

CSF - Mini Grant Final Application

Grant Type

Mini Grant

Application Type

Final Application

Primary Project Manager

The Primary Project Manager is responsible for completing this application, answering questions posed by the Campus Sustainability Fund Committee, and completing all required reporting on project progress and outcomes. If the Primary Project Manager is a student who graduates in May 2023, the Secondary Project Manager must be a staff or faculty member OR a student who graduates after May 2023.

Primary Project Manager Name:

Benjamin Hunt

Primary Project Manager Status:

Student

Primary Project Manager Email:

huntbenjamin02@arizona.edu

Primary Project Manager Department

Biosystem Engineering

Secondary Project Manager

The Secondary Project Manager is the back-up for the Primary Project Manager if they are unable to complete any of the requirements of the Campus Sustainability Fund, particularly completing required reporting on project outcomes. Alternatively, the Secondary Project Manager could be co-facilitating the project with the Primary Project Manager should the proposal require or desire to have two Project Managers.

Secondary Project Manager Name:

Gracie Reinholz

Secondary Project Manager Email:

reinholz1@arizona.edu

Secondary Project Manager Status:

Student

Secondary Project Manager Department

Biosystems Engineering

Project Advisor Name:

Projects where the Primary and Secondary Project Manager are both students require the involvement of a staff or faculty member within project's Fiscal Officer's department. The Project Advisor contact must be a staff or faculty member within your department who is responsible for monitoring the project's budget, communicating with the Fiscal Officer, and reporting if both project managers are unavailable. Please ensure you have received consent from this individual to be the Project Advisor for your proposal and have informed them of your proposal's intent and budgetary needs. If this does not apply to you, type N/A for these responses.

Matthew Recsetar

Project Advisor Email:

msrecs@arizona.edu

Project Advisor Department:

Biosystems Engineering

Fiscal Officer:

The Fiscal Officer is a staff member within your department who is responsible for financial transactions and who will support reporting by pulling requested expenses against awarded funding and ensuring that funding is spent within awarded categories. Please coordinate with your department to properly identify an individual who is a designated Fiscal Officer. If awarded, this will be the individual who will help you access your project's funding. Please ensure you have received consent from this individual to be the Fiscal Officer for your proposal and have informed them of your proposal's intent and budgetary needs.

Darren Shevchuk

Fiscal Officer Email:

Shevchuk@arizona.edu

Fiscal Officer Department Name:

Biosystems Engineering

Request Funding Amount:

\$5000

Official Project Name:

Please be specific but concise as this name will appear on reports and our website. Creativity is encouraged!

Sustainable Citrus Plus

Primary Project Category:

Food

Secondary Project Category:

Water

Background and Context:

Please provide any relevant background about your organization/team including your mission and/or expertise. Please also lay out the rationale for the proposed project, focusing on the issue that your project would address. 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 specifics.

Response:

We are student interns for Dr. Recsetar at the aquaponics greenhouse (CEAC Greenhouse 3118, Allen Rd). Currently the greenhouse consists of two aquaponic systems stocked with Tilapia and goldfish that are set up to grow various types of herbs and leafy greens. Aquaponics is a sustainable agriculture system that uses the effluent from a fish culture system to feed and grow plants. Studies have shown the nutrient-rich effluent from aquaponic systems is adequate for growing most plants, including citrus and various tree fruits, and also contributes to a healthy and diverse root microbiome. Dr. Rex and us interns would like to start a project to further utilize the excess nutrients from the aquaponic systems. When brainstorming projects, the idea of planting citrus trees came up as a feasible and sustainable endeavor that we could accomplish. Being from a background of growing and planting trees with my grandfather in Illinois, I felt this idea aligned with my interests and expertise in a unique way. In addition, planting trees would require no additional space within the greenhouse, as they would be grown outside adjacent to it. Scoping out the area around the greenhouse, we discovered that we had room to easily plant 6-8 citrus (or other fruit) trees. These trees could then be fed with nutrients from the aquaponics system and could grow large, healthy fruit without the need for fertilizer supplements. This project would utilize the benefits of a closed nutrient loop aquaponics system, currently used only for leafy, herbaceous plants in the controlled environment of the greenhouse, and expand it to woody outdoor plants. In addition, a rainwater harvesting system would be installed on the greenhouse to support water sustainability.

Project Description:

Please provide a thorough description and explanation of your project. Describe the objective(s) and what will be accomplished. Describe how each objective will be achieved (listed as steps or goals, with anticipated timeframes for each). Explain how the project will be implemented (who does what?). Finally, please identify the core goals of your project and how you will measure the degree of its success (includes the metrics you will track to measure the success or impact of your project (e.g., number of kWh saved, gallons of water saved, number of student training hours, etc.). Responses are limited to 3,000 characters including spaces.

