

## Climate Change-Mitigating Shade Structures

**Grant Type**

Annual Grant

**Application Type**

Final Application

**Project Manager 1 Name**

Thomas Plasse

**Project Manager 1 Status**

Staff

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**Project Manager 1 Department**

4-H Pima County Cooperative Extension, Tucson Village Farm

**Project Manager 2 Name**

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**Project Manager 2 Status**

Staff

**Project Manager 2 Department**

Pima County Cooperative Extension/Tucson Village Farm

**Project Manager 2 Role**

Co-lead

**Project Advisor Name**

n/a

**Project Advisor Email**

n/@a

**Project Advisor Department**

n/a

**Fiscal Officer**

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**Fiscal Officer Department Name**

Pima County Cooperative Extension

**Requested Funding Amount**

*Only enter this number after completing the budget sheet (the budget template will round up your request).*

*Mini Grants may request \$250 up to \$5,000.*

*Annual Grants may request \$5,001 up to \$100,000, and up to three years of funding.*

**Year 1:**

\$42806

**Year 2:**

\$0

**Year 3:**

\$0

**Project Name**

Climate Change-Mitigating Shade Structures

**Primary Project Category**

Water

**Secondary Project Category**

Food

**Background and Context**

*Please provide relevant background about your organization/team including your mission and/or expertise. Lay out the rationale for the proposed project, focusing on the issue that your project would address. You may also share how the project is new or how it complements, builds upon, or scales existing initiatives. This section is meant to give us more information about you and the context for the project, while the questions below provide space to go into detail about your proposal's plan and specifics.*

**Response:**

Tucson Village Farm (TVF) is a small education-focused urban farm teaching youth about agriculture and nutrition as well as facilitating team building and outdoor adventure activities, all of which are designed to help youth to flourish and thrive. We are a program of 4-H and the Pima County Cooperative Extension office and are located at two sites, 2201 E. Roger Rd. and 4210 N. Campbell.

Our model of creating environments in which youth and young adults can thrive is multifaceted. TVF creates myriad opportunities for youth to flourish in a nurturing, safe space in which they can be equipped with the tools that they need to thrive. These opportunities include field trips to TVF focused on agriculture and nutrition for grades ranging from pre-k to high school, summer day and overnight camps ranging in focus from farm and culinary, art, to various outdoor adventures and a High Ropes Course designed to create opportunities for strengthening bonds between group members and increasing individual confidence. Our Healthy Living Ambassador (HLA) program is flourishing, with 164 enrollments in 2024. The HLA program focuses on providing teens with opportunities to participate in projects with such diverse foci as culinary, photography, organizing a music festival to name just a few. TVF also provides internship opportunities for UA students in which — depending on their area of interest or study — they learn about urban agriculture, education, culinary skills, team building facilitation, and so much more.

In 2024 alone, TVF reached 9,267 youth through direct service — this includes the programs mentioned above, but through programs such as TVF's U-Pick and farmer's market, cooking classes for adults, Holiday Market, volunteer days, and other public-facing events we reach an even greater amount of community members, youth and adult alike.

Instrumental to all of the efforts mentioned above is the successful cultivation of vegetables on TVF's two farms. The vegetables grown at TVF are used in our commercial teaching kitchen, in which youth and adults learn how to prepare vegetables in a way that will encourage them to incorporate more of them into their diet. Our growing fields are also a key component in our educational efforts, showing our field trip groups, volunteers, interns, and community members that it is in fact feasible to grow healthy food sustainably in the desert.

Our proposal is a request for funding to construct large shade structures that will facilitate more efficient cultivation of vegetables in a poly-cultural agronomy; TVF grows a wide range of vegetables and varieties with different needs. These structures will allow us to continue to grow vegetables in an increasingly unpredictable climate.

