

Planning to Expand Research Infrastructure at Yuma Agricultural Center, Arizona

A proposal submitted by the University of Arizona to the USDA NIFA Research Facilities Act Program

Funding Opportunity Number: USDA-NIFA-OP-010063

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Written by

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Total Proposed Project Cost: \$47, 712; cost shared 50:50 by USDA and University of Arizona

Project Summary:

We propose a planning process to identify and meet future needs for research lab facilities at the 514-acre Yuma Agricultural Center (YAC). Outputs will be needs and capacity assessments, a conceptual design with options for new building construction and existing building renovations to meet those needs, and the expected costs for those options.

Contributors to the process will include the University of Arizona (UA) faculty, the UA Yuma Center for Excellence in Desert Agriculture, and leaders in UA research administration, private industry, and the Greater Yuma Economic Development Corporation. Previously, having a conceptual plan helped us obtain construction funding from federal, state, and local governments and industry sources.

YAC is one of 10 units in the UA Arizona Experiment Station portfolio. The current labs and offices were constructed in 2008, and occupancy of the 13 labs exceeds capacity. Three labs are shared by faculty.

More research lab infrastructure is needed to meet emerging needs for climate resilient agriculture and food practices in the face of reduced access to irrigation water supplies, increasing temperatures, greater climate uncertainty, and new pests and diseases.

The University of Arizona clearly identified the need to support this research through Strategic Plans and the 2023 UA President's Advisory Commission on the Future of Agriculture and Food Production in a Drying Climate.

Agriculture is a major industry in Yuma County, contributing \$ 3.2B annually to the local economy. Underrepresented groups account for 70% percent of the population in Yuma County, Arizona.

This document contains the main narrative and attachments. Budget and personnel information was not included.

PROJECT SUMMARY

Instructions:

The summary is limited to 250 words. The names and affiliated organizations of all Project Directors/Principal Investigators (PD/PI) should be listed in addition to the title of the project. The summary should be a self-contained, specific description of the activity to be undertaken and should focus on: overall project goal(s) and supporting objectives; plans to accomplish project goal(s); and relevance of the project to the goals of the program. The importance of a concise, informative Project Summary cannot be overemphasized.

Title: Planning To Expand Research Infrastructure At Yuma Agricultural Center, Arizona

PD: PD/McClaran, Mitchel P

Institution: The University Of Arizona

CO-PD: PD/Slinski, Stephanie L

Institution: The University Of Arizona

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Institution:

CO-PD: PD/PI 7 Name (Last, First, MI)

Institution:

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This file MUST be converted to PDF prior to attachment in the electronic application package.

Section 1. Introduction

The Yuma Agricultural Center urgently needs more labs to support the critical research needed to sustain the valuable winter vegetable industry that is facing the reduced access to water for irrigation from the Colorado River and increasing temperatures. Several efforts are ongoing to secure the funding for the new research, and this proposal focuses on securing funding to plan for building the additional labs that are needed.

University of Arizona's (UA) purpose and activities in the fields of food and agricultural science are clearly expressed in its land grant mission to provide education, research and Extension to support agricultural production and sustainability. This is accomplished through academic programs and research faculty, the Arizona Experiment Stations (AES) [1], and Cooperative Extension [2]. The AES mission is to "Provide a diverse, world-class infrastructure essential to generating and disseminating critical knowledge and technologies for Arizona and the world." The Yuma Agriculture Center (YAC) [3] is a unit of the AES and it currently hosts research and Extension programs in subjects including plant physiology, crop production, insect biology and control, disease biology and control, weed ecology and management, soil and water management, fate and transport of environmental contaminants, food safety, and autonomous agricultural mechanization. These activities serve a diverse agricultural community and are accessible to stakeholders that include farmers, farm workers and the broader agriculture industry, including in the neighboring region of Imperial County CA. The farmers in the Yuma Region have a \$3.2B annual economic impact on Arizona's economy (see Section 2). Additionally, by hosting activities that engage the broader community in agriculture, the YAC is an important resource for a historically underserved community.

We are proposing to increase laboratory capacity at the YAC because it is currently oversubscribed and we expect a tremendous need for more labs in the near future. Today the YAC (Figure 1.1) has thirteen existing labs fully occupied by sixteen researchers, meaning some labs are shared by multiple researchers (see floor plan in Attachment 8). More critically, additional lab space is needed to support new researchers who will address emerging challenges of reduced access to water for irrigation, increasing temperatures, greater climate uncertainty, and resulting increases in disease and pest problems affecting both plant and human health (see

Box 1). These challenges will require more research space and researchers to provide guidance on the hard decisions in agriculture that lie ahead.

Box 1. Emerging challenges to Yuma Agriculture

Withdrawals from the Colorado River in Arizona will be reduced in 2024 by at least 15% according to a proposal sent to the US Bureau of Reclamation (BR) from Arizona, California, and Nevada. The distribution of that reduction among user groups (agriculture and urban), water districts, and end-user is uncertain. Also uncertain is how withdrawals will be reduced in 2026 when the current agreement between with BR and the 7 states (AZ, CA, ID, NM, NV and UT) expires. What is certain about future withdrawal for irrigation is that they will be reduced compared to now and the last 50 years.

