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Biotechnology United States House of Representatives  
*“A Review of Title VII: University Perspectives on Research and Extension Programs”*

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Good morning, Chairman Baird, Ranking Member Spanberger, and Members of the Committee, my name is Kathryn Uhrich and I serve as the Dean of the College of Natural and Agricultural Sciences at the University of California, Riverside (UC Riverside). I am honored to have this opportunity to discuss the agricultural research that is currently being conducted at UC Riverside and to provide perspectives on Title VII, as you consider provisions for the next Farm Bill.

At UC Riverside, we are proud to be part of the Land Grant partnership that was developed between states and the federal government with the 1862 Morrill Act, 1887 Hatch Act, and the 1914 Smith-Lever Act as part of the ten campus UC System. We acknowledge that this partnership enterprise has, for over 130 years, advanced scientific knowledge in food – food production, food production capacity, profitability, and safety of the nation's food system.

Located in inland Southern California, we at UC Riverside respectfully acknowledge and recognize our responsibility to the original and current caretakers of this land, water, and air: the Cahuilla, Tongva, Luiseño, and Serrano peoples and all of their ancestors and descendants, past, present, and future.

UC Riverside is one of the most diverse student bodies at any Research 1 (R1) institution in the country. In 2008, UC Riverside became the first UC campus to be recognized as a Hispanic-Serving Institution (HSI). Of our UC Riverside students that were enrolled in fall of 2022, 36% identified as Chicano or Latino and 52% of our students were First Generation – as was I.

UC Riverside is also designated as a Hispanic-Serving Agricultural Colleges and Universities (HSACU) Program as designated by the US Department of Agriculture. HSI's were first recognized as a national asset to be strengthened with the 1992 amendments to the Higher Education Act of 1965 (HEA). Five years later, HSI's were incorporated into the Farm Bill reauthorization of 1997 under Title VII, which expanded their inclusion in 2008 with a HSACUs program and endowment.

In 2018, UC Riverside attained status as an Asian American and Native American Pacific Islander-Serving Institution (AANAPISI). Under the Higher Education Act (HEA), AANAPISI Institutions are defined as colleges or universities with an undergraduate enrollment that is at least 10 percent Asian American and Native American Pacific Islander. Additionally, at least half of the institution's degree-seeking students must be low income. Each year, UC Riverside graduates more Pell Grant-eligible (or low income) students than all the Ivy League universities, combined.

It's also worth noting that for the fourth consecutive year, the U.S. News & World Report recognizes UC

Riverside as the No. 1 public university in the U.S. for social mobility (2020, 2021, 2022, and 2023). The social mobility category considers the degree to which a university elevates its low-income graduates to a higher standard of living.

On June 1, 2023, UC Riverside was pleased to have been invited to join the Association of American Universities (AAU). The association includes the nation's top research universities.

Thank you for allowing me to share some highlights about UC Riverside. I'd also like to thank you for holding this hearing today where I can also provide some insight from an HSI and California perspective.

California continues to be the nation's top agricultural state. For more than a century, California's \$51 billion agricultural industry has depended on UC for the stream of new technologies and research breakthroughs needed to stay competitive and responsible.

It is also an honor to be here today to testify from the perspective of an HSI institution about Farm Bill priorities: *"A Review of Title VII: University Perspectives on Research and Extension Programs"*.

Specifically at UC Riverside, the agricultural research we conduct as an HSI is unparalleled and is financially supported by Title VII programs authorized under the Farm Bill. I'd like to share some of the priorities for the Farm Bill from an HSI perspective as well as examples as cutting-edge agricultural research currently being conducted at UC Riverside that has benefited from Title VII agricultural research programs. From disease and stress tolerant and resilient plant research to combating citrus greening disease to saving avocado orchards from lethal fungal disease to a creating community space to facilitate public engagement and workforce programs in sustainable, controlled-environment, and high-tech agriculture, the 2023 Farm Bill is an opportunity to support and protect our country's food supply.

## **HISPANIC-SERVING INSTITUTIONS (HSI) AND HISPANIC-SERVING AGRICULTURAL COLLEGES AND UNIVERSITIES (HSACU) PRIORITIES FOR THE FARM BILL**

### **Education Grants Program for Hispanic-Serving Institutions**

The Hispanic-Serving Institutions Education Grants (HSI) Program is a critical U.S. Department of Agriculture (USDA) competitive grants program, operated through the National Institute of Food and Agriculture (NIFA). These competitive grants support STEM education programs in the food and agricultural sciences at institutions with at least 25 percent Hispanic enrollment. UC Riverside supports the reauthorization of the Education Grants Program for Hispanic-Serving Institutions during the Farm Bill reauthorization process and supports expanding authorized funding for the program from the current \$40 million to \$100 million per year. The HSI Education Grants Program provides assistance to HSIs to build capacity to conduct education and research programs and to support workforce development, in the agricultural sector. Providing additional support for the HSI Education Grants Program would allow HSI's across the nation to have greater opportunities to serve their communities and help to improve educational opportunities for students in research, education, and cooperative extension programs. Within the UC System, UC Riverside is one of six HSI institutions.