## **Project Description**

*Please provide a thorough description and explanation of your project. Be explicit in what your team is proposing. What will your project's outcomes be and how will you achieve them? Outcomes should be specific, measurable, achievable, realistic, and timely.*

**Response:**

TVF is requesting the above amount to build and install various shade structures on our field rows and greenhouse. While it seems counterintuitive to reduce the amount of sun that a plant receives, over the fifteen years that TVF has been growing food we have directly experienced the effects of a changing climate. There are two primary growing seasons in the Sonoran Desert — winter and summer. Each of these two seasons have distinctive plants that can tolerate the various stressors of the season. Plants such as lettuces, other greens and brassicas flourish in the colder months, and in the summertime fruiting plants such as tomatoes, okra, and eggplant are better able to tolerate the summer heat.

Over the course of time since TVF's establishment, we have been challenged by a strong warming trend. Since 1951, the number of days annually that Tucson's high temperature has exceeded 100 degrees increased from 40 to 68 (source: NOAA/National Weather Service). Anecdotally, here on the ground at TVF, we have seen the length our winter season shrink and the extremity of heat in the summer increase, as well as an earlier onset of heat and a later seasonal abatement of heat.

TVF has found that well-managed shade can give us greater control over the effects of extreme heat on our food crops — crops that are crucial to our mission of providing opportunities for youth to flourish. We are requesting funds to construct a modular shade structure that can be installed over some of our field crops to protect them from the sun and heat of the summer, and a shade structure to protect our vegetable starter plants from the heat in the period between when they leave the greenhouse and before they are planted in the field.

To be aware of the processes of the cultivation of food and to have access to a resilient local food system is an important community resource. TVF is doing our part to ensure that the Tucson community has that resource available. In 2024, TVF produced 6,254 pounds of produce which we distributed to the Tucson community through programming and markets. An infrastructural enhancement of the proposed shade will allow us to enhance our cultivation of food crops in the arid environment of the Sonoran Desert and provide a local food resource for youth and the Tucson community more broadly.

We estimate that these shade structures will allow us to produce 15% more consumable food (non-heat damaged) and reduce our water use by 10%. An added benefit of shade is that it reduces evaporation of water from the soil and allows more water to enter the root zone of crops.

## Timeline

*Please provide a timeline breakdown for the key steps in your project. The timeline can be basic, but please include anticipated timeframes for each major step, including any key dates for when certain elements must start or be completed. The timeline can be in list format.*

### Response:

July 2025: Receive CSF grant funds

July – August 2025: Order and acquire fabricated structures and other materials

August — September 2025: Await delivery of fabricated structures from supplier (estimated time of departure for shipment of items from Greenhouse Megastore is four weeks)  
October — December 2025: Construct and install shade structures at Tucson Village Farm

## Budget Narrative

*Use this section to provide supplemental justification for the items you are requesting on your budget sheet. Please break down your justifications into the budget categories: Personnel or operating budget. Do not list out each expense or repeat notes made in the budget template, but instead address why the line items are being requested and the purpose they will serve, providing elaboration when necessary.*

*If you are requesting funding for personnel, use this section to elaborate on the position you are creating and how the budget and timeline was established for it. If you plan to hire students, describe in what capacity. Describe relevant details thoroughly (wages, responsibilities, duration of job, extent of involvement, how you will solicit/ market these opportunities etc.).*

*Ensure the descriptions match the line items in the budget sheet.*

*If matching or supporting funds are secured for the project, identify the source and amount in this section, and detail the impact of the matching funds on your overall budget.*

### Response:

1200 Series Gothic Arch Frame (x2) - Two structures to shade, cover and provide structural support for TVF's crops. Each structure will cover four field rows and will provide enough vertical clearance for program participants to interact and learn in our shaded, cooled growing spaces. Arch Frames will also provide climate control that will facilitate more efficient and effective cultivation of vegetable crops. As an additional benefit, the structural nature of these frames will allow TVF to more effectively cultivate vining vegetables such as cucumbers, tomatoes, and peas, as this frame will provide a vertical support for crops.