Average temperatures in Yuma have increased 2.7°F in the last 30 years (72.1°F for 1963-1992 compared to 74.8° F 1993-2022) [4]. It is uncertain if and when the warming trend will slow or end. However, the increased temperature already have impacted earlier timing of planting and harvest, greater irrigation use to offset greater evaporation, and greater disease and pest issues related to higher temperatures.

Recent patterns of precipitation have been anomalous in relation to the El Nino Southern Oscillation (ENSO). Past patterns have been a greater probability of winter precipitation as the ENSO increases, but that relationship has weakened in recent years. Greater uncertainty in precipitation patterns has implications for Colorado River withdrawals, and more directly on the ability to plant, manage, and harvest in waterlogged fields.

These challenges and the expected demand for more research labs are what drive this proposal for funding. Because Yuma is such an important agricultural region, the UA recognizes the YAC as an essential research facility anchoring its pursuit of funding to meet those challenges. For example the YAC was recently identified as a future technology and innovation hub by the UA President's Commission on the Future of Food and Agriculture [5]. Several grant applications have been submitted that that address these challenges including 1) a \$160M proposal to the new Directorate of Technology, Innovation, and Partnerships NSF Engines: Type-2: Innovation Engine for Climate Resilience in the Colorado River Basin States (CRISIS Engine), to advance economic development, resilience and sustainability in agriculture, related energy production, and sustainable water management in five states of the Colorado River basin; 2) a NSF Global Center proposal: Global Center for Clean Energy Agri-Tech Systems (CleanEATS), in partnership with the University of Lincoln's Institute for Agri-Food Technology

[6] in the UK that focuses on AI and robotics in agriculture for climate change mitigation and clean energy; and 3) a NSF Campus Cyberinfrastructure grant in partnership with Arizona State University and the Sun Corridor Network [7] to improve the cyberinfrastructure of the YAC. The UA will continue to seek funding to meet these challenges and the needs of stakeholders, and the facilities that must be in place and maintained for the long-term success of any new programs at the YAC. **Given this recent pursuit for research funding, this proposal to plan for increased capacity is clearly not a situation of “if we build it, they will come”. Instead, this is a situation where “we better build because they are coming!”** (See section 3 for more information.)

The UA is committed to maintaining and improving the YAC. The research lab facilities in proposed plan will be sustained with AES annual operating funds in the same manner that all facilities have been maintained across the ten AES units for the past 30+ years, and we plan to continue that practice. We include maintenance activities in the annual operating budget for all AES sites. We feel that the impact justifies the funding request of this proposal because the major initiatives and the resulting new faculty hires described above far exceeds our modest application for \$47,712 to prepare a conceptual plan for a new lab building at the YAC. Already, the proposals that have been submitted (described above) exceed \$200M, and there will certainly be more research proposals submitted and funding awarded, meaning that more lab space will be needed.



Figure 1.1. Yuma Agriculture Center Valley Farm. (Google Earth June 2023)

Section 2. Significance and Target Audience

The organizational structure of the YAC is shown in Figure 1.2. In short, the YAC is one of ten units in the AES which is one of three units in the Division of Agriculture, Life, Veterinary Sciences and Cooperative Extension (ALVSCE) [8]. The other ALVSCE units are the College of Agriculture and Life Sciences [9] and Cooperative Extension. The CALS is home to ten academic programs, 199 faculty, and ~5300 undergraduate and graduate students. The Cooperative Extension is the cornerstone of the University's unique position as Arizona's land-grant institution. It employs nearly 500 people, approximately 70 percent funded by external grant funding. The Cooperative Extension is located throughout the state, on five reservations, and four military bases. The translational effort of the Cooperative Extension makes scientific

discoveries usable for the Arizona population and serves as the eyes and ears that bring real-world problems back to the research faculty. Approximately 130 of 199 (65%) faculty in CALS, and 250 faculty in Cooperative Extension, work in areas related to food and agriculture disciplines, including agronomy, animal and range science, plant and soil science, and entomology. Besides labs on the UA main campus, all other research facilities used by the CALS and Cooperative Extension are at AES units. (See Attachment 5 for more information.)

Faculty expertise from throughout CALS and Cooperative Extension is sought out locally, nationally and internationally [10]. Briefly, here are two examples of faculty with labs at the YAC. Dr. John Palumbo is an essential resource for integrated pest management expertise in the Southwestern US. He was recently recognized with an Endowed Chair in Integrated Pest Management in honor of his contributions to the agricultural community. Funding for this endowment came from the agriculture community that he serves. Dr. Glenn Wright's date palm research has been sought out not only in AZ and CA, but across the border from Yuma in Northern Mexico, and more recently as part of the Million Date Palm project in Oman.