#### *Recommendation*

- UC Riverside recommends reauthorizing the Hispanic-Serving Institutions Education Grants Program and increasing the authorization to \$100 million per FY, over the current authorization level of \$40 million per year.

### **Hispanic-Serving Agricultural Colleges and Universities (HSACU)**

UC Riverside also supports the reauthorization and expansion of funding opportunities under the USDA's Hispanic-Serving Agricultural Colleges and Universities (HSACU) Program, which was first established in the Food, Conservation and Energy Act of 2008 (FCEA), and falls within NIFA. The HSACU designation is reserved for HSI institutions meeting certain criteria and allows HSACU designated universities to be eligible for funding through specific competitive grants programs created under the HSACU Program.

HSACU's are particularly vital given the evidence showing significant job growth in the agricultural-related fields and, at the same time, limited overall employment growth of agricultural workers in the next decade. For example, according to the U.S. Bureau of Labor Statistics, the overall employment of agricultural and food scientists is projected to grow faster than the average for all occupations. It is estimated to increase by 8 percent with an annual average of 41,000 new jobs over the next decade. On the other hand, the overall employment of agricultural workers is projected to grow slower than the average for all occupations (1 percent growth from 2019 to 2029).

UC Riverside supports the reauthorization and continuation of the HSACU Program and urges the Committee to increase potential funding opportunities for HSACU designated universities as part of the Farm Bill reauthorization process. While the HSACU Program authorized promising grants and endowment funding opportunities for HSACU designated universities to be eligible to apply for, unfortunately, the programs have not yet been funded, which has resulted in a lack of opportunities for HSACU's to expand educational opportunities for students and to strengthen the agricultural workforce.

#### *Recommendation*

- Increase authorized funding levels for HSI and HSACU grant programs to reflect their rapid institutional growth and chronic underfunding.
  - UC Riverside recommends that HSACU grant programs be strengthened in the Farm Bill reauthorization process, including the HSACU Endowment Program; the HSACU Equity Grants Program; the HSACU Institutional Capacity-Building Grant Program; the HSACU Basic and Applied Research Grant Program; the National Resources Leadership Program; and the HSACU Training Hispanic Agricultural Workers Grants program.
- To create and strengthen career pathways for Hispanic students within HSIs and HSACUs to meet the current and future demand for highly skilled jobs in agricultural-related fields under the reauthorized Farm Bill of 2023.

## **AGRICULTURAL RESEARCH AT THE UNIVERSITY OF CALIFORNIA, RIVERSIDE**

### **Citrus Research at UC Riverside**

#### **Citrus Clonal Protection Program (CCPP)**

With Title VII support, UC Riverside is home to the Citrus Clonal Protection Program (CCPP), which is part of NCPN. The CCPP provides a safe mechanism for the introduction into California of citrus varieties from any citrus-growing area of the world for research, variety improvement, or for use by citrus enthusiasts and California citrus growers. CCPP is playing a vital role in preventing the spread of citrus greening disease across California.

The CCPP is the first of its kind in the world. It began in the 1950's, and its scientists spend up to three years testing and clearing citrus seedlings trees of disease so they can be released to commercial and private growers.

By law, every citrus tree newly propagated in California can be traced back to one mother tree created at UC Riverside through CCPP. Program Director Georgios Vidalakis, Professor of Cooperative Extension, and his group begin their process by testing incoming citrus trees for more than 30 diseases, whether the diseases are known to have emerged in the state or not.

#### **Citrus greening disease**

Citrus greening disease, also known as huanglongbing (HLB), is one of the most destructive diseases of citrus worldwide. UC Riverside scientists are using a variety of approaches to fight citrus greening disease. Research on citrus greening is made possible with support from the United States Department of Agriculture (USDA), National Institute of Food and Agriculture (NIFA), California Department of Food and Agriculture (CDFA), and the Citrus Research Board.

**Damage:** Leaves of newly infected trees develop a blotchy mottle appearance. On chronically infected trees, the leaves are small and exhibit asymmetrical blotchy mottling. Fruit from HLB-infected trees are small, lopsided, poorly colored, and contain aborted seeds. The juice from affected fruit is low in soluble solids, high in acids and abnormally bitter. The fruit retains its green color at the navel end when mature, which is the reason for the common name "citrus greening disease." There is no cure for the disease - yet - and rapid tree removal is required to prevent its spread. Citrus greening disease is a global problem. It has crippled Florida's citrus industry and has already been detected in California, which grows 80% of United States' fresh citrus. An estimated 267,000 acres of the Golden State's oranges, lemons, grapefruits, and mandarins are at stake.

**Economic Impact:** Citrus greening disease is one of the most devastating diseases of citrus. Since its discovery in Florida in 2005, citrus acreage in that state has significantly declined. By some estimates, the end of citrus orchards in California and Florida could amount to \$14 billion in lost commercial revenue.