Response:

The objectives of this project will be to demonstrate the ability to grow citrus fruits (lemons and oranges) and other fruits (plums and avocados), using aquaponics effluent and harvested rainwater, for the campus party at the University of Arizona to help promote student health and food accessibility, and also provide

the opportunity for student interns to grow trees and harvest fruit for many years down the road. The beginning of the project will consist of installing the rainwater harvesting system on the greenhouse and setting up the irrigation system for the trees to utilize the water and nutrients in the greenhouse. Spring is the best time to plant the trees and will give them the highest chance of rooting and acclimating well to their environment. Thus, we would spend the fall semester digging trenches to ensure the trees make use of rainwater and digging the actual holes to plant the trees in. A rainwater cistern would then be set up to collect rainwater via gutters that will be installed on the roof of the greenhouse. We will then set up a drip irrigation system with a sump that allows us to draw nutrient water from the aquaponics system as well as the cistern of rainwater and water from the city, if necessary. This design allows us to dilute the nutrients to the necessary level for irrigation of the trees while not completely depleting the nutrients in the aquaponics system. Once pipes are placed and the irrigation system set up so that everything can be delivered to the plants we will install a soil moisture sensor. This will help save water by ensuring that we only irrigate the trees when needed. After the trees are planted, the base of the trees will be fertilized with biosolids. Aerobic mineralization of solids removed from the aquaponic systems produces stabilized biosolids that once dried are a perfect solid amendment that will provide nutrients and stimulate healthy root microbiomes for the trees. Using these biosolids as nutrients for the trees will allow us to fully close the loop of the aquaponics system so that no waste is produced. To measure the success of our project we could determine the amount of fertilizer that would have been required to be bought, the amount of water saved from the rain collection and trench style rain irrigation, and the energy saved from cooling effects of the trees around the greenhouse. Although it's beyond the scope of this project, we expect to harvest and donate over 500 lemons and plums as well as 200 avocados per year once the trees are fully mature.

Project Summary Snapshot:

Please provide a short summary of your project. This summary will be used on our new website and other Office of Sustainability materials, if approved. Think of this as a hyper-concentrated summary to capture your project's scope and impact.

Response:

Grow smart, eat smart! The Citrus+ Sustainability Project brings fresh citrus and other fruits to campus pantry using sustainable growing techniques and recycling nutrient-dense water and biosolids from our aquaponics farm.

Project Feasibility and Logistics:

Please provide a description of the work that has been completed so far to make this project feasible. Have all relevant partners been contacted/coordinated with? Have you received consent or authorization from relevant departments or offices to complete your project (Housing and Residence Life, Facilities Management, Parking and Transportation, etc.)? Please identify them in your response. For example, have you received reasonable quotes for supplies? What research has been completed to lay the foundation for this project?

Response:

So far, the aquaponics system is already set up and in use. Since we already have access to the nutrient water and biosolids, only the irrigation and site construction of the grove has to be completed. We have consulted with Bridgette Reibe, the coordinator of the campus pantry, to confirm the need for oranges and a few other tree fruits that we plan to grow. Interns working at the greenhouse will then transport the fruits back to Campus Pantry in boxes during harvest season. We have permission from the aquaponics greenhouse supervisor, Dr. Recsetar, to move forward with this project under his guidance. There are many supplies, such as PVC fittings, that are being unused at the greenhouse and that could be recycled for this project. The actual PVC pipe would be purchased new to insure its longevity. Once materials have been sorted through, we can more accurately determine the quantity of supplies that will need to be purchased. Research on citrus trees has been conducted to determine their nutrient and space requirements. The nutrients provided by the aquaponics system will adequately satisfy the citrus and avocado tree needs and the space around the greenhouse will give space for trees and will provide the added energy saving benefit of cooling the greenhouse.

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 Resources webpage.

Response:

This project will advance environmental sustainability on campus by growing produce using more environmentally friendly methods. By recycling the nutrient-rich water used in our aquaponics systems and also harvesting rainwater, we can reduce the amount of fertilizer and water required to grow the fruit. We estimate this will allow us to save roughly 15,000 gallons of water per year. Nutrients will also be provided to the trees by biosolids that can be collected from the aquaponic systems. Biosolids are fish waste that has been stabilized to contain little to no bacteria. These biosolids have been aerated until they become stabilized and then dried via the sun so they are a safe and nutrient rich soil amendment. By using these biosolids we can completely close the loop of the aquaponics system so that it produces no waste. Planting trees where there used to be impermeable surfaces, the temperature around the greenhouse would drop by 5 to 10 degrees in the summer, thus saving energy on cooling the greenhouse. This cooling effect will be accomplished through evapotranspiration of the trees around the greenhouse along with the shading of impermeable surfaces that would otherwise absorb heat. Additional cooling would be theoretically possible if the trees were large enough to shade the greenhouse; however, we do not want the greenhouse to be shaded and will plant them far enough away so they will not block sunlight to the greenhouse when fully mature. Finally, by utilizing the slightly lower elevation of the proposed planting location compared to its surroundings, we will be able to increase the hydrological load to our trees during rainfall events to further mitigate the need for irrigation.