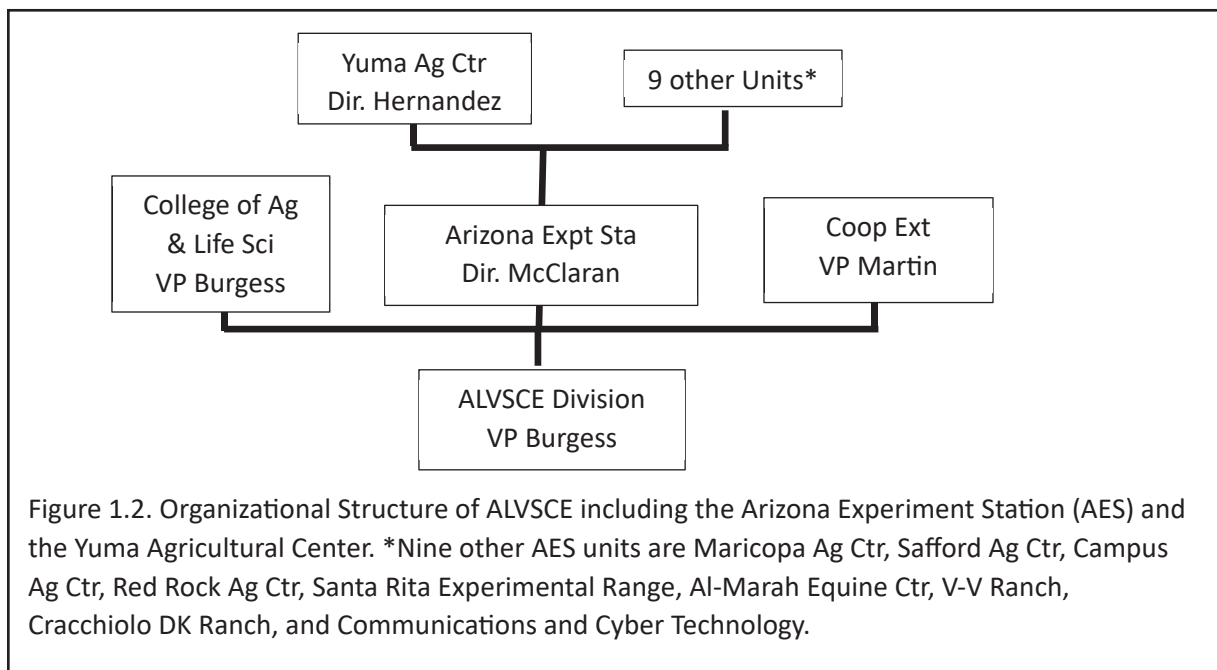
The target audience for the proposed research lab facilities is primarily in Yuma County, Arizona, but the impact will also spread to neighboring areas of California, and Sonora and Baja, Mexico. The agricultural industry in Yuma has strong associations with CA growing regions, especially in Imperial county and in Salinas CA. Many of the companies move operations seasonally between Salinas and Yuma. Many farming operations also farm in other states in the US and in northern Mexico. The Yuma agriculture region and the facilities available at the YAC have attracted international collaborations with the University, including companies developing technologies for conserving water in arid environments [11], and agricultural robotics [12].

Yuma County is in the southwest corner of Arizona and is bordered by Mexico to the south and California to the west (Figure 1.3). The agricultural region consists of 170,000 acres of farmland, much of which is planted 1-3 times per season and irrigated using withdrawals from the Colorado River. Crops grown include leafy greens, melon, broccoli, cauliflower, celery, high-quality durum wheat, cotton, alfalfa, citrus, and medjool dates. Between Thanksgiving and Easter, fresh produce from Yuma represents approximately 90% of the total North American leafy greens market. Agriculture provides a \$3.2B economic impact to Yuma County, and accounts for about 25% of the County's jobs [13]. The new knowledge generated to address

emerging challenges supported by the increasing capacity at the YAC will benefit the entire agricultural industry in the southwestern US. Stakeholders who benefit indirectly include the residents, businesses, and local government service organizations. (See the letters of support in Attachment 7. which includes 3 letters from private industry and one from an economic development organization.)

Yuma County has ~200,000 residents, including two tribal reservations. The County suffers from some of the highest levels of poverty and unemployment and lowest per-capita income, and levels of four-year college attainment in Arizona. Efforts are underway in the community to increase higher education accessibility to develop a local workforce for future industry needs and the UA is actively involved in that effort.

The UA is a designated Hispanic Serving Institution (HSI), meaning undergraduate enrollment is at least 25% Hispanic students. About 76% of the UA-Yuma campus student population is Hispanic, and 72% are first-generation college students. Retention and mentoring programs are very common at the University of Arizona, and specifically the Arizona's Science, Engineering, and Math Scholars (ASEMS) [14]. The ASEMS program is supported the the College of Agriculture and Life Sciences.