Be Cool Solutions Custom Shade Cloth - This item is attached to the above mentioned Arch Frame (providing a reduction of 40 percent of UV rays). It is the item that provides the shade, engendering all of the benefits outlined above in the description of 1200 Series Gothic Arch Frame (x2). This shade cloth in TVF's experience lasts about ten years, and will be replaced when needed by TVF staff, AmeriCorps Volunteers, interns and student workers.

Economy Shade Structure (20x40) - One structure to be installed outside of TVF's existing greenhouse to provide a space in which vegetable starts can acclimate to the outside environment before being planted in TVF's fields rows. The structure will also be large enough to provide a thermally comfortable space to conduct educational programming.

Quickrete Concrete Mix - 102 60lb bags - Concrete to set structural elements of constructions.

Retail Benchmaster Black Plastic Grid Top Tables (5' x 2') x 20 - Twenty tables to temporarily store vegetable starts above ground while they are acclimating to climate before being planted in field rows. These tables will also provide protection from rodent damage and an ergonomically ideal working space for various TVF programs.

Husky 6 cu. ft. Steel Wheelbarrows x4 - Wheelbarrows to facilitate the efficient construction of above structures — mixing concrete to set posts for structural elements of frames. After construction is complete, these items will be used for daily farm operations and optimize community volunteer labor at TVF's facilities.

Educational Signage for Shade Structures - To provide public education resources for visitors and program participants to learn about the importance of shade in arid land agriculture and to acknowledge the support of CSF in TVF's efforts.

Work Day Refreshments - Snacks and drinks provided for volunteers during a workday to build aforementioned structures.

Personnel - The two staff members leading the project will supervise and train student workers and ensure the successful completion of the project. Based on previous construction projects, we determine that the timeline provided is a realistic estimate. Student workers will be hired to attend work days, installing the structures and supervising community volunteers during larger volunteer events.

## **Project Feasibility and Logistics**

*The Campus Sustainability Fund will only fund projects that have completed the necessary work to ensure they can succeed, be completed in the grant's timeline, or have an accurate budget.*

*Please provide a description of the work that has been completed so far to make this project feasible. Please provide a description of the work that has been completed so far to make this project feasible. If relevant partners have been contacted/coordinated with, please identify them in your response.*

*For example, have you received consent or authorization to complete your project (such as from Housing and Residence Life, Facilities Management, Parking and Transportation, etc.)? If you are making modifications to campus, do you have written authorization or official quotes from Facilities Management to accurately identify the cost of labor and supplies?*

### **Response:**

TVF has a long track record of successfully completing projects in-house and expanding infrastructure, all of which serves our educational mission. The supervision necessary to install the requested shade structures will be completed by TVF staff.

The sites upon which the structures will be situated are already prepared for the installing of the structures, and TVF has access to the necessary tools for install. Student workers, student interns and volunteers will assist TVF Staff in accomplishing the necessary labor for the project. TVF staff will train student workers and equip them with the tools necessary to lead work days and supervise interns and volunteers during large work days to ensure that the three shade structures are properly constructed and installed.

Our Farm Manager and Instructional Specialist, Senior will oversee and train all of the personnel involved in this project, and also contribute to the on-the-ground-labor. Our Instructional Specialist,

Senior will supervise construction of the shade structures and lead training days. The Farm Manager will determine correct placement of the structures and also coordinate and recruit volunteers, interns and student workers, along with scheduling work days. Constructing these structures will require a significant amount of labor.

The tasks involved include:

- Surveying the site and ensuring the square and true shape of the finished structures are accurate. This is a time-consuming process and essential to ensure that the shade will be structurally sound. We estimate that this will take two weeks to complete.
- Mixing and pouring concrete for the vertical members of the structures. This is a labor-intensive process and will allow our personnel to fill their time in a large-scale effort and use their labor hours effectively. We estimate this will take four weeks, including two large volunteer work days planned to assist in the digging and concrete pouring.
- Assembling the shade structure. This will also necessitate a team of staff, student workers, interns and volunteers to execute. We estimate that this will take four weeks to accomplish, including two large volunteer work days planned to assist in the installation of the more labor intensive elements.

