UNIVERSITY OF SOUTH FLORIDA

Implementing Urban Agriculture Within the Tampa Bay Area: The Importance of Urban Agriculture for Sustainable Food Production

Sustainable Food Production

April 27th, 2021

IDS6270.001S21

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(Rosebud Continuum, 2018)

Entry Vignette:

(Nierenberg, 2013)

Introduction:

At the Rosebud Continuum in Land O' Lakes, there is currently an aquaponic system that has been donated to the facility. However, this system is currently unable to operate due to its current configuration. This is primarily due to the fact that the current aquaponic system is set up to work as a two pump system. This two pump system feeds clean water to the fish, the water from the fish tank feeds directly into the grow beds, and the water from the grow beds feeds directly into a sump tank to serve to filter the water where the cycle begins once again. While this concept works in theory for 100% of water to move from tank to tank, in reality this linear approach often results in "twice the chance of failure, twice the maintenance, and twice the headaches" (Storey, 2013). Two pump systems are often notorious for being costly, complicated, and

unpredictable. Instead of the two pump system, myself and another group from PCGS will be reconfiguring the system from a two pump system to a Constant Height One Pump (CHOP) system. The CHOP system we will be implementing uses gravity as a factor to replace the second pump. The grow bed will be placed on top of the fish tank, and a sump tank will be connected to each tank to assist in water filtration and to help retain water levels between the grow beds and the fish tanks. In addition, the CHOP system could serve to be the more sustainable option for several reasons. The first reason being that by using gravity, less energy will be generated from moving water from the grow bed to the fish tank. Secondly, this could be considered a sustainable option because a majority of the materials being used for this project are preexisting recycled materials including: grow beds, fish tanks, PVC pipes, sump tanks, and a pump.

(Pictured: The Original Two Pump System Configuration)

Ultimately the primary problem regarding this aquaponic system is that the current two pump set-up does not work. By the current two pump system being converted to a CHOP system, there is a greater possibility that this system will work due to its simpler design, less likely room for error only containing one pump, and by making use of gravity to have a more natural flow throughout the system. We will ideally be setting up two identical but separate CHOP aquaponic systems consisting of a grow bed, a fish tank, a sump tank, and a pump. A major benefit of switching to a CHOP set up is that this particular set up is regarded as one of the most common aquaponic set ups, and there are many successful tutorials to follow on the internet such as Rob Bob's Aquaponics and Backyard Farm Youtube channel where we are currently gathering information from an experienced aquaponic farmer that utilizes a CHOP system. In addition, this system, unlike the two pump system, is able to maintain more consistent water levels which causes less stress on the fish by the grow bed being placed on top of

the fish tank, which will supply clean filtered water from the grow beds through a bell siphon.

The team and I have chosen to follow the CHOP system not only for simplicity and ease, but also because most all of the materials needed to construct the two aquaponic systems are already on site at Rosebud. These materials include: grow beds, fish tanks, sump tanks, pumps, bell siphons, and PVC pipes to use for drain pipes from one tank to another. Other supplies that we already have access to to get started include: fish food, proximity to water and electric sources, clay media for the grow beds, and freshwater test kits. The aquaponic systems will be set up in a greenhouse which will provide protection from many pests and will provide optimal sunlight. By taking this approach from the current preexisting aquaponic system, the new CHOP set-up will result in a fully functioning aquaponic system which is able to support fish and plant life, and will be significant for future endeavors at Rosebud.

(Pictured: The current CHOP System Setup)

By constructing functioning CHOP aquaponic systems, along with other sustainable food endeavors currently taking place at Rosebud, such as hydroponic systems and outdoor gardens, this facility has the potential to provide healthy and sustainable sources of food for the community of Land O' Lakes; as well as serve to potentially inspire surrounding regions in the Tampa Bay Area to implement sustainable urban agriculture methods. There are numerous benefits to implementing urban agriculture not only in Land O' Lakes, but around the surrounding Tampa Bay Area. Some of these benefits include: stimulating the local economy, community involvement, providing individuals with a direct connection to their food, increased access to nutritious food sources to a myriad of communities, increased health both mentally and physically, combating climate change/ improving environmental health overall, as well as city-wide beautification.

Description of the Project:

The Rosebud Continuum in Land O' Lakes strives to help preserve and restore Florida's natural land through community outreach, sustainable agriculture projects, and

environmental education opportunities in Pasco County. The Rosebud Continuum also prides themselves in preserving and bringing awareness to Native American history with their connection to the Lakota Sioux Indian Reservation in South Dakota. The Rosebud Continuum is an ever evolving facility with new and diverse projects being developed every year. A huge focus for Rosebud is sustainable agriculture. There are a variety of hydroponic, aquaponic, and organic gardens that are tended to by various volunteers, many of whom are from the Patel College of Global Sustainability at the University of South Florida. Rosebud even has future plans to eventually host farmer's markets and an organic food cafe that utilizes the organic produce grown on the property. This facility promotes sustainability education to not only PCGS students, but also to various school organizations throughout Pasco County. One way in which they are achieving this is by providing school field trip opportunities with hands-on experience including: native plants, a biodigester, aquaponic and hydroponic systems, beekeeping, solar and wind projects, organic gardening, and interaction with friendly farm animals.

