Component 1: The University of Arizona's Regional Future of Farming Hub

1. Program Description and Scope of Work

The University of Arizona (UA) proposes to create the regional Future of Farming Hub (FFH, or Hub) to build, expand and support an innovation ecosystem focused on three areas – precision field agriculture, indoor farming, and on-site energy production/waste management. The Hub falls under Component 1 of the Southern Arizona Coalition for Climate Adaptation and Resilience structure.

Eight unique assets form the ecosystem's foundation and framework: 1) Translational research fostering use- and user-driven innovation; 2) Land-grant university with an established Cooperative Extension network, 3) Economic analysis support for researchers, students and entrepreneurs; 4) Technology transfer with industry alignment; 5) Faculty and student entrepreneurship programs; 6) Workforce pipelines that draw from state-wide networks of students with high interest in agriculture; 7) Unique "living labs" and testbeds for technology development; and 8) A model of strong industry leadership and engagement (YCEDA). BBBRC funding will help aggregate these regional assets and accelerate economic recovery toward a prosperous, resilient, and equitable future.

The main objective of Component Project 1 is to leverage the eight assets above to build a regional network (**Figure 1**) and associated programming to solve industry challenges in the face of climate change. This will be accomplished through the tasks in **Table 1.**

Table 1. Scope of Work	
Task 1	Formation of Hub leadership and governance structure to include a leadership team and advisory boards within the first 30 days
Task 2	Establish Hub by-laws
Task 3	Establish internal and external communications channels, web and social media presence, and other web-based infrastructure
Task 4	Establish platforms and venues for virtual marketing and communications, including internally- and externally-facing web portals, blogs, vlogs, etc.
Task 5	Recruit additional advisory board members and complete Hub strategic plan within the first 90 days; foster alignment with strategic objectives of the other Components, particularly Workforce and Entrepreneurship
Task 6	Identify Key Performance Indicators (KPIs), conduct baselining to measure historical and current outcomes, and make longitudinal measurements for continuous improvement
Task 7	Work with Component 4 (Infrastructure) to establish testbeds within the first 12 months after award
Task 8	Plan (year 1) and run (years 2-4) the "Proposers Conference" event
Task 9	Leverage the existing UA program, summer academy for pre-college students, to direct interested students into programs run under Component 2 (Workforce)
Task 10	Plan (year 1) and run (years 2-4), in collaboration with Component 3 (Entrepreneurship), ag tech-themed business pitch competitions, hack-a-thons, venture builders workshops, etc.
Task 11	Author best practices manual and disseminate across the US and territories (**Figure 2**) in year 4

2. Regional Industry Assets and Needs

Field agriculture is strongly represented in our region by Yuma County on the Colorado River, which contains many farms and growers of leafy green fresh produce, cotton, hay, wheat, citrus, dates and other fruits and nuts, as well as suppliers of seed and other associated materials and equipment. There is also large beef and dairy production. Companies include Bayer Crop Science, Nature Sweet Tomatoes and WholeSum Foods (all of whom provided letters of support in Phase 1). The Yuma Center of Excellence for Desert Agriculture (YCEDA) is a public-private partnership that includes the University of Arizona and companies such as Barkely Ag, JV Smith Companies, Taylor Farms, Gowan Co., D'Arrigo Bros., Nutrien Ag Solutions, and many others. These companies help to produce more than 90% of US leafy greens during the winter months and represent a vital national asset.

Indoor agriculture is supported by UA's Controlled Environmental Agriculture Center (CEAC) whose members and sponsors include Bright Farms, Ridder, Priva, Argus Controls, Bios, Pro-Mix, Beaver Plastics, Grodan, and Iluminar Lighting. Technologies such as controlled environment agriculture support a new and expanding sustainable production industry, and these companies are poised to reach critical mass as an industry in the near future.

