

Progress Report - Campus Sustainability Fund

May 2023: Feeding the Future

Email:

jadamsb2@arizona.edu

Project Manager Name:

who is submitting this project?

John Adams

Project Name:

Feeding the Future: Student led Design Next of Food Energy and Water

Project Subaccount Number:

2234751 - 23.52

Project Summary Snapshot:

Please copy and paste the "Summary Snapshot" you provided in your project application.

Response

A multi-pronged approach is necessary if we are going to reduce the carbon emissions from agricultural production and its transport, improve the nutritional value of the crops, and increase the accessibility of the food to communities. Container grow environments provide a highly efficient and portable grow space that can be placed almost anywhere. The goal is to create "circular economic" structures, leveraging and integrating this new facility into existing programming to student/community engagement, alternative curriculum, and research & development. Biosphere 2, with its one-of-a-kind mesoscale structure, surpasses traditional laboratories in providing a place that enables this research.

Requested Metrics:

Please report your project's metrics and their most recent number or response in a list format.

Response

Production

- To date, Freight Farm has produced 2362.44 pounds of produce that have been delivered to the Campus Pantry, Impact of Southern Arizona, and to Biosphere 2.
- 25,652 plants have been grown and harvested.
- Production includes the following species with respective number of cultivars:
 - Lettuce (22 cultivars)
 - Mustard greens (6 cultivars)
 - Kale (4 cultivars)

- Basil (3 cultivars)
- Arugula (1 cultivar)
- Bok Choi (1 cultivar)
- Collard greens (1 cultivar)
- Radicchio (1 cultivar)
- Swiss chard (1 cultivar)
- Sorrel (1 cultivar)
- Spinach (1 cultivar)
- Watercress (1 cultivar)
- Upland cress (1 cultivar)

3 UArizona Students work on average 10 hrs per week

Project Accomplishments :

Please describe what aspects of the project have been accomplished. Be as descriptive and specific as possible. Examples of accomplishments could include: Held 4 public meetings totaling 130 attendees; Transitioned 300 square feet of dirt into usable garden space and signed on 14 community garden volunteers. Other examples of accomplishments could include sharing a confirmed schedule of events, the connections/contacts that have been established, etc.

Response

Biosphere 2 sponsor a University of Arizona ENGR 489 A/B Interdisciplinary Capstone Design team to design an integrated photovoltaics system that will support the electrical needs of the container and provide a shaded grow environment for taller stature crops outside. The objective of the design is to combine technologies into a system that could be placed in regions and communities where electrical connectivity is unavailable and harshness of the environment limits agricultural practices. Design by the students was completed May 1, 2023. The students are:

- Brooke Bykowski, bykowski@arizona.edu
- Stephanie Orchard, stephanieorchard@arizona.edu
- Alejandro Quijada, aquijada52@arizona.edu
- Katelynn Carroll, katielynn@arizona.edu
- Logan Eaton, loganeaton@arizona.edu
- Hailey Schleining, haileyschleining@arizona.edu

The students design won 2 awards:

- Innovation Engineering Production, Supply or Use
- Sustainable Manufacturing Innovation

Biosphere 2 has commissioned M3 Engineering to produce construction documents for the building of an integrated Freight Farm & Agrivoltaics system. See attached renderings Biosphere 2 have provided internships for 3 students to maintain and cultivate a variety of crops inside the container. This provides real-world hands-on experience with a system they will likely work with once they are in the workforce. These students are:

- Jordan Collins, jcollins@arizona.edu
- Alex Cantor, alexcantor@arizona.edu
- Paiton Stith, pstith@arizona.edu
- Hosted Dr. Triston Hooks, CEAC Faculty Biosystems Engineering Integrated Freight Farm into BE 217, BE 350 Advanced Hydroponic Crop Production, BE 497 Integrated Pest Management for CEA. This fall BE 217: Intro to Hydroponics; 14 students plus Triston visited Freight Farms.