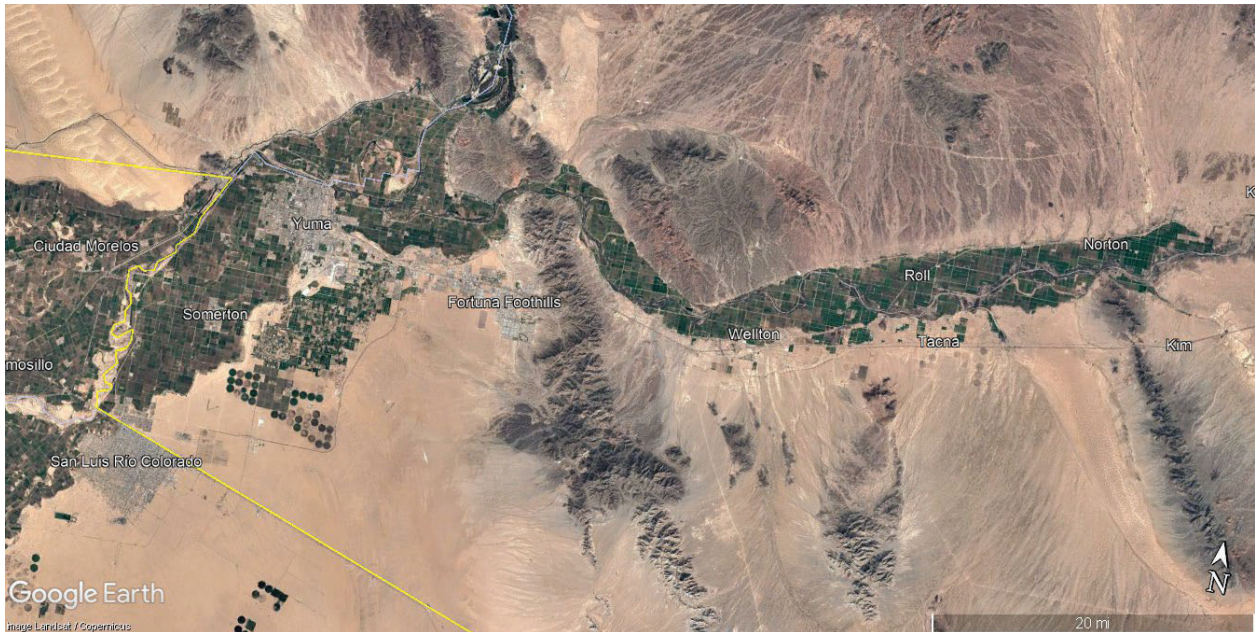


Figure 1.3: Yuma County Agriculture (Google Earth June 2023)

Section 3: Long-term Impact and Institutional Commitment

The proposed planning project will increase research capacity in food and agriculture at the YAC by identifying the number of additional labs needed in the next ten years. Currently, all thirteen existing labs at the YAC are occupied, and multiple researchers are sharing three of those labs. Research use has been trending upward at the YAC in the past five years, and now exceeds lab space capacity. Simply put, there is no capacity to support the additional researchers that are expected to be recruited and supported by the new research funds being pursued to address emerging challenges (see Box 1).

The proposed new labs will be used to increase research capacity to create transformative technologies and climate-resilient agriculture and food practices. Specifically, we expect new research efforts to focus on irrigation and agronomic practices, crop and variety evaluation and selection, and pest and disease detection and control. We also expect research to extend into big data applications and management to improve efficiencies of practices, life-cycle analysis to evaluate climate and water impacts per unit of production, and farmer worker health and training.

The propose for the proposed increase in research labs is directly aligned with strategic goals for the UA and the Division of Agriculture, Life, Veterinary Sciences and Cooperation Extension. In addition, it is aligned and critical to a recent \$160M proposal to the National Science Foundation (NSF) submitted by ALVSCE and the College of Engineering (COE). The greatest alignment is with the new UA President's Advisory Commission on the Future of Agriculture and Food Production in a Drying Climate [5]. The Commission's report specifically identifies the YAC as the technology and innovation hub to provide faculty a place to work on meeting challenges of reduced access to water for irrigation, increasing temperatures, greater climate uncertainty, and resulting increases in disease and pest problems because of the magnitude of agriculture in the area, the sustained research performed at the YAC, and opportunities to expand research facilities at the YAC. Our proposed effort clearly aligns with the UA Strategic Plan Pillar 3, Arizona Advantage Driving Social, Cultural and Economic Impact [15]. The UA President's Advisory Commission (see above) is identified explicitly in this Pillar. Finally, our proposal aligns with the ALVSCE Strategic Plan Goal 2 of Optimizing Research Infrastructure to support ALVSCE Mission [16]. The goal specifically calls for planning and investment to increase research facilities in the AES to support critical research needs.

In January 2023, ALVSCE and COE submitted a \$160M proposal to the new Directorate of Technology, Innovation, and Partnerships titled NSF Engines: Type-2: Innovation Engine for Climate Resilience in the Colorado RIVER BaSIn States (CRISIS Engine). The YAC was specifically identified as a core location for agriculture and food research to advance economic development, resilience and sustainability in agriculture, related energy production, and sustainable water management in five states of the Colorado River basin.

The nine letters of support (Attachment 7) come from the UA research and administration leaders, private agriculture industry, and economic development partners. All letters confirm that current use of labs exceeds capacity, and the more space is needed. The UA letters focus their justification on expected growth in research funding, whereas the industry and community development letter focus their justification on the assistance needed from new research to help sustain and advance the agriculture industry in the face of new and serious challenges.

