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RESEARCH INNOVATIONS FROM OUR NATION'S AGRICULTURAL COLLEGES AND UNIVERSITIES
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Part 1: Innovations in research and training provided by a member of the Hispanic-Serving Agricultural Colleges and Universities

Florida International University (FIU), Miami's only public research university, is finding solutions to some of the most challenging problems of our time. As the 4th largest university in the country, and the largest Hispanic-serving university in the United States, FIU enrolls more than 55,000 students and conducts over $132 million in research expenditures every year. FIU is an anchor institution in South Florida contributing $8.9 billion each year to the local economy.

FIU has been aggressively building agriculture and food-related research to complement and expand the local capacity offered by the state's Land Grant Institution, University of Florida. As testament to FIU's efforts in agricultural education and research, it was one of the first universities in the nation to receive the USDA's Hispanic-Serving Agricultural Colleges and Universities (HSACU) designation.

FIU is the largest producer of STEM degrees for Hispanics in the U.S. It is ranked as a top institution in the United States for granting bachelor's and master's degrees to Hispanics, with more than 60 percent of the university's 55,000 students coming from Hispanic populations. In 2013, FIU had the largest percentage of minority students in the U.S. with 61 percent Hispanics and 13 percent African-Americans.

Hispanic students graduating from FIU Environmental Studies, Sustainability, Dietetics and Nutrition, Biological Sciences have joined U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS), Natural Resources Conservation Service (NRCS) and other agencies. Hispanic and other minority students graduating from FIU have joined graduate programs in some of the nation's prestigious agriculture and forestry institutes.

FIU sees itself as a Solutions Center for the community – both locally and nationally. Our commitment to this mission is evident in our collaborative efforts to help solve the challenges of the agricultural industry in Miami-Dade County, one of the most diverse in the country. This important sector employs over 20,000 people and produces more than $2.7 billion in economic impact each year.

The industry includes many subtropical and tropical crops that can't be grown anywhere else in the United States; additionally, a large ornamental industry leverages our local climate. But the

agricultural industry faces accelerating and unprecedented challenges which require innovative research, policy changes, and targeted training of the next generation for the agriculture industry. For example,

- Exotic pests and disease are being introduced into the U.S. at startling rates. These introductions, like citrus greening, emerald ash borer, Asian Long Horned Beetle, Redbay Ambrosia beetle and fruit flies, have cost Miami-Dade county billions of dollars in treatment, eradication programs and lost revenue.

- Local weather patterns and climate are shifting and will affect the crops we can grow and threaten food security. Rainfall and temperature are predicted to shift. For example, although predicting future changes in rainfall is one of the harder challenges of global climate models to resolve at the regional level, we expect shifts in the wet season to cooler times of year, which will increase heat stress to crops during the dry season. This is compounded with challenges in managing water to balance needs for urban, agricultural, and natural systems. In addition, sea level rise threatens to impact ground water and agricultural production.

- In South Florida, we also face a challenge in food waste. A large portion of some crops, although edible, is discarded because of imperfections. Changes in regulations regarding how this waste can be used or disposed of represents a difficulty – but also an opportunity – for the local community.

- Finally, agriculture is an industry with an aging workforce. We need to find ways to bring more young people into the industry and to diversify. Florida also has a large population of socially disadvantaged farmers. In a region with 20,000 unemployed veterans and nearly 44,000 migrant farmworkers, it's critical to work with the community to equip these individuals with technical and entrepreneurial skills, and access to government assistance which enables them to launch and sustain viable farm operations.

FIU faculty, staff and students are helping to address these challenges. The examples below show how Hispanic-Serving Agricultural Colleges and Universities can add to the expertise in our nation's Land Grant Institutions.