It is also worth noting that here at TVF we value our projects as not only an opportunity to improve infrastructure, but also an opportunity to increase the knowledge base of the community members with whom we work. It is not uncommon for personnel (elucidated above) to have limited experience with the tasks requiring completion, in this case, the construction of a shade structure.

For this reason, completion of tasks often require a longer timeline that would be expected of a trained crew of professionals. However, TVF is ultimately focused on education, and the completion of tasks — even with an extended timeline — is secondary to the opportunity for our personnel to learn valuable life skills.

## Environmental Sustainability Outcomes

*Please provide a description of how you expect your project to advance environmental sustainability on campus. A definition of environmental sustainability is provided on our Guides and Tips page.*

### Response:

These shade structures will be crucial to adjusting TVF's growing practices to adapt to a changing climate which has already posed significant challenges to our food production. As a local food producer, we see the desire of our Tucson community for fresh food grown locally without a significant amount of food miles attached.

Mitigating the effects of significant heat will allow TVF to produce more food more efficiently — one crucially important facet of building sustainability: a resilient food system. TVF also acts as a proving ground for gathering information about the changing reality of food production in a world that is experiencing widespread aridification as a result of climate change. Despite the challenges presented by aridification, food still needs to be produced to feed a growing population. As other regions of the world begin to become hotter and drier, methods used in Tucson and the Sonoran

Desert could be applied to other regions experiencing some degree of aridification.

Additionally, applying shade on a large scale will allow TVF to lower water use as the shade will reduce evaporation and allow the farm to apply less water to thirsty crops in the hotter months. The proposed shade has been demonstrated to capture heat, reduce transpiration from plants (thus reducing water use), and lower temperatures in the growing zone.

Whenever possible, TVF tries to support local suppliers of goods and this project will be no different. We have over our many years of growing done our best to reduce the miles that our necessary goods travel. We've partnered for many years with local businesses such as Tank's Green Stuff and Arbico Organics to keep our fields healthy and productive. For this shade structure project we will make sure that whenever possible we source goods locally. To enumerate, we will purchase the signage from our usual local supplier, Cook & Company Signmakers, and as much of the construction material that is feasible and wheelbarrows will be purchased from our local Mark's Ace Hardware, a locally-owned store which is part of a hardware retailer's cooperative.

## Social Sustainability Outcomes

*Please provide a description of how you expect your project to advance social sustainability on campus. A definition of social sustainability is provided on our Guides and Tips page.*

### Response:

Tucson Village Farm has from its inception made sure that baked into our mission was and is the goal of reaching all facets of the diverse populations of Tucson and the UA. Schools from all over Tucson attend our field trips and enjoy samples of the produce that we grow here on the farm. We carefully track the demographics of our participants to ensure that TVF reaches a wide range of population groups. These efforts articulated through our programming have been demonstrated by research to have a positive impact on the lives of participants, through avenues such as increased vegetable consumption and more active lifestyles.

At our markets TVF is also able to offer beneficiaries of SNAP (Supplemental Nutrition Assistance Program) double-up benefits — allowing Tucsonans who may be experiencing food insecurity access to affordable fresh vegetables and increase their benefit by two-fold when purchasing locally grown produce.

We have also worked closely with refugee resettlement and support organizations (IRC, Owl and Panther) to ensure that the resources that TVF provides are made accessible to new members of the Tucson community.