### **Treating and preventing citrus greening disease**

With USDA funding from AFRI and CDRE Professor Hailing Jin identified a naturally occurring peptide found in citrus greening disease-tolerant citrus relatives, such as the Australian finger lime, can kill the bacterium that causes the disease and also activates the plant's own immune system to inhibit new bacterial infection. This naturally occurring molecule, an antimicrobial peptide, offers numerous advantages over the antibiotics currently used to treat the disease.

Professor Caroline Roper, a plant pathologist, is leading new research with USDA funding from AFRI and ECDRE that will test whether soil amendments like manure and compost might suppress parasitic microorganisms in roots and soil, giving trees increased strength to combat diseases, including citrus greening.

### **Breeding citrus tolerant to citrus greening disease**

With USDA AFRI support, UC Riverside scientists are searching for plants that are impervious to citrus greening disease.

The first step is to search for plants that are able to grow and produce healthy fruit despite infection. Then researchers identify the genetic basis of the disease tolerance and make sure the next generation of plants includes these genes. Danelle Seymour, Professor of Botany and Plant Sciences, and Philippe Rolshausen, Professor of Cooperative Extension, will examine a set of 350 citrus hybrids developed and grown by project collaborators in Florida. All trees in the set are already infected with HLB (which is why the studies are performed in Florida), yet the tree live longer, are healthier, and yield more fruit than their infected relatives.

UC Riverside botanist Chandrika Ramadugu is leading a research team to breed new citrus varieties with natural resistance to citrus greening disease. The fruits from the hybrid trees will ideally share the best of their parents' attributes: the tastiness of the best citrus and resistance to citrus greening disease. Currently, the team is studying differences in the genetic makeup of the hybrids they've already bred. Analyzing the new plants' DNA will help the team see whether enough disease resistance has been bred into the hybrid trees, but not so much that the fruit's flavor is compromised.

### **Avocado Research at UC Riverside**

#### **Seventy years of breeding avocados**

UC Riverside has played a major role in helping California become the agricultural powerhouse of the nation. Grants from the USDA supports research led by Professor of Cooperative Extension Mary Lu Arpaia to help UC Riverside's nearly seventy-year-old avocado breeding program. The avocado research program creates new varieties with the capability to be grown in diverse global areas, produces enhanced post-harvest characteristics, and increases yield and diversity. Professor Patricia Manosalva, Director of the Avocado Rootstock Breeding Program, receives funding from the USDA-NIFA Specialty Crop Research Initiative (SCRI) and USDA Agricultural Research Service (ARS) to evaluate the plant safety and horticultural impact of essential oils in managing diseases in fruits, including avocados, blueberries,

peaches, and mangos. Funding from the California Avocado Commission supports the research of Professor Peggy Mauk, Director of Agricultural Operations, in examining commercial-scale field testing with the potential of releasing five elite advanced rootstocks. Research on the 'Hass' variety at UC Riverside has provided growers with essential information for decades that has aided in the skyrocketing popularity of avocados worldwide. This research has informed the California avocado industry to make decisions on post-harvest care including temperature sensitivity, storage time, and ethylene exposure.

**Challenges:** Avocados suffer from several fungal and Oomycete diseases that are devastating the avocado industry. A notorious example is *Phytophthora* root rot, the most common avocado disease worldwide. The avocado breeding program is selecting rootstocks that can resist *Phytophthora* root rot. The program also selects for resilience to salinity, drought, and heat - all of which are expected to become worse as the climate warms. In collaboration with the California Avocado Commission, UC Riverside advanced five rootstocks exhibiting resistance to these major challenges are being evaluated by growers throughout California.

**Economic Impact:** Over the last 30 years, the avocado market has increased 2.5-fold and per capita consumption has quadrupled, generating interest in avocado production in many other countries. However, diseases, climate change, and the worldwide market's dependence on the Hass variety has threatened this market.

### **Avocado rootstock breeding program**

With Title VII support, UC Riverside's 70-year-old avocado breeding programs house one of the most elite germplasm collections of scion and rootstock breeding material in the world. The University of California has partnered with California avocado growers since the inception of the industry a century ago and has had several plant breeders developing new varieties and rootstocks for the industry.

The avocado rootstock breeding program is one of the few well-recognized rootstock breeding programs worldwide and has been historically funded by the California industry through the California Avocado Commission. The main goal of the rootstock program is to develop and release the next generation of rootstocks that meet the most pressing needs of growers using traditional breeding complemented with genomic-assisted breeding approaches.

### **Saving America's avocado orchards**

With Specialty Crop Research Initiative (SCRI) support, UC Riverside is working to solve problems facing American avocado orchards, including a lethal fungal disease called Laurel Wilt. Laurel Wilt can destroy an entire avocado orchard in a couple of weeks once symptoms develop. Laurel Wilt is caused by a fungus, *Raffaelea lauricola*, that the non-native redbay ambrosia beetle introduces in trees of the Laurel family, which includes avocado. In addition to Laurel Wilt and *Phytophthora* root rot (PRR), avocado growers face numerous production challenges including soil salinity, which in combination with PRR cause severe reduction in fruit yield and quality. This combination can also completely destroy avocado orchards. UC Riverside research is developing next-generation technological solutions to these problems, as well as short- and long-term solutions for managing avocado PRR, the major hindrance for avocado production worldwide.