Developing more resilient crops

As part of the International Center for Tropical Botany (ICTB), Dr. Eric Bishop von Wettberg is working with collaborators around the country and world to develop new varieties of crops that are more resilient to changes in climate. The wild relatives of many of our crops are better able to survive variation in growing conditions including droughts or periods of excessive rainfall. Using cutting-edge genetic techniques, research teams can breed new varieties that retain positive the qualities of domestic crops that incorporate the hardiness of wild plants. Currently, Dr. von Wettberg

works on chickpeas, lentils, and mangoes. But, this approach holds promise for many other crop species growing in areas that – like South Florida – will face large changes in weather and climate. This innovative approach to developing the next generation of crops also holds promise for responding to emerging diseases.

Combating invasive pests
The aggressive Asian Redbay Ambrosia Beetle currently has Florida's multi-million dollar avocado industry in limbo. The insect spreads laurel wilt, a disease so deadly that growers in affected areas can't ship or move any fruits or plants for fear that it could spread to other susceptible crops, potentially affecting 430 different fruits, vegetables and nuts (95 percent of the fruits and vegetables in the county).

Detection is a major challenge. Diseased trees can begin to wilt within two weeks, and by the time symptoms are visible, the fungus has likely spread to nearby trees. This is a particular problem in commercial groves, where trees are planted close together.

Florida International University researchers, funded by the Florida Department of Agriculture and Consumer Services, have developed a unique detection program, **Detector Canines**, which could have far-reaching applications for the agriculture industry.

This program, led by FIU Provost and Executive Vice President Kenneth G. Furton and Biological Sciences Professor DeEtta Mills couples drone surveillance with canine scent detection:

- Drones carry spectral thermal digital imaging instruments that search for stressed trees before symptoms are visible
- Canines, which have up to 50 times more olfactory receptors than humans and can be hundreds to thousands of times more sensitive to detecting odors, have successfully identified infected trees that were not yet showing symptoms
- DNA tests confirm that the dogs are able to detect the pathogen much earlier than any other method.
- Trees that are detected early can be given an infusion or injection of the fungicide "Tilt" to significantly increase their chances of survival

To date, 85% of the pre-symptomatic trees identified have been saved and will continue to produce safe fruit for harvest. This is a stark contrast with 100% death rate of trees that are not detected early. The fungicide treatment is expensive but it protects the tree for 12 to 18 months. Waiting until symptoms appear jeopardizes not only the affected tree, but the entire grove. Prior to the development of this method, the main treatment method was removal of diseased trees and any surrounding trees.

More than 6,000 of Miami's 74,000 avocado trees have been destroyed due to laurel wilt. This isn't just a Florida problem. From California to Latin America, there are growing concerns about how to respond to this aggressive disease. The spread of infestation has already reached Texas in its march along the Gulf Coast. With the potential to spread into California, whose industry is 10 times that of

Florida, and Mexico, who produces 100 times that of South Florida, the impact could be devastating to growers and consumers around the world.

The approach pioneered at FIU holds promise for the early detection of emerging diseases so we can respond before they become so entrenched that the costs of treatment are crippling.

Adding Value

Adding value to the raw products grown by the agricultural industry in critical to the long term success of the community. Value-added products – like new foods, soaps, oils, supplements or medicines – provide avenues for reducing food waste, will create jobs, and enhance the local economy.

FIU has been a long-time academic collaborator with the University of Florida, and in 2013 entered a partnership to develop an Agribusiness Incubator. The concept was developed at the request of agricultural stakeholders in the Redland

The agri-business innovation center will:

- Improve agricultural products
- Enter new markets and develop products
- Provide market opportunities and information
- Teach financial management skills and access to financing, technical information and training, and mentorship
- Assist with regulations, standards and compliance

Miami-Dade county commissioners have decided to unanimously seek state funding to support the Agribusiness Incubator, which will include:

- a biotechnology production facility with specialized clean labs including a contemporary tissue culture facility
- a technology production facility with high quality infrastructure to accommodate flexibility in space uses such as moveable walls, a loading dock, and a "brainstorming room" that will be available for meetings on a regular basis for scientists, entrepreneurs and others to exchange ideas and concepts for forming new agri-businesses
- a Food Venture Center that will be a high-technology service laboratory that contains numerous pieces of equipment that will assist new businesses in product development

This facility will be staffed by highly trained technicians who will guide and direct adjustments needed in refining various value-added oil, drinks, medicines, etc. FIU will be the lead institution for the Food Venture Center, and STEM students will be intimately involved in the work conducted there as well as in labs at the Incubator.

