**Statement of Dr. Fred Gmitter**
**Professor, Horticultural Sciences**
**University of Florida, Institute of Food and Agricultural Sciences**
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**"Increasing Resiliency, Mitigating Risk: Examining the Research and Extension Needs of Producers"**
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Good morning, Chairwoman Plaskett, Ranking Member Dunn and members of the Subcommittee. I am Fred Gmitter, a professor in horticultural sciences at the University of Florida and I'm pleased to be here to testify on behalf of the UF Institute of Food and Agricultural Sciences.

For more than 30 years, my major areas of study and research have been the genetic code of citrus trees and fruits — the genes that determine how the fruit tastes, smells, looks, and how the tree responds to pressures like disease and pests—and using that knowledge to develop improved citrus trees and fruit. I have no doubt that, today, plant breeding is one of the most important and powerful tools at our disposal to combat global challenges in agriculture and food production.
Also, over those years, I have seen a dramatic increase in our knowledge of plant biology and genetics that enable us to better understand what makes a plant do what it does in response to various environmental and man-made stressors. This information is what has enabled us to develop new, innovative breeding tools like gene editing; and it is these new tools that also will enable us to capitalize on the tremendous investment into the knowledge base we have developed, to improve in ways that were just a dream when I first began to work in this field, the plants that serve all humanity.

As temperatures rise, pests and diseases evolve and spread, and natural resources become scarcer, we need to develop new varieties that are resilient to these emerging threats. This is what plant breeders have been doing for centuries: combining genetic knowledge with plant breeding tools to improve seeds and plants for better crops for the benefit of our environment, our health, and our food.

With the rapid development of environmental threats, diseases and pests, we are up against the clock. Long-term, sustainable food production requires continued application of innovations, like gene editing, that allow us to develop more resilient plant varieties.

An increasingly warming climate means an increase in: disease intensity, mutation rates, and the range of pests and diseases in areas where they formerly didn't exist. In my state of Florida, the citrus industry has been devastated by citrus greening disease, and production has been dramatically decreased by 75% in less than 15 years. We are running out of time. Citrus growers need long-term, sustainable solutions. There is no question that plant breeding innovation holds the key. Using gene editing, my team and others are working right now on developing citrus trees that are resistant, if not immune, to citrus greening, and the bacteria that causes it and the insect that spreads it. Innovation is enabling us to potentially do in years what would previously only have been possible in decades, or longer. And with this rapidly moving disease, time is a luxury we don't have.

The University of Florida is engaged is a number of other research initiatives directly related to mitigating the impacts of climate change.  AgroClimate is an innovative web-resource for decision-support and learning, providing interactive tools and climate information to improve crop management decisions and reduce production risks associated with climate variability and change. Developed by the Southeast Climate Consortium, AgroClimate is a coalition of eight universities including: Florida State, University of Florida, University of Miami, University of Georgia, Auburn, North Carolina State, Clemson University and University of Alabama-Huntsville.

The Decision Support System for Agrotechnology Transfer (DSSAT) is a software application program that comprises crop simulation models for over 42 crops, as well as tools to facilitate effective use of the models. DSSAT and its crop simulation models have been used for a wide range of applications at different spatial and temporal scales. This includes on-farm and precision management, regional assessments of the impact of climate variability and climate change, gene-based modeling and breeding selection, water use, greenhouse gas emissions, and long-term sustainability through the soil organic carbon and nitrogen balances. And these are just a few…

Outside of Florida, researchers are using cutting-edge plant breeding methods to develop new water-efficient varieties of crops. With 70% of the world's freshwater used for agriculture, reducing the amount of water needed to grow food could have a significant environmental impact. In California, lettuce struggles in the heat. But researchers have found a wild variety of lettuce that is capable of germinating at high temperatures in the Central Valley of California– a useful characteristic given warming global temperatures. Using gene editing they have shown that it is possible to develop lettuce varieties that have the same heat tolerance as their wild relative, with the same taste and nutritional value as the lettuce we enjoy today.

Salinity in irrigation water is a major factor limiting the production of rice, a globally significant food crop. Gene editing has been used to develop rice lines that can be grown using saline water, with no changes to any other genes and no deleterious changes on any other aspects of plant yield and performance; this result was achieved in one year, where it could have taken a dozen years or more to accomplish this by conventional breeding. Work is underway to address drought tolerance in rice as well. With decreasing land and water resources available to meet the future needs of humanity, such changes become critical for our future.

Another area where researchers are working is in food waste reduction. In 2007, the global carbon footprint of wasted food was 3.3 billion tons — about 7% of greenhouse gas emissions, according the U.N. Food and Agriculture Commission. Plant breeders are using gene editing to develop new crop varieties specifically designed to cut the amount of food wasted. By making a small change to a potato's DNA, for instance, researchers will be able to make it less likely to bruise and brown. The new characteristic could eliminate 1.5 billion pounds of wasted potatoes.

Innovation is also key to the ability—and in fact, the necessity--to grow more food on less land, using fewer inputs. For example, using gene editing, scientists can develop higher-yielding crop varieties – from vegetables to corn and soybeans. These new plant varieties could produce more food, without additional inputs. The result: farmers can grow more food on less land, and in many cases on lands once deemed marginal for food production. Potentially this can also slow the rate of global deforestation, and thereby put the brakes on increasing CO2 levels by sequestering more carbon.

And speaking of carbon, researchers are even looking at solutions to develop plants that can reduce carbon pollution.  Naturally, plants take carbon out of the atmosphere and  release oxygen through photosynthesis. A key to controlling carbon pollution could be to train plants to suck up just a little more CO2 and keep it longer.

Scientists at the Salk Institute in San Diego are looking to do just that, by engineering crops to have bigger, deeper roots made of a natural waxy substance called suberin—found in cork and cantaloupe rinds—which is incredibly effective at capturing carbon and is resistant to decomposition.

The roots would store CO2, and when farmers harvest their crops in the fall, those deep-buried roots and the carbon they have sequestered would stay in the soil, potentially for hundreds of years. Thanks to innovation, we could see real-life climate-change-fighting plants in our future!

These are just a few of the many examples of the tremendous investment by public and private sector plant-scientists around the world in research across a wide variety of crops—with groundbreaking potential.

However, in order for these benefits to be fully realized, and widely adopted across breeding programs of all sizes and sectors, developers need clear, science-based policy direction. This is why we appreciate the recognition of USDA, in its new proposed rule on agriculture innovation policy, that applications of gene editing can result in plant varieties that are essentially equivalent to varieties developed through more traditional breeding methods. And in those cases, it only makes sense that they should be treated in the same way from a policy perspective.

Historically, under the Coordinated Framework for Regulation of Biotechnology, USDA, FDA and EPA have each served a specific function in ensuring the health of our food and the environment. We encourage the U.S. government to ensure alignment in risk-based policies around plant products of newer breeding methods across these three federal agencies. Any lack of consistency among the agencies will stifle research investments and activity, and prohibit widespread access to for public sector scientists to these evolving tools and the array of critical benefits they hold for society now and in the future.

It's also important that the U.S. continues to take a leadership role in driving consistent plant breeding policies at the global level. Late last year 13 countries, including the U.S., joined together in signing an International Statement on Agricultural Applications of Precision Biotechnology. This was a strong and encouraging show of support by governments around the world in recognition of plant breeding innovation, and the critical role that it will play in ensuring a more sustainable and secure global food production system.

In order to maintain the United States' position as an economic world-leader in innovation, it's critical that we continue moving forward in supporting research in plant breeding solutions to solve our collective global challenges. With that, I'll be happy to take any questions you have. Thank you.