### **Scientists search for pheromones to disrupt insect mating**

With significant USDA support, UC Riverside entomologist Mark Hoddle is on the hunt for a chemical that disrupts "evil" weevils' mating and could prevent them from destroying California's supply of avocados. Avocado weevils are small beetles with long snouts that can drill through fruit to lay eggs. The weevil grubs, or larvae, bore into avocado seeds to feed, rendering everyone's favorite toast-topping inedible.

Avocado weevils are native to Mexico, to prevent them from being accidentally introduced into California, Professor Hoddle is working with Jocelyn Millar, a UC Riverside insect pheromone expert. They are working to discover the weevil's pheromone, with the goal of using it to monitor these pests and prevent them from mating in avocado orchards. Pheromones are chemicals produced and released into the environment by an insect that can be "smelled" by others of its species and affect their behavior.

## **Honeybee research at UC Riverside**

### **Understanding bee colony collapse**

With the support of USDA funding, UC Riverside is home to the world-renowned Center for Integrative Bee Research (CIBER) to serve as a beekeeping think tank. The center is one of the largest honeybee health networks in the country, enabling entomologists, engineers, economists, and professional beekeepers to collaborate on innovative solutions for colony collapse. UC Riverside is leading efforts to stop and reverse a worldwide decline in honeybees, which threatens food security and prices. Honeybees pollinate more than 80 agricultural crops, which account for about a third of what we eat, with a global estimated annual value of \$220 billion. U.S. beekeepers report losing roughly 45% of their hives, with similar losses reported worldwide. These losses have been happening on this scale for nearly 20 years and will have a significant impact on our food security. The decline of honeybees is the result of many factors, making this a complex issue. Several factors, including pesticide exposure and the spread of parasites and environmental changes, are to blame for the widespread collapse of bee colonies over the past decade.

### **Managing bee health**

FFAR support is helping to best manage practices to protect bees. Lauren Ponisio, Quinn McFrederick, and Hollis Woodard, all professors of entomology at UC Riverside, are examining how management practices in almond orchards affect the interacting risks of inadequate bee nutrition, pesticide exposure, and parasites. Determining whether recommended pollinator-friendly practices are successfully improving bee health and crop pollination will have important outcomes for farm managers deciding whether to employ those practices.

## **Research on Tolerant and Resilient Plants**

### **Helping plants to hold onto water**

With the support of NIFA funding, Sean Cutler, Professor of Botany and Plant Sciences, is leading research on creating a chemical to help plants hold onto water, which could stem the tide of massive annual crop losses from drought and help farmers grow food - despite a changing climate. This chemical, Opabactin, is also known as "OP," which is gamer slang for "overpowered," referring to the best character or weapon in a game. An earlier version of OP developed by Cutler's team in 2013, called Quinabactin, was the first of its kind. It mimics abscisic acid, or ABA, the natural hormone produced by plants in response to drought stress. ABA slows a plant's growth, so that it doesn't consume more water than is available and doesn't wilt.

### **Genetic insights help rice survive drought and flood**

With USDA NIFA support, Professor Julia Bailey-Serres, a geneticist, is mapping out plants' own stress-busting strategies to save one of the most important crops on Earth from extreme climate swings. Her team has learned what happens to the roots of rice plants when they're confronted with two types of stressful scenarios: too much water or too little water. These observations form the basis of new protective strategies.

While it is possible for rice to flourish in flooded soils, the plants yield less food or even die if the water is too deep for too long. This work simulated prolonged floods of five days or longer, in which plants were completely submerged. It also simulated drought conditions.

The researchers examined the roots' response to both types of conditions because roots are the unseen first responders to flood and drought-related stresses. One key finding is about a cork-like substance, suberin, that's produced by rice roots in response to stress. It helps protect the plants from floods and drought. The researchers also identified the genes controlling some of rice's other stress behaviors. One of the interesting findings is that when rice plants are submerged in water, the root cell growth cycle pauses, then switches back on shortly after the shoots have access to air. In the future, the research team plans to test how modifying these stress responses can make the plant more resilient to both wet and dry conditions.

## **How plants fight against infections**

As another example of USDA research funding, at UC Riverside we are studying how plants package and deliver the small RNAs (sRNAs) they use to fight back against plant pathogens. The study focused on *Botrytis cinerea*, a fungus that causes a grey mold disease in almost all fruits, vegetables, and many flowers. Professor Hailing Jin, a plant pathologist, has been studying the role of sRNAs in plant immunity and disease. Her goal is to develop effective and environmentally friendly strategies to control plant diseases and to secure food production.

## **COMMUNITY PARTNERSHIPS**

In partnership with the City of Riverside and Growing Hope, UC Riverside is working to create the Northside Regional Agriculture Innovation Center. The partnership was created to build regional workforce capacity and foster innovation, entrepreneurship, and tech-enabled businesses around modern sustainable agriculture and food production technologies.