The Agribusiness Incubator is estimated to generate $45 in local taxes for every dollar invested and have incubated business conducting $17M of business per year after five years. In addition, a new

FIU Kitchen Lab will improve the well-being of underserved communities, including low income immigrant food entrepreneurs. They will be able to formalize and grow their businesses through affordable commercial kitchen space, industry-specific technical assistance and access to new market opportunities. The Kitchen Lab will provide opportunities to link new products to local restaurants and grocery stores. It will also provide a storefront for innovative new products, making it a focal point for visitors and a gateway to agritourism in South Dade.

Planning for the future

An increasingly proactive approach to plantings is critical to the long-term sustainability of the industry in light of the myriad challenges outlined earlier. FIU's International Center for Tropical Botany – a collaboration with the National Tropical Botanic Garden – is working to not only enhance the genetic diversity of crops but to predict where crops will grow best in the future, what new crops or plants might be better adapted to future conditions, and combinations of plants that can be grown together to reduce unpredictability in economic yield for farmers and reduce susceptibility to pests and extreme weather.

K-12 Outreach and Workforce Pipeline

The FIU Agroecology Program has developed an institutional alliance with area USDA ARS, Miami-Dade County Public Schools, Miami Dade College (another HSI), local non-governmental agriculture research organizations, in addition to several organic farms.

Through FIU's organic garden, designated a USDA People's Garden in 2011, the Agroecology program conducts hands-on learning activities for over 500 K-12 students each year and hosts summer workshops for K-12 teachers. Organic garden activities draw students from disciplines across the University and throughout the community.

This training creates a pipeline for future recruitment of minority students into higher agriscience related education. Through summer internships at FIU, high school students get hands-on experience in agriculture and related sciences.

FIU researchers serve on the Miami-Dade County Public Schools Agriculture and Related Science Committee. Routine visits are conducted at area high schools to recruit minority students into agriculture and related sciences at FIU. These students participate in annual symposia, workshops, and conferences on agriculture and related sciences.

By thoughtfully incorporating Hispanic-Serving institutions into the network of Land-Grant and Extension centers, the USDA has added to their agricultural and environmental research, education, and outreach mission. Some examples of FIU education and training programs complementing our partner Land Grant include:

- Since 2005, the USDA has provided over $7 million in funding to the FIU **Agroecology Program** to support undergraduate and graduate student training and research on a wide range of topics related to agriculture and natural resources. The program has trained more than 500 students, with more than 40 going on to jobs at USDA or prestigious agriculture programs for graduate studies.

- The **Veteran and Small Farmers Outreach Program** is designed for military veterans, socially disadvantaged and beginner farmers, and nursery growers. The collaboration between FIU, community partners and the Dade County Farm Bureau is made possible by a grant from the U.S. Department of Agriculture's Office of Advocacy and Outreach, This program, lauded before Congress this past summer by US Representative Carlos Curbelo, assists participants in learning technical skills through hands-on activities with tropical fruits, vegetables and nursery plants, beekeeping, composting, and disease management. Their training culminates with a farming apprenticeship at a local farm or nursery operation.

- The **Florida-Caribbean Consortium for Agriculture Education and Hispanic Workforce Development (FCCAgE)**, led by FIU and in collaboration with Miami Dade College-North, St. Thomas University, and Universidad Interamericana de Puerto Rico, recruits and trains Hispanic students from communities that are under-represented in agriculture sciences and natural resource management. The multi-institutional consortium is funded by the USDA Hispanic Serving Institutions Grants Program and supports student travel, research, professional development workshops, summer internships, and job placement. FIU, along with FCCAgE partners Over 80 students have benefited from internships since its inception.

Part 2: The future of university partnerships to accelerate Agriculture Research, Extension and Teaching

In exploring opportunities for Congress and the United States Department of Agriculture to further accelerate the nation's agricultural research, extension and teaching priorities, it is important to consider the policy challenges facing the university research community.