TVF works closely with The Garden Kitchen and provides the organization with produce to be distributed among residents of the city of South Tucson. Much of South Tucson residents live in what is known as a Food Desert, a designation coined by the USDA indicating the lack of availability of fresh food to residents. The Garden Kitchen helps to mitigate this condition with their PLAZA



(Promoting Local AZ Agriculture), supporting South Tucson residents while simultaneously bolstering the local food production system. TVF provides fresh produce to this market every Tuesday, to be sold at PLAZA the next day. The total food miles embodied in the produce from TVF is only fourteen miles (the market takes place at 202 W Valencia Rd.).

The food crops produced by TVF are used, cooked and consumed by a wide range of people from the many facets of our Tucson community. By creating infrastructure to increase, optimize and streamline TVF's production of vegetables we will be able to increase our food distribution and culinary programming and continue to reach all demographics in the Tucson area.

## **Student Leadership & Involvement**

*Please provide a description of how your project will benefit students on campus regarding the creation of leadership opportunities or student engagement. What leadership opportunities exist within your proposal? If you plan to seek student involvement, include relevant details thoroughly and how you will solicit/ market these opportunities.*

### **Response:**

Tucson Village Farm has in its fifteen years of operation provided hundreds of opportunities for student workers and interns to participate in facilitating our programming and assisting in the operation of our growing facilities. In 2024 alone TVF provided opportunities for 46 students in the form of either a student worker position or an internship. We have recruited UA students from diverse programs including but not limited to: Animal & Comparative Biomedical Sciences, The School Garden Workshop, The School of Nutritional Science & Wellness, Agricultural Technology and Management, and Nutrition Opportunities for Undergraduate Students Promoting Resilient and Inclusive, Sustainable Food and Health Systems (NOURISH).

With TVF's proposed project we will produce more food, which will be used in the programming that many of these students participate in, teaching youth about healthy eating habits and distributing produce to the Tucson community.

During the construction of the proposed shades, interns and student workers will also have the opportunity to learn real-world skills related to sustainable cultivation of food crops in arid regions. At TVF we ensure that students who spend a period of their valuable time with us receive a diverse range of experiences that contribute to their growth as leaders in their relevant fields. We also plan to have a volunteer day in which we recruit students of the UA and community members to assist in the construction of the structures.

## **Education, Outreach, and Behavior Change**

*What opportunities does this project provide for members of the campus/community to learn about sustainability? How will your project educate the campus community and/or incorporate outreach and*

*behavior change, particularly those who are not currently engaged with sustainability or environmental work? Please provide a description of how you expect your project will communicate its impacts to the campus community.*

**Response:**

All of Tucson Village Farm's activities are conducted with the goal of education in mind. This goal spreads across ages and demographics, incorporating youth, young adults, and adults. When TVF begins a project, a critical question is how our organization can leverage the results of the project to best serve our educational goals.

With large, prominent shade structures on our field area we will be able to highlight the challenges presented to agriculture by climate change and describe in detail the strategies that TVF uses to mitigate a warming climate while producing thousands of pounds of produce for the Tucson community.

The interpretive signage will be designed in house — staff members have created signage across the farm and have the capacity to create new signs that will highlight the benefits of the newly installed shade and emphasize the challenges posed by an increasingly unpredictable climate. The signs will be youth-friendly and accessible to young learners, using graphics and narratives that anthropomorphize plants so that these plant "characters" can describe their struggles and the ways in which the newly installed shade has alleviated these struggles.

An important component of our field trip programs here at TVF is the Farm Chores station during which students have an opportunity to tour the growing spaces and learn about growing food through hands-on experiences. Incorporating information about the utility of the shade structures into the educational curriculum already established in our field trip programs with regards to our changing climate will be a natural fit with our existing educational programming.

Student workers will participate in this project and in so doing learn about the actual work involved in adjusting our behaviors and actions to a changing climate, specifically how food can be produced sustainably in arid lands. At TVF we are committed to equipping young people with the tools to go forth and feel empowered to make significant changes in the world and increase humanity's resilience in the face of a changing planet.