This multi-phase, 8-acre project will provide needed infrastructure and state-of-the-art demonstration and training for local schools from K-Ph.D. The project also provides incubator space for local entrepreneurs and innovators to launch modern agricultural technologies and sustainable cultivation in regenerative agriculture, controlled environment agriculture, food production, food processing, and food distribution.

The Northside Regional Agriculture Innovation Center encompasses several key elements:

### **Urban greening**

- Nearly seven acres of open space to sequester carbon via planting of 450+ trees and shrubs and using healthy soils farming practices to demonstrate heat island mitigation and carbon-sequestration functions provided by green infrastructure and working landscapes.
- The management of land-based activities in sustainable, climate-impact mitigation methods to demonstrate how agricultural and natural landscapes can address climate change impacts.
- Approximately ½ mile of trails around the perimeter of the project site with interpretive signs.

### **Workforce development**

- State-of-the-art solar greenhouses to train and prepare a highly skilled workforce in sustainable, controlled environment practices and high-tech agricultural technologies.
  - Four agricultural workforce programs have been developed, with two certified by UC Riverside University Extension.
- Integration of solar photovoltaic (PV) panels over soil-based agricultural activities to support applied research and training in emerging dual-use agrivoltaic practices, which is the integration of solar and agriculture practices.
- Over 1.5 acres committed for soil-based training via a Beginner Farmer Training Program certified by UC Riverside University Extension.
- Additional future opportunities include collaboration with partners to establish an on-site microgrid to support research and training in solar renewable energy management, solar facilities, and multi-sector connectivity.

### **Innovation and entrepreneurship**

- Solar greenhouses, coworking spaces, and incubation facilities to:
  - Train at least 135 individuals annually.
  - Incubate 6-10 new farmers and ag tech start-ups annually with an estimated 25 companies launched over 10 years.
- Specialized agriculture-based education and training will be delivered by accredited instructors and business mentorship via seasoned entrepreneurs in residence and education partners.

### **Community engagement**

- An open-space agricultural-themed venue for community events including a community garden, indoor/outdoor event spaces, a co-work learning center, and demonstrations of climate-smart

agricultural practices to educate a broad audience on how agriculture can function in an urban environment.

- Demonstration greenhouses to showcase agriculture of the future and a teaching kitchen for food demonstrations and events.
- A 30-plot community garden and site trails for public engagement.

## **UNIVERSITY OF CALIFORNIA, RIVERSIDE 2023 FARM BILL PRIORITIES**

### **Title VII – Research, Extension, and Related Matters**

#### **Smith-Lever Act of 1914; Sections 3(b) and 3(c) Capacity Grants; 7 U.S.C. §341 et seq.**

The Smith-Lever Act established the Cooperative Extension System at land-grant colleges and universities in partnership with USDA and local governments. UC Cooperative Extension develops and extends science-based information and programming, bringing the power of UC research into the hands of local communities on topics regarding agriculture, natural resources, nutrition, economic and youth development.

#### *UC Recommendation*

- Protect the program as it is currently written.

#### *Impact to UC Riverside*

- Georgios Vidalakis is Professor of Cooperative Extension and Director of the Citrus Clonal Protection Program (CCPP). Cooperative Extension programs are critical to moving new science directly to growers. As described above, the CCPP provides a safe mechanism for the introduction of citrus varieties in California from any and all citrus-growing areas in the world. The CCPP safeguards our nation's citrus in the spread of citrus diseases, such as citrus greening disease, which has already devastated much of Florida.

#### **Hatch Act – Agricultural Experiment Stations; 7 U.S.C. §361a et seq.**

The Hatch Act of 1887 provides funding for agricultural research at State Agricultural Experiment Stations (AES). In California, our AES facilities include UC Berkeley, UC Davis, UC Merced, UC Riverside, and UC Santa Cruz. Hatch Act funding has been used to conduct research on emerging issues and allows us to work directly with producers.

#### *UC Recommendation*

- Protect the program as it is currently written.

#### *Impact to UC Riverside*

- All agricultural research at UC Riverside, only a portion of which was described above, is funded by the Hatch Act.

#### **Research Facilities Act; §7503 of the 2018 Farm Bill**

The Research Facilities Act was reauthorized by the 2018 Farm Bill to create an agriculture and food-focused research infrastructure program for facility construction, alteration, acquisition, modernization, renovation, or remodeling. The need to reauthorize and fund the Research Facilities Act is clear: infrastructure in most land-grant universities is aging, inadequate, and, in many cases, obsolete.

A national study of capital facilities and deferred maintenance recently documented the magnitude of the infrastructure problem that threatens to further erode the United States' preeminence in global food and agricultural research. The conclusions from this 2021 Gordian Report on the age of the buildings, the lack of capital investment over time, and the levels of deferred maintenance needs are sobering – the total deferred maintenance cost is at least \$11.5 billion. For the United States to remain a world leader in food and agricultural research, this aging infrastructure problem must be addressed.