Section 4: Project Planning and Activities

We will use the funds to perform a planning process for additional research lab capacity that will include 1) needs and capacity assessments for research laboratories in the next 10 years, 2) a conceptual design with 2-3 options for new building construction and existing building renovations to meet those needs and the expected costs for those options. Contributors to the process will include the UA faculty, the UA Yuma Center for Excellence in Desert Agriculture (YCEDA) [17], and leaders in the UA research administration, private industry, and the Greater Yuma Economic Development Corporation (GYEDC). (More details and a timeline are provided in Attachment 4.)

There have not been any planning efforts to meet future needs of the YAC since 2008 (see Attachment 8). The YAC is grossly overdue for new planning and design efforts. The need for this proposed planning project became glaringly obvious when recent efforts to prepare funding proposals. The UA President Commission on the Future of Agriculture [5] identified the YAC as the hub for future research activities (see Section 1). When presented with the prospects of increased research activity, we are left asking: **“What labs are available to support these new efforts?, we are already overcommitted for lab space.”**

The UA’s Planning, Design and Construction (PD&C) [18] will lead the planning process. All infrastructure projects placed on any UA property must work with the PD&C to develop plans and assure compliance with all federal, state, and local regulations for new and renovation construction as well as historic preservation compliance. Specifically, the PD&C will provide technical assistance with all parts of the process. They have expertise in-house and often contract with private firms to provide needs and capacity assessments, conceptual plans, and cost estimates. Based on the excellent working relationship between AES and the PD&C, we expect this entire planning effort to be completed within six months after receiving funding (see Plan in Attachment 4).

Recently, PD&C provided similar conceptual designs and cost estimates for projects on AES sites. Those plans and estimates were critical to obtaining funding from the State of Arizona because they provided sufficient detail and forethought to ensure success with the allocated funding. For example, in FY23, ~\$10M was provided by the State of Arizona in special

appropriations for three AES projects. We plan to pursue the same approach with the plans that will be developed if this proposal is funded.

Section 5: Financial Capacity and Fundraising

The AES is financially sound, and has continued to have the resources needed to support its Mission. The AES is responsible for providing and maintaining research infrastructure and research services to the UA scientists. The AES annual operating budget has grown from ~\$10M to ~\$16M between FY19 to FY23. The \$6M growth covers increases in salaries, costs of supplies, investments in major equipment, utilities, and establishing one new experiment station for equine research. About 50% of the costs are covered by revenues that are self-generated by 1) charging the UA researchers for services using the federal rate study procedure to calculate the charge for the services and supplies provided, 2) charging private researchers and growers fees set by the market rate, and 3) selling agricultural products that were grown during a research project. The other 50% of the budget comes from the CALS, which is the home of the academic units in the Division of Agriculture, Life, Veterinary Sciences and Cooperative Extension. The ~50:50 ratio of self-generated and CALS sources has remained steady through this period, indicating that use has grown and rates for services have also grown due to increased costs. (More detail is provided in Attachment 5.)

Specifically, the YAC has a ratio of ~70:30 self-generated income to contributions from CALS in the current FY23 budget of \$2.3M. The greater than 50% contribution from self-generated funds reflects a larger proportion of service to private researchers and growers than the AES as a whole. This greater proportion of self-generated revenue provides more discretionary funds to support this proposed planning project.

Funds will be used from within the Arizona Experiment Station (AES) to cover the \$22,856 match to meet the obligation of providing half of the \$47,712 needed to complete the proposed planning project at the YAC. The matching funds will come from the YAC's self-generated revenue coming from service charges to the UA and private researcher and growers, and sales of agricultural products grown during research projects. The Director of AES, McClaran (PI on this proposal), has the discretion to use these funds for this purpose.

Section 6: Project Team

The project team includes three experts who are familiar with existing conditions and needs at the YAC: Mitchel McClaran, Stephanie Slinski, and Humberto Hernandez. The team will ensure that the plan is followed as described so that 1) sufficient and representative input is gathered during the needs assessment, 2) full disclosure is provided during the capacity assessment, and 3) options are shared with interested groups, and 4) the final conceptual design with options and cost is shared with those groups and made easily available on the YAC website.

Mitchel McClaran, PhD [19] has been the Director of the Arizona Experiment Station since January 2020, and was Associate Director between 2017-2020. He has been a Professor of Range Management at the UA since 1986. He was intimately involved in obtaining the conceptual designs and costs estimates of the three projects funded by special State of Arizona appropriations in FY23. Dr. McClaran brings expertise in the AES organization and familiarity with UA organizations and procedures, including the UA Planning, Design and Construction group (PD&C) who will perform the assessments and conceptual plans with cost estimates described in the proposal.

Stephanie Slinski, PhD [20] is the Interim Executive Director of the UA Yuma Center for Excellence in Desert Agriculture (YCEDA) [20]. YCEDA is a public-private partnership between the UA and the agriculture industry with offices and a laboratories at the YAC. Their work focuses on high-priority issues identified by industry stakeholders, including but not limited to increasing production efficiencies through disease and water management, crop yield maximization, food safety, and technology utilization. Dr. Slinski has been the Associate Director for Applied Research and Development at YCEDA since 2018, and assumed the role of Interim Executive Director in June 2023 when the former Executive Director was appointed as the Director of the Department of Agriculture for the state of Arizona. Dr. Slinski brings expertise in facilities use at the YAC and research and research administration for sustainable arid agriculture in the Yuma area.