Social Sustainability Outcomes:

Please provide a description of how you expect your project to advance environmental sustainability on campus. A definition of social sustainability is provided on our Resources webpage.

Response:

This project will give students of all backgrounds the opportunity to learn about sustainable agriculture. Whether students are supporting the project through being involved with campus pantry or are directly involved by working in the citrus grove, they can learn about sustainable agriculture practices. When students pick up fruit from the Campus Pantry, they will have the opportunity to learn about the sustainable growing practices by reading a poster displayed near the produce. This poster will show information about where our fruit came from, how it was grown, and how students can get involved. Internship opportunities are available to students of all backgrounds both at the greenhouse or in the fruit grove. Students also have the opportunity to tour the greenhouse through using the contact information that will be provided on the informational poster board. This also gives students of all economic backgrounds access to fresh and organic produce. In the future, we could possibly start a workshop that would be available to all students that teaches students how to grow crops sustainably and how they can start small scale systems of their own.

Student Leadership & Involvement:

Please provide a description of how you expect your project to benefit students on campus regarding the creation of leadership opportunities or student engagement. What leadership opportunities exist within your proposal? If you plan to hire/ or involve students, please describe in what capacity. For example, if you plan to hire students, create an internship, or seek student involvement, please describe relevant details thoroughly (wages, responsibilities, duration of job, extent of involvement, how you will solicit/ market these opportunities etc.).

Response:

This project will expand the role of student interns at the greenhouse to manage the fruit grove to better learn about aquaponics, irrigation, and agriculture. Internships can be acquired through Dr. Recsetar and can be for the duration of a semester or year. These internships are open to all students of any major and a priority is given to agriculture majors. We will provide information on how to get involved in the internship at Campus Pantry when delivering the fruits so that people are aware of the opportunity to help on this project. Students interested in working with the fruit grove will have the opportunity to earn class credit at the university. Even if students are not interested in being involved in the fruit grove, they can benefit directly from the project by having access to fresh produce. We will, likewise, offer our contact information if anyone would like to tour the aquaponics greenhouse and learn more about the system. This project will be led by current student interns and allow us the opportunity to lead and plan a project that will benefit students for years to come. Most internship details are discussed between student and professor but usually require 6 hours of work per week. Students will be responsible for monitoring the system, fixing any irrigation problems, harvesting produce, and trimming trees.

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? How are you reaching beyond the "sustainability choir?" Please provide a description of how you expect your project will communicate its impacts to the campus community. What is your plan for publicizing your project on campus? How visible and accessible will your project be to the general campus population?

Response:

This project will provide members of the community the opportunity to have access to fresh citrus and other fruits, grown sustainably. By donating the produce to the campus pantry, we can spread information about aquaponics and its future in sustainable agriculture. We expect to communicate aquaponics information through a poster board setup or powerpoint slide at the distribution area that describes what aquaponics is, why it is a sustainable agricultural system, and how the food they are receiving was grown using the benefits of aquaponics. Since people with all different levels of sustainability awareness use campus pantry, we will have the opportunity to expose community members to aquaponics for the first time. While the fruit grove is not located on the main campus, the project will be accessible to the general public by providing free produce and the opportunity to intern at the aquaponics greenhouse and be directly involved in the Citrus+ Sustainability Project.

Timeline:

Please describe the timeline of your project. The timeline may be estimations at the point of this Preliminary Application but providing this is especially important if your project is a time-sensitive event. Funds may not be used as reimbursement for projects already completed, therefore a realistic amount of lead time should be given in order for proposals to be eligible for review. Please describe when your project will take place, key dates for when certain elements must start or be completed by, or any other known dates. Timeline extensions will be granted on a case-by-case and limited basis.

Response:

Citrus and avocado trees in Arizona are best planted in the spring when there is no threat of frost. This means we will aim to plant the trees in March. We will determine an exact date based on the current weather conditions during that time. In order to have the trees planted in that timeframe, all digging and irrigation setup must be completed before. We aim to start designing and implementing the Irrigation and rainwater harvesting systems in November and have both completed by February, which gives us ample time to assemble the irrigation and begin digging the planting sites. By giving ourselves 3-4 months to prepare for the fruit trees, we will have enough time to overcome obstacles as they arise and begin to bank some rainwater before planting the trees.