We cannot conduct 21st century research and innovation with 20th century infrastructure and facilities. California has the scale, crop diversity, and workforce to lead the world in agricultural innovation, but



bringing new food and agriculture technologies from the lab to the fields – and to the commercial marketplace at scale – remains a significant challenge. UC Agriculture and Natural Resources is creating new partnerships, such as the Verde Innovation Network for Entrepreneurship (The VINE), to better support cross-regional collaboration, mentorship and expertise, and to bridge the rural/urban “innovation divide” between Silicon Valley and California agriculture. However, these projects depend on adequate infrastructure and basic technologies, such as broadband internet, that are not available in rural agricultural areas.

The return on investment is high. International research from the Organisation for Economic Co-operation and Development (OECD) indicates that agricultural research investments result in \$10-\$20 in benefits for every \$1 spent on research.

For UC, our research drives the agricultural sector. We deliver innovative technologies, we grow the agricultural marketplace, we support job creation, and we boost the economy. However, many of our buildings and facilities were built in the 1950s and 60s and are in great need of replacement. In fact, 70% of the research facilities at U.S. public colleges of agriculture are at the end of their useful life. Bringing our facilities up to modern standards would provide capacity for precision agriculture, remote sensing, lab space for CRISPR-based research, and would ensure that cutting-edge research can continue to be conducted to meet the agricultural and natural resources needs of California and the nation.

#### *UC Recommendation*

- Reauthorize the Research Facilities Act and remove the matching requirement.
- Provide \$5 billion for agriculture and food research infrastructure for land-grant colleges and universities.

#### *Impact to UC Riverside*

- Infrastructure in most land-grants is “historic” but research is cutting-edge. As described above, at UC Riverside we are using all the tools in the toolbox to find a cure for the citrus greening disease. We use “old” tools, such as crossbreeding species or splicing resistant branches onto rootstock. We also use “new”, 21<sup>st</sup> century tools such as genomic sequencing to combat this disease; these are the same tools used by pharmaceutical companies to make antibiotics for humans – we use them to develop antibiotics for citrus trees. To use these tools, we need sophisticated state-of-the-art research labs.
- UC Riverside is also concerned with the potential impact of the 50 percent cash matching fund requirement in the Research Facilities Act and suggests that Congress consider amending the language that requires matching funds.

#### **Agriculture and Food Research Initiative (AFRI); 7 U.S.C. §3157; §7504 of the 2018 Farm Bill**

AFRI was established in its current form in the 2008 Farm Bill and AFRI-funded science is vital to meeting food, fiber, and fuel demands as the world’s population races toward a projected \$9 billion by 2050 concomitant with diminishing land and water resources and increasingly variable climatic conditions. In addition, AFRI programs help develop new technologies and a workforce that will advance our national security, our energy self-sufficiency, and the health of Americans. Under the Farm Bill, Congress has mandated six research areas of priorities: (1) plant health and production and plant products; (2) animal health and production and animal products; (3) food safety, nutrition, and health; (4) bioenergy, natural resources, and environment; (5) agriculture systems and technology; (6) agriculture economics and rural communities.

In the past five years, from fiscal years (FYs) 2016-2021, UC has received over \$135 million in AFRI funding. These awards have focused on invasive pests, citrus research, STEM workforce development, agricultural technology, clean water, food safety, water use and irrigation, and providing UC labs with much-needed research equipment.

AFRI’s Competitive, Special, and Facilities Research Grant Act is geared towards new investigators, and the stated criteria is too restrictive and counterproductive for the future workforce – it does not take into consideration pandemics or family leave options. Currently, new investigators are defined as those who

“do not have an extensive research publication record” and who are “within 5 years of the beginning of the initial career track position.” This does not exclude scientists who have worked outside of academia for many years but then, for example, take on an academic appointment. Language should be added that specifies the applicants should be within 12 years of their terminal degree, with an allowance for medical leave or other extenuating circumstances, and do not already have extensive publication records.

*UC Recommendations:*

- Reauthorize AFRI and increase or maintain the authorization level at \$700 million per FY.
- Avoid attempts to “ earmark” AFRI for specific fields of research or to combine it with other programs.
- Change new investigator criteria to those “who are within 12 years of their terminal degree, with an allowance of up to 2 years due to medical leave or other extenuating circumstances and have fewer than 25 peer-reviewed publications as first, or senior, author and fewer than 75 total peer-reviewed publications.

*Impact to UC Riverside*

- Under the Farm Bill, Congress has mandated research areas where UC Riverside has excelled. Our AFRI projects focus on plant health, food safety, natural resources, and agricultural technology. Funding has focused on invasive pests, citrus research, STEM workforce development, agricultural technology, clean water, food safety, water use and irrigation, and providing UC labs with much-needed research equipment.
- UC Riverside’s College of Natural and Agricultural Sciences has \$25,027,076 in active AFRI funding.