Adequate support for agricultural research is critically important, especially as the community aims towards greater sustainability in the food production chain and an increasing need to respond rapidly to major challenges from introduced pests, shifting growing conditions, and economic volatility. In addition to leveraging federal research dollars, universities must also increase the direct relationships with industry and commodity groups in helping fund cutting-edge research, even beyond any one particular commodity. And of course, maintaining well-funded, viable, long-term research programs engages undergraduate and graduate students, who will be the future of providing science-based solutions for agriculture.

I Continue to complement the extension network and regional collaboration

Extension is a critical mission of the nation's Land Grant institutions and is built on the partnership between the Land-Grant colleges of each state, the federal government through the United States Department of Agriculture (USDA), and local county governments. Traditionally, each county of all 50 states has a local extension office, although some county offices have consolidated into regional extension centers. Today, there are approximately 2,900 extension offices nationwide. In South Florida, the University of Florida and Miami-Dade County, particularly Agriculture Manager Charles LaPradd provide outstanding extension services to the community. But, the needs of the community exceed the capacity. FIU, like other Hispanic-Serving Agricultural Colleges and Universities, have an important role to play in advancing the mission of extension by becoming part of the collaboration. In South Florida, FIU and UF have partnered on multiple initiatives to serve the community and have corresponded to build complementary expertise.

II The future of role of our nation's Hispanic-Serving Institutions in Agriculture

America's Changing Landscape and STEM Challenges

As of 2013, according to U.S. Census Bureau population estimates, there were roughly 54 million Hispanics living in the United States, making people of Hispanic origin the nation's largest ethnic or race minority, at 17% of the U.S. total population.

Increasingly, post-secondary Hispanic students are enrolled mostly at Hispanic-Serving Institutions (HSIs), which are defined in the Higher Education Act as institutions whose enrollment is made up of at least 25% Hispanic full-time equivalent (FTE) students. According to the Hispanic Association of Colleges and Universities (HACU), HSIs, like FIU, make-up 12.1% of non-profit colleges and universities, yet enroll 20% of all students and 58.9% of all Hispanic students currently enrolled in higher education. The number of HSI's in the United States is rapidly growing. In 1990, there were 137 institutions; in 2005, 245 institutions; and since 2013 over 400 institutions. Looking towards the future, almost 300 institutions are "emerging HSIs" with Hispanic enrollments between 15% and 24.9%.

According to the United States Department of Agriculture (USDA), although Hispanics represented 15% of all US wage and salary workers, as of 2012, Hispanics represented 50% of all farm laborers and supervisors in the U.S., only 16% at the management level. Looking at the Science and Engineering workforce, the source of many of our food scientists and engineers, only 3% of those doctoral recipients in the biological, agricultural, environmental and life sciences are Hispanic.

Hispanic-Serving Institutions and Agriculture

We salute Congress and the USDA for making important strides to engage with the greater Hispanic-Serving institution community. Notable efforts with ***direct*** impact on leveraging the research, outreach and educational missions of HSI's include:

- USDA and the Hispanic Association of Colleges and Universities have long been affiliated through a formal Memorandum of Understanding (MOU) and active leadership

group meetings that recognize the need to include more HSIs in USDA programs and research.

- This past year at FIU, USDA piloted a new expedited Pathways recruitment strategy for interns and full-time employment targeting Hispanics, African Americans and other underrepresented minorities. By working with multiple USDA agencies and other universities in the area, the agency placed 25 successful candidates after one full day of interviews on campus.

- USDA's **Hispanic-Serving Institutions National Program** and its leadership have ensured strategic partnerships between USDA and HSIs like FIU to provide improved access to employment, educational and institutional development opportunities.

- In particular, the **USDA HSI National Program's six regional offices** serve as important conduits for engagement and outreach to universities. The Miami office has served to create strategic partnerships between USDA and over 80 HSIs, serving as a valuable asset to our faculty and students seeking to assist students, faculty, and administrators in accessing USDA's educational, employment, and funding opportunities.