As detailed in Section 4(A) of the Overarching Narrative, the comprehensive economic development strategies (CEDS) for Tucson, Pima County, Yuma County, and Western Arizona Economic Development District (WAEDD) align around themes of inclusivity, resilience, entrepreneurship, and innovation. These regions reflect Arizona's multicultural heritage and the strength of the state's agriculture industry sector. Common needs supported by the Hub include technology development that is directly inspired by the challenges faced in these areas and their associated farm communities and industries, workforce development driven by inclusion of groups that have been traditionally underrepresented in technology-focused disciplines (e.g. science and engineering), and entrepreneurship that will foster new startups that add critical mass to the ecosystem.

3. Proposed Solution

The ability to collect, process, and analyze temporal, spatial and individual data on inter- and intra-field variability in crops (known as precision agriculture) has never been greater. Yuma agriculture is growing rapidly and poised to make significant contributions to the state's economy while preparing field agriculture to respond to the challenges of climate change. At the same time, indoor farming, such as that in Tucson, does not require vast acres of land or expensive field equipment; it embodies translatable sustainability by maximizing reduce/re-use/recycle strategies, energy efficiency, and crop consistency and yields. Subsequently, in many emerging industry segments, entrepreneurs can start a precision agriculture (or related) business from modest beginnings, thereby offering unprecedented equity and access. 'Future farming' is our term for this precision agriculture field to enclosed ag to startup model.

In this way, we develop resilient practices in the face of a changing climate and can significantly reduce or even eliminate reliance on land, good weather, and natural sunlight. Future farming offers compelling and adaptive business models and can address nutritional concerns with locally-grown products, thereby eliminating so-called "food

deserts" in underserved communities. Catalyzing the growth of a modern agriculture industry has huge potential to contribute to equitable wage and job growth across Arizona and the US.

The regional Future of Farming Hub (**Figure 1**) leverages the state-wide resources of Arizona's flagship land grant university to create an ag tech-focused ecosystem that connects subject matter experts to practitioners in the field. The Hub will work continuously throughout the year, but a key feature of our proposed solution will be an annual "Proposers Conference." This event will bring together all regional stakeholders and accomplish several important goals:

- Hybrid meetings of individuals and organizations across the region to learn about the Hub's activities and funding opportunities.
- Networking and partnering activities will be held to foster teaming and pilot project ideation.
- The Hub's three testbeds [1) Ubiquitous Broadband Yuma and precision field ag, 2) Indoor ag at the Controlled Environment Agriculture Center or CEAC, and 3) Biogas energy production at a partner farm and UA] will be highlighted at the conference for pilot project ideation.
- Attendees will learn about the process for pilot project proposals and applications for Future Farming Fellowships for faculty and students.
- Workshops will be held to educate faculty and students on best practices for use- and user-inspired research and technology transfer to industry.
- Students working on existing projects (years 1-4) will present their research in a poster reception format to encourage networking among stakeholders.
- Workforce outreach will be facilitated by inviting members of the younger state-wide population such as 4H, FFA, and, most importantly, students, particularly from/for the College of Agriculture and Life Sciences, UA Yuma, and Arizona Western College.