**Specialty Crop Research Initiative (SCRI); §7305 of the 2018 Farm Bill**

The SCRI program within USDA’s National Institute of Food and Agriculture (NIFA) traces its roots to the 1998 Farm Bill, but it was established in its current form in the 2008 Farm Bill. In the 2018 Farm Bill, Congress provided \$80 million in mandatory funding each FY for 2018-2023. SCRI is important to California’s agricultural research enterprise as California grows over 400 agricultural commodities and produces over 50 percent of the nation’s supply of fruits, nuts, and vegetables. In fact, 8 of our top 10 commodities are specialty crops: almonds, grapes, pistachios, lettuce, strawberries, tomatoes, flowers, and walnuts. Since SCRI’s inception in 2008, UC entities have received over \$94 million in funding.

*UC Recommendations*

- Reauthorize SCRI and increase or maintain the mandatory funding at \$80 million per FY.
- Eliminate the matching funds requirement for programs such as the Specialty Crop Research Initiative (SCRI) which were imposed under the 2018 Farm Bill. Specifically, Section 7614 Matching Funds Requirement reinstated the pre-2014 Farm Bill matching requirements for land-grant universities applying for NIFA grants. This is exceedingly important for specialty crops: given their unique nature and limited market share, they require crop-specific research but lack the industry bandwidth to offset matching costs. While Congress has included language in several appropriations bills since passage of the 2018 Farm Bill to allow the Secretary of Agriculture to waive the matching funds requirement under the SCRI program, there is still a great deal of uncertainty about whether land-grant universities will be able to continue to apply for SCRI grants, or for other impacted programs. UC recommends that the next Farm Bill be amended to reinstate applicable language from Subtitle P of the National Agriculture Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3371), to again allow land-grant universities to apply for federal grants under NIFA without having to meet matching funds requirements reinstated under the 2018 Farm Bill.

*Impact to UC Riverside*

- Through the USDA/NIFA Specialty Crop Research Initiative, Patricia Manosalva, UC Riverside Professor and Director of the Avocado Rootstock Breeding Program, is conducting research on reducing avocado losses to major challenges by improving resistance selection and disease management using next generation technologies.

- SCRI is important to the state of California – we have 400+ different crops and produce >50 percent of fruits, vegetables, and nuts for the US. With its unique climate, California is unique in our ability to produce a broad range of crops – unlike my family in South and North Dakota, where predominantly only grains can be grown.

### **Emergency Citrus Disease Research and Extension (ECDRE) program; 7 U.S.C. 7632(j); §7306 of the 2014 Farm Bill**

The 1998 Farm Bill created the Citrus Disease Research and Extension (CDRE) program within SCRI to combat Huanglongbing (HLB; citrus greening), which is a bacterial disease spread by the Asian Citrus Psyllid. Citrus greening has been ravaging Florida’s citrus industry and has the potential to devastate Texas’ and California’s citrus industries as well. The 2014 Farm Bill re-created CDRE as the Emergency Citrus Disease Research and Extension program (ECDRE), and the 2018 Farm Bill funds the program through the Emergency Citrus Disease Research and Development Trust Fund (see Miscellaneous section of this document). Congress provided \$25 million per year for FYs 2019-2023 for ECDRE, for a total of \$125 million. Since 2014, UC has received over \$52 million in funding to conduct research to combat citrus greening from the CDRE/ECDRE program.

#### *UC Recommendation*

- Reauthorize ECDRE and increase or maintain the mandatory funding of \$25 million per FY.

#### *Impact to UC Riverside*

- The ECDRE program brings interdisciplinary research teams together with citrus industry representatives to find scientifically sound solutions to combat citrus greening disease, as described above.
- UC Riverside research funded by the ECDRE program include: “Novel, Non-Transgenic, Hybrid Citrus Varieties with Resistance to Huanglongbing: Evaluation and Cultivar Development” and “CAP: Combining Cultural and Genetic Approaches for Grove Success to Unravel and Enhance Resistance/Tolerance to Huanglongbing.”

### **Support for Honeybee Research and a Genetics and Breeding Health Center**

Honeybees are responsible for the pollination of more than 80 agricultural crops, making them a pivotable player in national security and the production of a stable food supply. US beekeepers are facing increased threats to keep their colonies alive; as much as 40 percent of stock has been lost each year over the past decade to issues with parasites and pathogens, pesticides, environmental changes, and ineffective management tools for bee health management. UC supports additional funding for honeybee research which is critical to support the shrinking U.S. honeybee population. UC also supports the possibility of establishing a new Honeybee Genetics and Breeding Health Center, which would serve as the hub of multi-state institutional partnership addressing the pollinator crisis with a targeted approach on extension/industry focus for the development and delivery of novel bee health management tools that are scientifically validated and feasible/affordable for beekeepers.

#### *UC Recommendation*

- Support funding for honeybee research and a genetics and breeding health center.

#### *Impact to UC Riverside*

- Since 2014, UC Riverside’s College of Natural and Agricultural Sciences has been granted \$2,896,618 in bee funding from the USDA.
- With the significant loss of the honeybee population, UC Riverside requests continued support.