- National Institute of Food and Agriculture's **Hispanic-Serving Institutions Education Grants Program (HSI)** is a competitive grants program intended to promote and strengthen the ability of Hispanic-Serving Institutions to carry out higher education programs in the food and agricultural sciences. Funding for this important initiative is currently at just over $9 million and has made possible over 80 grants in recent years.

- The HSI Education Grants Program has made possible the **Florida-Caribbean Consortium for Agriculture Education and Hispanic Workforce Development** described in Part I.

- The **E. Kika De La Garza Fellowship Program** offers faculty and staff from HSIs the opportunity to work collaboratively with USDA to gain insight and understanding of the federal government. This uniquely tailored experience brings together HSI staff and federal executives to address the spectrum of challenges faced in the development of a well prepared Hispanic workforce. Fellows spend two to four weeks in Washington, D.C. to increase their understanding of USDA and other federal agencies, particularly at the national level, and be able to identify mutual collaborative interests. FIU has been fortunate to have had faculty and staff participate in this program.

- The **Multicultural Scholarship (MSP) Program and National Needs Fellowship (NNF)** Program have made an impact in attracting diverse students to agricultural professions. Many at FIU have benefitted from this support because of diligent staff at USDA.

Going forth, we present some thoughts on specific policy challenges facing the research community in Hispanic-Serving universities

1. **Creatively incorporating Hispanic-Serving Institutions into the land-grant ecosystem**
   As FIU and UF have proven, collaboration between a Land-Grant institution and Hispanic-Serving Institution is a win for all involved, and one which advances agricultural research, outreach and training. With only a handful of Land-Grants currently being Hispanic-Serving Institutions nationwide, the challenge for all involved is how to thoughtfully incorporate HSI's into the network.

2. Building greater capacity at HSI's through the **Hispanic-Serving Agricultural Colleges and Universities (HSACUs) programs**
   Laudably, the reauthorization of the Farm Bill in 2014 preserved the previously authorized programs for HSIs and Hispanic-Serving Agricultural Colleges and Universities (HSACUs) and added a new competitive grants program in support of Hispanic agricultural workers and youth. These programs are designed to strengthen the ability of HSIs to offer educational programs that attract, retain and graduate outstanding students who will enhance the nation's food and agricultural, scientific and professional work force. ***However, none of the HSACU programs authorized in 2008 has ever been funded by Congress and only the HSACU Endowment program has ever been included in the President's Budget Requests.***

   Authorized, yet unfunded programs include:
   - $20 million for the HSACU Equity Grants Program
   - $80 million for the HSACU Endowment Fund
   - $40 million for the HSACU Institutional Capacity-Building Grant Program
   - $40 million for the HSACU Fundamental and Applied Research Grants Program
   - $40 million for the HSACU Extension Grants Programs
   - $5 million for the competitive grants program for Hispanic agricultural workers and youth

HSIs receive 0.69 cents on the federal dollar when compared to all other institutions of higher education. This funding inequity is evident in agricultural research and infrastructure development investment by the US government. HSIs enroll 60 percent of all Hispanic higher education students and that proportion is likely to increase.

Congress should then not be surprised by the underrepresentation of Hispanics in agricultural-related programs and academic opportunities. Congress must correct this trend now or our nation's future food security and economic development will be unnecessarily limited.

3. **Unintended consequences of the creation of the HSACU designation**
   Considering the HSACU programs have not yet been funded and implemented, caution is urged in restricting universities that may be HSACUs from applying to other programs at USDA.

One example is with the Non-Land Grant College of Agriculture program, which was also authorized in 2008 and has been funded. This year's competition awarded $4 million dollars, yet HSACU applicants had to opt out of their respective designation to qualify as Non-Land Grant Colleges of Agriculture to be eligible for this program.

FIU looks forward to working with Congress and the US Department of Agriculture to accelerate agriculture research, extension and teaching and thanks the committee for providing the opportunity to share our perspective**.**