Humberto Hernandez has been the Director of the Yuma Agricultural Center since 2020, Associate Director since 2005, and a staff member since 1984. Mr. Hernandez brings deep familiarity with the YAC facilities and research trends driving facility use. He is keenly aware of the need for additional research infrastructure to serve the expected growth in UA faculty

performing research to develop technologies and climate resilient agriculture and food practices in the face of challenges of reduced access to water for irrigation, increasing temperatures, greater climate uncertainty, and resulting increases disease and pests.

Section 7: Deliverables, Outcomes, and Sustainability

Our planning proposal will result in three deliverables; 1) needs and capacity assessments, 2) a conceptual design with options for new building construction and existing building renovations to meet those needs, and 3) the expected costs for those options for the YAC. These deliverables will be developed with the assistance and expertise of the UA Planning, Design, and Construction (PD&C). The PD&C has expertise in-house and will often contract with private firms to provide needs and capacity assessments, conceptual plans, and cost estimates. All infrastructure projects placed on UA property must work with PD&C to develop plans and assure compliance with all federal, state, and local regulations for new and renovation construction as well as historic preservation compliance. We expect this entire planning effort to be completed within six months after receiving funding (see Plan in Attachment 4 and Section 4 above).

We expect the outcome of the planning process to be an increased likelihood to secure funding for the construction of new research labs at the YAC. Investments in these facilities may come from federal, state, local governmental organizations, and from private sources. The investments will be made to increase research capacity to create climate-resilient agriculture and food practices in the face of reduced access to water for irrigation, increasing temperatures, greater climate uncertainty, and resulting increases disease and pests. These goals have been identified strategic plans at the UA, the recent UA President's Advisory Commission on the Future of Agriculture and Food Production in a Drying Climate, and the submission of recent research proposals described in Section 3: Long-term Impact.

Most importantly, we believe that having the conceptual plans and cost estimates in hand will increase our chances of obtaining funding to build the infrastructure. For example, in FY23, ~\$10M was provided by the State of Arizona in special appropriations for three AES projects. Support for those appropriations was more readily obtained because we had

conceptual designs and cost estimates for each project. If we are funded, we plan to pursue the same approach with this planning proposal.

The sustainability of this new infrastructure will follow the same procedures and practices of review and funding that occurs within the AES (see section 5 Financial Planning and Fundraising). In short, the AES will continue to provide to staff and equipment needed to perform operations, maintenance, and services associated with the new research infrastructure. Funding for the actual research will be obtained by faculty and private researchers through other funding sources.

Bibliography and References Cited

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16. University of Arizona Division of Agriculture, Life, Veterinary Sciences and Cooperative Extension Strategic Plan Goal 2 of Optimizing Research Infrastructure
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17. University of Arizona Yuma Center for Excellence in Desert Agriculture
<https://desertagsolutions.org/>
18. University of Arizona Planning, Design and Construction <http://pdc.arizona.edu/>
19. Mitchel McClaran <https://nature.arizona.edu/mitch-mcclaran>
20. Stephanie Slinski <https://desertagsolutions.org/person/stephanie-slinski>
21. University of Arizona Yuma Center for Excellence in Desert Agriculture
<https://desertagsolutions.org/>

Attachment 4: Project Planning and Activities

YAC was established in 1945, and no plans have been drafted to meet future needs since 2008. Based on the excellent working relationship between AES and the UA Planning, Design, and Construction (PD&C) <https://pdc.arizona.edu/>, we expect this entire planning effort to be completed within six months after receiving funding.

The PD&C will provide technical assistance with all parts of the process. They have expertise in-house and will often contract with private firms to provide needs and capacity assessments, conceptual plans, and cost estimates. All infrastructure projects placed on UA property must work with PD&C to develop plans and assure compliance with all federal, state, and local regulations for new and renovation construction as well as historic preservation compliance.

Recently, PD&C provided similar conceptual designs and cost estimates for projects on other AES sites. Those plans and estimates were critical to obtaining funding from the State of Arizona because they provided sufficient detail and forethought to ensure success with the allocated funding. The plan will include installation of a photo-voltaic system, extra insulation, and low water use fixtures in all designs.

Project Milestones and Chronology (starting month assumes funding arrives Jan 2024)

Milestones	Jan 24	Feb 24	Mar 24	Apr 24	May 24	Jun 24
1. Needs Assessment	■					
2. Assess Existing Infrastructure		■				
3. Develop Options			■			
4. Conceptual Design for 2-3 options including cost estimates				■		

Project Milestones

Milestone 1: Needs Assessment: Determine the need for additional lab infrastructure in the next 10 years at YAC using survey responses and short interviews. Input will be solicited from relevant University of Arizona (UA) faculty, the UA Yuma Center for Excellence in Desert Agriculture (YCEDA), and leaders in UA research administration, private industry, and the Greater Yuma Economic Development Corporation (GYEDC).

Milestone 2: Assess Existing Infrastructure: PD&C will determine the cost of expanding the existing lab building versus construction of a new building and determine whether converting existing buildings is more efficient and effective than constructing a new building.

