

**Written Remarks by James C. Carrington
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**Subcommittee on Biotechnology, Horticulture and Research
House Committee on Agriculture**

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Good morning Chairman Davis, Ranking Member Lujan Grisham, and members of the subcommittee. My name is Jim Carrington and I am the President of the not-for-profit Donald Danforth Plant Science Center in St. Louis, Missouri. We are a research-intensive organization with over 240 scientists and staff working to improve the human condition through plant science. I am also a scientist working to understand how plants work, and to apply that knowledge in ways that help people and communities. Thank you for the invitation to discuss the importance of agricultural research and innovation as you prepare the next Farm Bill.

First, let me state this clearly: Among the most important Grand Challenges of the 21st century is to provide food security to a growing, changing world while, at the same time, preserving our vital natural resources and maintaining a healthy environment for this and future generations. I and my colleagues at the Danforth Center and across the nation strongly believe we can meet this challenge by attracting the best minds to the problem, by continuing and growing federal investments in research, and by delivering innovations to the marketplace through the private sector.

The role of public investment in research by the USDA – through intramural, cooperative state, and competitive funding – in fueling agricultural advances cannot be overstated. Just over my lifetime, that is since 1960, U.S. agricultural productivity (Total factor productivity) has more than doubled, meaning that we are producing over twice as much with the same total inputs. This was due almost entirely to technological advances and innovations, based on science!

Let's examine this in a different way. What would happen if we eliminated all of those technological advances and brought back the U.S. farm of 1960 to serve our needs today?

- We would need over twice as much farm and pasture land compared to what we use today, or roughly 900 million new acres, for a total of approximately 1.8 billion agricultural acres. That would be almost the area of the entire continental United States;
- We would need nearly twice as much irrigation water from lakes, rivers and groundwater sources;
- We would suffer annual instability in most row and specialty crops due to lack of disease-resistant, drought-tolerant and climate-resilient varieties.

Past research in agronomy, biochemistry, genetics, genomics, quantitative and computer sciences, and many other scientific fields that bear on agriculture means that we now have technologies to breed improved crops and livestock more quickly, lower the use of fresh water, reduce emissions, preserve soil and water quality, reduce costs of production and maintain quality for the consumer. These all start with investments in fundamental science, which is as

critical now as it was in the past. I also stress the importance of USDA competitive research funding that encourages and supports creative science by a broad spectrum of institutions and scientists.

Federal investments in science underlying agriculture have extensive economic payback, as has been well documented by the USDA and others organizations. They are also paving the way for future returns, as is now clearly evident in the neighborhood around the Danforth Center in St. Louis. Research investments at the Center, combined with private capital, entrepreneurs, and corporate and community investments have fueled a vibrant innovation ecosystem focused on agricultural technology in our region. Just within a ¼ mile radius around the Danforth Center, there are now nearly 40 high-tech companies delivering products to improve crop productivity with fewer inputs, like water and fertilizer; facilitate better decision-making on the farm; and produce high-value natural products for food and industrial uses.

Therefore, I strongly encourage strengthening and growing competitive research through the Agriculture and Food Research Initiative (AFRI) program in the next Farm Bill, with recommendations in three areas.

1. Quality, quantity and impact of AFRI-funded research

As the flagship USDA competitive research program, AFRI should have a budget that reflects the vital importance of food and agriculture for every U.S. citizen, and the fact that science provides the foundation to assure food safety, improve food quality, grow agricultural productivity, and preserve soil, water and air quality as impacted by agriculture. We stand with many other organizations in supporting continued growth of competitive research funding through the mechanisms that Congress determines to be most appropriate and stable. AFRI should be on par with programs in agencies, like NIH, that fund fundamental, competitive research in support of other national priorities. By comparison, current authorized and appropriated AFRI funding levels are modest.

To illustrate the comparatively modest levels of available AFRI funding, consider competitive research grants awarded to my organization, the Danforth Plant Science Center, from federal agencies over the past two years. During this period, we were awarded new grants totaling \$21.7 million from the NSF, DOE and USDA (AFRI) to understand plant responses to changing environments, improve sustainability of food and bioenergy crops, and develop next generations of technology to measure crop performance in the field. AFRI grants comprised only \$1.1 million, or 5%, of new federal grant awards to the Center. This was due to the modest size of the AFRI budget for plant science research funding, not to the mandated or funded topical areas, which align extremely well with our expertise and capabilities.

2. Structural and managerial aspects of AFRI

In 2015, I co-authored the National Research Council report “Spurring Innovation in Food and Agriculture: A Review of the USDA Agriculture and Food Research Initiative Program.” I refer the subcommittee to our analysis of strengths of AFRI, as well as to the recommendations to improve structure and management of AFRI. For example, we recommended that AFRI have

dedicated leadership and staff with sole responsibility for competitive research, and that better mechanisms be put in place to align the scientific community with national priorities.

I strongly recommend that AFRI indirect cost recovery rates be brought in line with most programs at other agencies, like NIH, NSF and DOE, that fund research at public and not-for-profit institutions. Current AFRI indirect cost rates capped at 30% fund only part of our actual indirect costs (determined using our federally negotiated rate). For every dollar of AFRI direct research funding received, the Danforth Center needs to contribute \$0.22 to fully fund the project. That is a non-sustainable funding model for us and most other AFRI grant recipient institutions.

3. Access to grants

I strongly argue that the public, which includes both consumers and agricultural producers, benefit when scientific research funding is awarded through open competition played on a level field. The scientific community is most effective when talented people with the best ideas are encouraged to participate and compete. The 2014 Farm Bill authorizes a dollar-for-dollar matching requirement only on AFRI funds awarded to non-Land Grant University institutions, like the Danforth Plant Science Center and universities like Washington University. It is recommended that discriminatory matching requirements not be included in future legislation affecting the AFRI program.

Thank you for inviting these comments, and for supporting science that helps assure food, environmental and economic security in the U.S.