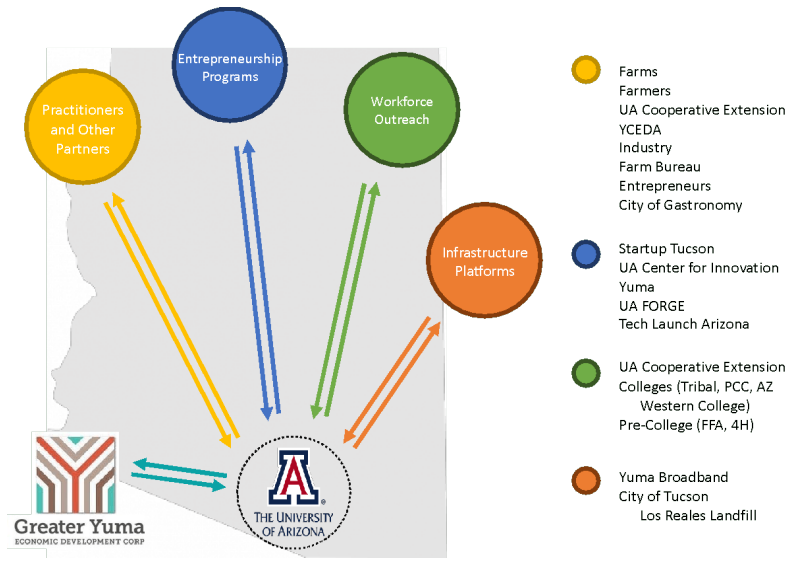

Figure 1. The foundation of Component 1 will be the Future of Farming Regional Hub led by the University of Arizona. Existing assets from Southern Arizona and across the state will be networked into a new innovation ecosystem. Through the Cooperative Extension system and other programming, subject matter experts will work with farms, farmers, and industry to solve challenges and open new markets. Programming will be available to connect entrepreneurs to regional resources.

Web and social media will be leveraged heavily for year-round Hub marketing and communications. Extension Specialists and industry experts will be recruited to contribute to monthly blogs and vlogs. A “Grand Challenges Blackboard” will be used to post needs, knowledge gaps and other opportunities so that engineers and scientists can work on potential new pilot project ideas and form nascent project teams in anticipation of the annual Proposer Conference, or to submit proposals for other funding outside of the Hub (e.g. other EDA, USDA, NSF, etc.). Student groups (e.g., college, FFA and 4H) will be able to produce text, image and video content (e.g. TikTok, Vine, YouTube) to showcase their connections to the Hub.

An important deliverable for the Hub will be its “Best Practices Manual,” which will be disseminated across the US through an existing network of land-grant universities and colleges (**Figure 2**). By leveraging a common land-grant mission with a strong agricultural theme, we will create impact at scale, covering essentially the entire US.

Figure 2. Hub dissemination vision. By the end of year 3, the Hub is expected to have developed and documented many “best practices” that define a productive, inclusive, and resilient ag tech-based ecosystem. US-wide impact can be realized by disseminating these practices across the country through land-grant institutions.

4. Partners and Program Outreach

Strong synergy already exists between the UA, UA Yuma, and the Greater Yuma Economic Development Corporation (GYEDC) with joint programs and complementary capabilities. Key partners that will help to deploy programming across the state by active participation in the Hub fall into four categories as shown in **Figure 1**.

A vital asset of the Hub is the Yuma Center of Excellence for Desert Agriculture (YCEDA). It is the industry broker for the region as well as a clearinghouse for best practices and connection to farms, farmers, industry, and students. Especially strong ties to economic development organizations in Yuma such as GYEDC are facilitated by YCEDA. The greater Yuma area is 70% Hispanic and 70% first generation college students, which presents significant opportunities for economic advancement through the Hub’s activities where the Coalition’s equity framework is expected to be especially impactful.

Another critical aspect of the region is Arizona FORGE, which is expected to play an active part with thousands of students (high school, community colleges, and UA) across

the region. Because of its unique student-community entrepreneurial mindset model, it will serve as an interlink for small companies and entrepreneurs (Component 3), workforce (Component 4), and funding (Component 5). FORGE is already a pillar partner with Startup Tucson, who work from FORGE's building in Tucson, and have been awarded multiple EDA grants in recent years.

Outreach will leverage the existing Cooperative Extension network, where specialists are already embedded in all 15 counties and have strong relationships with farms, farmers, municipalities, schools, and industry. They develop and implement plans based on locally identified needs that lead to improved agricultural practices, and collaborate with all Extension program areas (Horticulture, 4H Youth Development, FFA) and volunteers on educational efforts that facilitate positive management practices with significant and locally-relevant impact. Our approach will focus on Southern Arizona and then scale across the state. Through these outreach efforts, Extension Specialists will be key facilitators in a continuous loop that brings new agricultural challenges into the Hub, and translates solutions out to farms, industry, and other stakeholders. This model can be emulated by other state Cooperative Extensions.