Milestone 3: Develop Options: based on the needs and capacity assessments of existing infrastructure, we will develop 4-5 options that will contrast in scope and design, such as renovation versus new, and 10 versus 20 new labs. Lab size will be based on University of Arizona standards of 600ft² per lab, one researcher office 115ft², supporting lab service room 140-300ft², and one office for support staff per researcher (115 ft²).

Milestone 4: Conceptual Design for 2-3 options including cost estimates: select 2-3 options from the larger set developed in Milestone 3, develop conceptual designs showing general plans and footprint, as well as estimated cost for construction/renovation including installation of a photovoltaic system, extra insulation, and low water use fixtures in all designs.

Attachment 5: Institutional Profile

a. **Informational facts and figures regarding the institution, such as it is:**

The University of Arizona (UA) was established in 1885, and it has been the Land Grant University in Arizona since 1887 (<https://www.arizona.edu/about>). There are ~36K undergraduate and ~10K graduate students enrolled, and it is a Hispanic Serving Institution. The UA Mission is *to continuously improve how we educate and innovate so we can lead the way in developing adaptive problem-solvers capable of tackling our greatest challenges*. Research efforts at the UA include \$761M in total annual research expenditures from sponsored projects, making it an NSF Research 1 Institution and in the top 20 of all US public research institutions. The UA has been accredited by the Higher Learning Commission since 1917 (<https://hlc2021.arizona.edu/>). The University's last comprehensive evaluation occurred in 2021 and validated the University's extraordinary quality and integrity of academics, research, administration, faculty, staff, resources, facilities, and procedures.

The organizational structure most relevant to the Yuma Agricultural Center (YAC) is shown in Figure 5.1. In short, YAC is one of 10 units in the Arizona Experiment Station (AES <https://experimentstation.arizona.edu>) which is one of three units in the Division of Agriculture, Life, Veterinary Sciences and Cooperative Extension (ALVSCE <https://alvsce.arizona.edu/agriculture-life-and-veterinary-sciences-and-cooperative-extension>). The other ALVSCE Units are the College of Agriculture and Life Sciences (CALs <https://cals.arizona.edu/about>) and Cooperative Extension (<https://extension.arizona.edu/about>). CALs is home to ten Academic programs, faculty, staff, and ~5300 undergraduate and graduate students.

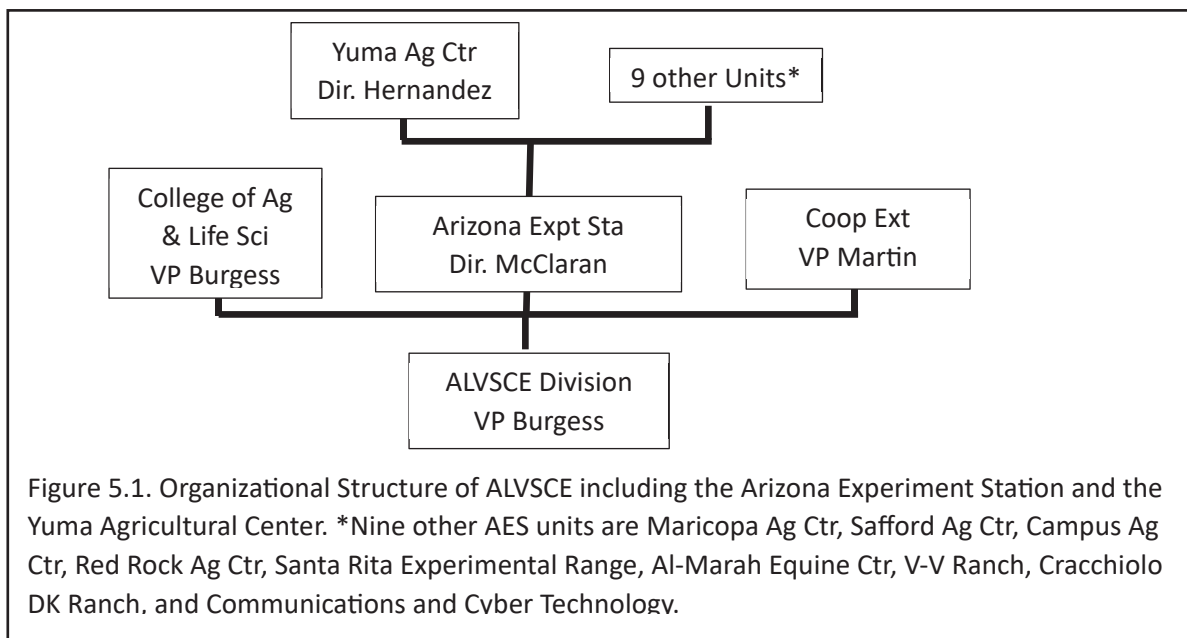
Approximately 130 of 199 (65%) faculty in CALs and 250 faculty in Cooperative Extension work in areas related to food and agriculture in disciplines including agronomy, animal and range science, plant and soil science, entomology <https://cals.arizona.edu/research/strengths>. Other than labs on the UA main campus, all other research facilities used by the CALs and Cooperative Extension are located on the AES sites.