### **Foundation for Food and Agriculture Research (FFAR); §7603 of the 2018 Farm Bill**

FFAR was created in the 2014 Farm Bill with the hope of filling in the research gaps that are currently unfunded by other federal agencies and programs. The Farm Bill provided one-time mandatory funding for FFAR of \$200 million and all research projects require a 1:1 match—the majority of which are raised by the individual researcher. The 2018 Farm Bill provided \$185 million. Thus far, UC campuses and spin-offs have received over \$10 million in grant awards.

#### *UC Recommendation*

- Reauthorize the Foundation for Food and Agriculture Research program.

#### *Impact to UC Riverside*

- UC Riverside is also concerned with the potential impact of the 1:1 matching fund requirement of the FFAR program and suggests that Congress consider amending the language that requires matching funds.

#### **Higher Education Challenge Grants Program; Grants and Fellowships for Food and Agriculture Sciences Education; §7107 of the 2018 Farm Bill; 7 U.S.C. §3152**

The USDA Higher Education Challenge Grants Program is designed to strengthen university capacity to, among other things, enhance the quality of instruction to help meet current and future workforce needs in the food and agricultural sciences.

#### *UC Recommendation*

- Reauthorize the program and increase or maintain funding at \$40 million per FY.

#### *Impact to UC Riverside*

- UC Riverside supports the HSI Grants Program and the need to expand funding opportunities in the Farm Bill reauthorization process. While the HSI Grant Program does receive funding in the appropriations process each year within NIFA, it should be expanded to provide greater funding opportunities for HSIs, such as UC Riverside, that serve their communities.
- HACU also focuses on expanding opportunities for HSACU programs which were authorized in an earlier Farm Bill but have not received funding. UC Riverside is listed as a HSACU (Hispanic Serving Agricultural Colleges and Universities) by the USDA. However, there are issues for land grant universities to be able to participate in HSACU programs since land grant universities are not eligible for HSACU funding.
- At UC Riverside, we also support expanding opportunities within the Farm Bill for HSACU programs which were authorized but have not yet been funded through the appropriations process.

#### **USDA AGARDA Program; §7132 of the 2018 Farm Bill**

The 2018 Farm Bill authorized the creation of the Agriculture Advanced Research and Development Authority (AGARDA) pilot program, to develop agriculture technologies. The reauthorization of the AGARDA Program in the 2023 Farm Bill reauthorization process would help to support the commercialization of agriculture related technologies.

#### *UC Recommendation*

- Reauthorize the program and consider authorizing at a funding level of \$100 million per year.
- In addition to reauthorizing AGARDA, UC also recommends creation of the following new innovation programs to support the commercialization of agriculture-related technologies, modeled after existing successful programs operated by NSF and NIH.

#### *Impact to UC Riverside*

- While AGARDA was authorized in the 2018 Farm Bill, the program has not had a chance to get off the ground to provide potential funding opportunities to support agriculture innovations. UC Riverside and other universities have not been able to apply for any grants.

#### **USDA I-Corps Hub Program**

The USDA does not currently operate an I-Corps Hub program. Creating a USDA I-Corps Hub Program, modeled after the National Science Foundation (NSF) I-Corps Program, would help to support the commercialization of agriculture related technologies.

#### *UC Recommendation*

- Consider creating an I-Corps Program at USDA.

*Impact to UC Riverside*

- A USDA supported I-Corps program is necessary to generate the next generation of farmers and agricultural scientists. As for NSF, the USDA would generate a community to translate university inventions into tech-based businesses around modern agricultural practices.
- This program could be modeled after the Northside Regional Agriculture Innovation Center (described above) to build regional workforce capacity and foster innovation, entrepreneurship, and build businesses.

**USDA SBIR Phase (0) Commercialization Proof of Concept Program**

Universities are not eligible for USDA SBIR programs which are reserved for small businesses. The creation of a Phase (0) Commercialization Proof of Concept Program at the USDA that universities are made eligible to apply for would help to support the commercialization of agriculture related technologies. A similar program had been established previously at the National Institutes of Health (NIH).

*UC Recommendation*

- Consider creating a SBIR Phase (0) Commercialization Proof of Concept Program at USDA.

*Impact to UC Riverside*

- As a participant in NIH SBIR programs, I know directly how important it is to partner with a company to move an academic invention from an academic curiosity to a commercial product. Without an industrial partner, our research to develop therapeutics for liver fibrosis would not have moved beyond the university lab.

**CONCLUSION**

On behalf of the UC Riverside community, I want to express how grateful I am for the opportunity to speak before you today. Congressional support for agricultural research funding under Title VII has been paramount for all the research I mentioned today that is taking place at UC Riverside. In training the next generation of Hispanic leaders in agriculture, HSACUs are a vital pipeline to the nation's agricultural workforce. With Title VII funding, the research we do, impacts the world around us — I am extremely proud of the work our faculty, staff, and students do day in and day out. I thank you for your continued support for agriculture research and offer to be a resource as you consider the reauthorization of Title VII of the 2023 Farm Bill. I look forward to answering any questions you may have. Thank you.