Diversity defines who and what we are, measured by our differences and representations; *Inclusion* is how we engage and value our diversity; *Equity* is how we ensure that diverse groups share in the benefits that the Coalition will bring to our region. Promotion of these important tenets will be accomplished by integrating our shared values, beliefs, and attitudes so as to influence the environmental climate, perception, and inclusive behavior across all aspects of the Hub, from research groups and project teams to the Hub leadership. We will leverage the Equity Framework (see overall Project Narrative) and specifically the Equity Committee to ensure representation on the Hub's leadership and advisory boards from tribal, rural, and underrepresented communities. We will promote a community-wide culture that nurtures, promotes, and advances societal impact. As a Hispanic Serving Institution (HSI), the UA is especially well-suited to lead this effort.

5. Measurable Goals and Impacts

Early key goals include completing the tasks outlined in Section 1 within the timelines previously stated, including establishment and early baselining of important KPIs, which will likely include metrics related to traditional innovation outcomes (e.g., those promoted by the Association of University Technology Managers or AUTM), as well as those that demonstrate economic development. AUTM metrics, in particular, have a large historical context and basis for comparison to other university ecosystems. In **Table 2**, we establish the list of expected milestones and performance targets.

The impact of accomplishing these goals will be a new standard for developing a sustainable agricultural ecosystem, anchored by academic-industry-community research innovation and translational technology; fueled by innovative models of workforce development and entrepreneurship; and supported by robust partnerships with industry and diverse communities. These new ecosystems will reach across the US and will drive strong economic growth and creation of thousands of new jobs in a rejuvenated agricultural sector that shows resiliency in the face of climate and other challenges.

Table 2. Goals for the Regional Future of Farming Hub		
Year 1	**Years 2-3**	**Year 4+**
• Implement all key Hub programs • Initiate/run participant training in translational research / innovation / entrepreneurship practices • Targets: 10+ industry partners, 2+ invention disclosures, 2+ translational grant applications.	• Hub programs running efficiently • Annual training in translational research, innovation and entrepreneurship of all Hub students and faculty • Targets: 30+ industry partners, 5+ invention disclosures, 2+ licenses, 2+ spin-off companies, 4+ student fellows hired by industry, 4+ industry-funded projects, 4+ translational grants awarded, 500 new jobs created	• Drive the Hub to self-sufficiency • Innovation integrated into training based “best practice” model • Initiate dissemination of Hub best practices across US through land-grant institutions • Targets: 45+ industry partners, 7+ disclosures, 3+ licenses, 3+ spin-off companies, 6+ student fellows hired by industry, 6+ industry-funded projects, 6+ translational grants awarded, 1000 new jobs created

6. Sustainability Plan

The Hub’s programs will reside mostly within the UA as part of the existing research enterprise, which currently includes more than $750M of extramural funding from government, philanthropic and industry sponsors. While EDA funding will be used to establish and initially run specific programs aimed at increasing technology transfer out of the university, the actual research leading to innovations will continue to come from these sponsors. The transition from university-based research to industry will continue to be supported by Tech Launch Arizona (the University’s technology transfer office), while the development of student entrepreneurship and venture will be supported by Arizona FORGE, independent of EDA funding.

This model of use- and user-inspired research, that emphasizes technology de-risking over esoteric academic questions, that fosters an entrepreneurial mindset among its participants, and that produces an industry-ready workforce with highly attractive skills and credentials is expected to attract significant support beyond EDA funding. Such an ecosystem is highly desired by current federal agencies as their funding portfolio shifts toward more applied research and real-world problem solving. Industry is more attracted to academic partnerships that can leverage public dollars and offset institutional risk. Students are increasingly attracted to educational programs that result in highly sought-after, marketable skills. The Hub’s operational principles and goals are in strong alignment with these trends, which will increase our competitiveness for these resources and help ensure sustainability after the EDA funding period ends.