The AES mission is *to provide a diverse world-class infrastructure essential to generating and disseminating critical knowledge and technologies for Arizona and the world*. The AES is responsible for providing and maintaining research infrastructure and providing research services to UA scientists. There are ~110 AES employees, and there are no faculty employed by the AES.

All faculty are employed in academic units of CALS or by Cooperative Extension, or both for Extension Specialists. In short, AES provides infrastructure and services to faculty researchers across the UA, and to researchers from other universities, and the private sector.

The AES annual operating budget has grown from ~\$10M to ~\$16M between FY19 to FY23. The \$6M growth covers increases in salaries, costs of supplies, investments in major equipment, utilities, and establishing one new experiment station for equine research. About 50% of costs are covered by revenues that are self-generated by 1) charging UA researchers for services using the federal rate study procedure to calculate the charge to research for the services and supplies provided, 2) charging private researchers and growers fees set by the market rate, and 3) selling agricultural products that were grown during a research project. The other 50% of the budget comes from the CALS, which is the home of the academic units in the Division of Agriculture, Life, Veterinary Sciences and Cooperative Extension (ALVSCE). The ~50:50 ratio of self-generated and CALS sources has remained steady through this period, indicating that use has grown slightly and rates for services have also grown due to increased costs.

Specifically, the YAC has a ratio of ~70:30 self-generated income to contributions from CALS in the current FY23 budget of \$2.3M. The greater than 50% contribution from self-generated funds reflects a larger proportion of service to private researchers and growers than the AES as a whole. This greater proportion of self-generated revenue provides more discretionary funds to support this proposed planning project.



b. Data on recent food and agricultural sciences program activities, including:

We report values for the UA-Main Campus and UA-Yuma Campus because the latter is in the same local area as the YAC where we propose to plan for new research infrastructure.

UA-Main Campus: The CALS is the home for ten academic programs and 21 separate undergraduate majors <https://cals.arizona.edu/students/majors>. These programs are reviewed by external panels every 5 years. Total annual student enrollment in 2021-2 and 2022-3 academic years is ~4800 undergraduate students summed across two semesters for each year (Table 5.1). That value accounts for ~60% of all undergraduate students enrolled in the CALS. About 15% of all undergraduate students in the UA are in the CALS.

Degree	Students enrolled		Degrees Granted		Cost / Unit*
	2021-2	2022-3	2021-2	2022-3	
Agribusiness & Resource Economics	200	169	20	31	~\$400
Environmental & Water Resource Economics	31	23	5	5	~\$400
Agriculture Technology Management & Education	118	115	29	23	~\$400
Animal Science	392	436	28	17	~\$400
Veterinary Science	937	946	91	59	~\$400
Biosystem Engineering	107	94	21	8	~\$400
Environmental Science	398	367	44	41	~\$400
Natural Resources	546	578	59	42	~\$400
Nutrition & Food Systems	61	47			~\$400
Nutritional Science	442	821	173	131	~\$400
Plant Science	81	84	8	3	~\$400
Sustainable Plant Systems	80	88	10	11	~\$400

UA-Yuma Campus: For more than a decade, the CALS has offered several BS degree programs directly in Yuma through the UA-Yuma (<https://www.azwestern.edu/student-support/transfer-services/transfer-from-awc/ua>). Efforts in Yuma are a direct extension of two of the CALS's strategic pillars: 1) Be a leading economic development engine for Arizona, and 2) Produce employable graduates who can do jobs that do not yet exist and create new jobs.

Approximately 625 students are enrolled at UA-Yuma, and approximately 150 are in food or agriculture related degree programs (Table 5.2). UA-Yuma serves the population of place-bound students who cannot relocate 235 miles to pursue their degree in person in Tucson where the main campus is located.

About 400,000 people live in the greater Yuma area (including Imperial County, CA). The ethnic demographics of the Yuma and Imperial region include; 60+ % Hispanic, 30% Caucasian, and 5-10% percent other. Yuma County adults report low educational attainment: only 24% have a 2-year or 4-year degree (15% of adults have a Bachelor's degree or higher). By comparison, statewide attainment rates for 2-year and 4-year degrees (combined) were 46% as of 2020.

While the local economy struggles against poverty and high unemployment, jobs in STEM fields are plentiful. Although the community has many job opportunities open in agriculture, engineering and other highly technical areas, employers in the service region find it increasingly difficult to fill these jobs because they cannot find employees with the necessary qualifications, technical skills, and education. A 2022 survey of more than 100 business and community leaders in the greater-Yuma area identified workforce development and training as the most important challenge to the region's continued growth, with 45% citing trouble filling specialty, engineering and technology positions related to the agricultural sector.

Degree	Students enrolled		Degrees Granted		Cost / Unit
	2021-2	2022-3	2021-2	2022-3	
Ag Systems Management	47	35	8	9	\$350
Family Studies Human Development	46	44	5	11	\$350
Nutritional Science	25	27	5	7	\$350
Sustainable Plant Systems	18	14	3	1	\$350
Systems Engineering	27	27	4	7	\$400

Attachment 8. Planning and Design Documents

The image below shows the existing lab and office building (Glen C. Curtis Building) at the Yuma Agricultural Center. It was built in 2008. The 13 labs are fully occupied, and three labs are shared by 2 researchers each.