- Dr. Gene Giacomelli and his Controlled Environment Systems BE & PLS 483/583 visited with 16 students. Working with Freight Farms to install a comprehensive energy monitoring system--Emporia

Next Steps:

Response

Biosphere 2 has applied to the University of Arizona Foundation small grant program for \$25,000 to support up to 7 undergraduate students for approximately 20 weeks (about 4 and a half months), 10 work hours per week, per student (\$23,950) and the purchase of two energy monitoring devices (\$450) and two precision scales (\$600) for weighing produce. The goals are:

- Produce a comprehensive energy audit and work with the manufacturer of the Freight Farm to reduce energy consumption through operational adjustments and equipment upgrades.
- Produce a comprehensive cost production audit and share with local communities who have reached out to us inquiring how much does it cost to produce, for example, a head of lettuce.
- Continued interfacing with the UArizona Campus Pantry and Impact of Southern Arizona Pantry to adjust produce types to meet nutrition requests of the pantry clients. To complete the construction documents and then move to the buildout of the freight farm/agrivoltaics system integration.

Challenges Faced:

Please identify and describe any obstacles/roadblocks you or your team have experienced, and detail how you've managed them/ will manage them. Should your project already be completed, please note what challenges you faced and what you would do differently.

Response:

This project has been very successful and there have been very few challenges to face. The one challenge is for the B2 team this is a new initiative and there was learning curve with the technology and operationally. We have successfully overcome these challenges to have a program centered around the Freight Farms that is showcased to all visitor to B2.

Project Support:

Can the CSF support you in addressing any roadblocks you've encountered? How else can the CSF support your project?

Response:

There have not been any roadblocks. CSF has been very supportive through the entire process, and we look forward to working with CSF in the future.

Photo Upload:

Please upload or provide links (below) to relevant photos.

Response:

* photo-view-2-b-am.jpg [https://sustainability.arizona.edu/system/files/webform/csf_progress_report/340/photo-view-2-b-am.jpg]

* photo-view-3-a-sm.jpg [https://sustainability.arizona.edu/system/files/webform/csf_progress_report/340/photo-view-3-a-sm.jpg]

* capstone-award-1.jpg [https://sustainability.arizona.edu/system/files/webform/csf_progress_report/340/capstone-award-1.jpg]

* capstone-awards-2.jpg [https://sustainability.arizona.edu/system/files/webform/csf_progress_report/340/capstone-awards-2.jpg]

Photo Link All the capstone presentation, photos and video are found in this box folder:
<https://arizona.box.com/s/79sz5f0se0pefnzveii85765p8plnvxt>

Photo Link:

Please copy hyperlinks to photos here should you not be able to individually upload photos.

Response:

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Media/Links:

Please include links to any media coverage or events information (e.g. news, social media, websites, interviews, etc.)

Response:

- UA News Release: <https://news.arizona.edu/press-release/feeding-future-biosphere-2-delivers-first-lettuce-crop-campus-pantry-food-bank>
- Story KVOA : https://www.kvoa.com/video/1st-crop-of-lettuce-grown-in-container-farm-delivered-to-uarizona-campus-pantry/video_e143bb68-1409-5675-8a63-e9e391e65a17.html
- Tweet From President Robbins: <https://twitter.com/UArizonaPres/status/1559627188185583616>
- KOLD News 13(Biosphere 2's Freight Farm, UA Students Find New ways to Grow Food):
<https://www.kold.com/2022/11/15/shipping-container-green-machine-ua-biosphere-2-finds-new-ways-grow-food/>
- Biosphere 2 YouTube Channel: <https://www.youtube.com/watch?v=b-k8xtCMAb0>
- Featured in Arizona Institute for Resilient Environments and Societies Newsletter The Dirt
- Featured in Biosphere 2's Newsletter: Inside the Impact, October 2022 Issue
- Featured in Freight Farm's recent Newsletter, went out to 37,000 subscribers