farm to Fork Strategy (FtF), which would move gene editing regulations in the direction of genetically engineered food products rather than regulating them like their conventional counterparts. This outcome occurred despite a concerted effort on the part of academic and research communities in Europe to limit the regulatory hurdles for these products to promote innovation and accelerate adoption.

Studies conducted on the impact of the FtF Strategy by the USDA,[2] HFFA Research,[3] the Joint Research Centre of the EU (JRC),[4] Kiel University as well as Wageningen University and Research (WUR)[5] all conclude that this strategy would have several significant negative impacts in terms of emissions, imports and hunger.

For example, the JRC study anticipates that the decrease of between 40 and 60 percent of GHG emissions from European agriculture from the implementation of Farm to Fork targets will lead to outsourcing European agricultural production, including its agricultural footprint (and emissions) to third countries. The Kiel University study projects that Europe could become a net food importer, in direct contradiction to the European Commission's expressed strategic goals. Finally, the USDA study concludes that the targets set out in the Farm to Fork strategy could lead to food insecurity for 22 million people.

Consumer acceptance of agricultural biotechnology continues to lag behind the global consensus among regulators in the safety of products currently on the market as well as confidence in the technology from the scientific community. Over the last decade public discourse about the technology has become muted as consumer groups have focused on other issues such as highly processed foods.

Despite the lack of understanding among the general population about the science behind agriculture biotechnology, vague concerns about the technology remain and are reflected in consumer purchases of products labeled non-GMO. This is similar to consumer behavior around many other food ingredients, nutrients and chemicals found in food, from the stigma of gluten to synthetic pesticides, which are based in fear rather than an assessment or understanding of actual risk.

What will it take for the U.S. to remain a leader in the field?

The United States has long held a comfortable lead in the development and application of new agricultural biotechnologies, but that leadership is now in doubt. This can be seen in the recent advances in product development and regulatory approval of products in Japan in the case of gene editing. It is also on display in other areas of food technology such as cell-cultured or cell-

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[2] https://www.fas.usda.gov/newsroom/economic-and-food-security-impacts-eu-farm-fork-strategy

[3] https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf

[4] https://publications.jrc.ec.europa.eu/repository/handle/JRC121368

[5] https://grain-club.de/fileadmin/user_upload/Dokumente/Farm_to_fork_Studie_Executive_Summary_EN.pdf

cultivated meat with governments in Singapore and Israel giving the greenlight to products ahead of U.S. regulatory agencies despite the long head start by U.S. technology developers.

Agricultural biotechnology, including genetic engineering and gene-editing tools, offers tremendous opportunities to develop new products from a wide range of public and private sector actors around the world to address some of the global challenges mentioned previously. The policies adopted and implemented in the United States will set an example for the rest of the world, which will ultimately determine the extent to which these technologies contribute meaningfully to a more sustainable food system.

Appropriate policies can incentivize investments from public and private sector stakeholders as well as promote consumer trust in the food system. It is critical both that the U.S. pursues a transparent, predictable and science-based regulatory approach that is risk-based and that the Federal government works closely with the global scientific community and other nations to promote harmonized policies around the world. The United States must also invest heavily in agricultural research, which currently lags far behind investments in medical research despite the fact that food-related illnesses are one of the major drivers of healthcare costs.

In conclusion, innovation is the only way to produce fifty percent more food using less land and water and while dramatically reducing emissions. Agriculture has a long history of reducing emissions while increasing output. For example. a bushel of corn today results in 35 percent fewer greenhouse gas emissions and requires 40 percent less land, 50 percent less water, and results in 60 percent less erosion than a bushel produced in 1980.

In order to see even greater gains over the next 30 years we must prioritize investments in agriculture and development of policies that promote more sustainable outcomes. This will ensure that the United States remains the global leader in technology development and, more importantly, provides leadership to the rest of the world to follow suit. If we are successful then agriculture will indeed save the planet.

Thank you for providing me this opportunity to discuss this critical topic. I'll be happy to take your questions.