"Urban agriculture programs can help local communities in both an economic way and a social way. They allow for people to have more immediate connection to their food, as well as help stimulate a local economy" (Baker, 2021). Not only would implementing urban agriculture help to stimulate the local economy and bring communities together, it would also serve to provide the residents of the Tampa Bay Area with nutritious and fresh sources of food, especially to underserved communities who would not have access to fresh fruits and vegetables otherwise. Experts from the Conservation Law Foundation claim that "while eating fresh food is beneficial in and of itself, the act of growing that food also boosts physical and mental health. Research shows that working with plants—and putting our hands in the dirt—provides outdoor physical activity, induces relaxation, and reduces stress, anxiety, blood pressure, and muscle tension" (Dewey, 2020). Another very important reason to integrate urban agriculture within cities would be to combat climate change and help to preserve the environment. Having vegetation throughout Land O' Lakes and the Tampa Bay Area could potentially have a number of benefits which include but aren't limited to: helping combat GHGs by the plants helping to absorb CO2 emissions, cultivated plants absorbing excess rainwater to mitigate stormwater that pollutes waterways, and

increase ecological diversity. In addition implementing urban agriculture also provides beautification to cities and entises more people to live in and visit cities with urban agriculture.

One successful urban agriculture program that is serving to provide nourishing and healthy food for its city is the Mill City Grows urban farming organization located in Lowell, Massachusetts. Mill City Grows had humble beginnings in 2013 starting in a small, overgrown, and messy corner lot in downtown Lowell. Many volunteers, even including individuals from the homeless shelter in Lowell, began helping clear the lot to make more room for gardens. The Mill City Grows organization quickly "became a nucleus of a newly forming community" (Dewey, 2020). This particular garden project has grown to encompass around 6 acres of land throughout Lowell. This includes spaces like: abandoned buildings, city parks, non-buildable land, as well as institutional and privately owned properties. Mill City currently provides around 30,000 pounds of nutritious, fresh, and healthy food to the community along with a variety of agricultural education opportunities.

While there are very successful urban agriculture organizations across the United States such as Mill City, there are many potential obstacles that must be overcome in order to establish a flourishing urban agriculture organization. One of the major issues urban agricultural farmers often come across is difficulty in the ability to acquire land within communities due to: "cost, competing land uses, or impenetrable legal systems" (Dewey, 2020). Mill City for example, is proposing a bill that would serve to entice property owners to make their unused land available for farming by means of an optional tax incentive. Ultimately, "providing more access to land for farming in our cities will help accelerate the growth of urban agriculture and support low-income, people of color, immigrants, and New American farmers in search of land on which to grow" (clf.org).

Review of the Literature:

There are many major cities worldwide that serve to set an example of transitioning towards large scale urban farming in order to effectively feed exorbitant populations. For example, Shanghai, one of China's largest cities, has plans through the Sasaki architecture firm to transform 100 hectares of land into urban farm space

which would include: hydroponics, aquaponics, algae farms, and floating greenhouses. The design is planned to incorporate vertical farms amongst buildings and skyscrapers (Cooke, n.d.). These vertical farms have the potential to feed the 24 million citizens that currently reside in Shanghai (Cooke, n.d.). While these plans have the potential to increase food security among Shanghai, one must question; how can a city such as this practically implement urban farming? It appears that the primary means of city-wide urban agriculture must begin by implementing policies in order to regulate control, and effectively fund these monumental projects.

(Cooke, n.d.)

Some initiatives the Shanghai government is taking at a policy level include: quality control systems being established among urban farmers, testing the safety of urban agriculture products, campaigns to promote urban agriculture, an increase in income to Shanghai farmers, promotion of community rooftop gardens/balcony gardens, as well as preservation of green areas. The city of Shanghai according to the World WildLife Fund, has also started a Multi-Stakeholder Policy and Action Planning Program through the Resource Centers on Urban Agriculture and Food Security (RUAF). This program serves to connect government authorities, farmers, universities, and businesses together in order to create a strategic and concise master plan to bring urban agriculture plans into fruition (World WildLife Fund, 2012).

The undoubtable need for urban agriculture within the Tampa Bay Area is stronger than ever due to the constant growth and development within Tampa and surrounding cities. Although, unlike a major city such as Shanghai, the Tampa Bay Area seems to struggle with creating government policies and awareness surrounding the need for urban agriculture, even though there seems to be an interest in incorporating urban agriculture within the Tampa Bay Area. Local rules and regulations often become a road-block. According to the Tampa Bay Times, in St. Petersburg, FL a hydroponic venture was attempted that utilized shipping containers that were estimated

to produce 10 acres worth of leafy greens and herbs every 5 weeks. It was stated by Shannon O'Malley, one of the founders of this project, that "the reason why we had these challenges is because there is no current definition of agriculture for the city of St. Petersburg" (Danielson, 2018). The project ultimately failed due to the inability to acquire properly zoned land to grow the crops. That is why it is imperative that areas within Tampa Bay that plan to implement urban agriculture establish a multi-stakeholder system in order to facilitate and establish cohesive urban agriculture plans and policies. In addition, incentives for farmers such as increased pay and tax breaks could serve to encourage a transition to urban agriculture and generate interest.

Another extremely important aspect of effectively implementing urban farming within the Tampa Bay Area would be education and community outreach. The Rosebud Continuum, one of the foremost sustainability education centers in the area, could potentially serve to further network to connect the center with local businesses and organizations that would be interested in implementing urban agricultural practices. Their goal ultimately is "preserving culture and engaging the community through sustainability education and development" (Rosebud Continuum, n.d.). For example, Rosebud could join a chamber of commerce in the area in order to continue spreading awareness, as well as the importance of sustainability/implementation of urban agriculture by means of teaming up with local businesses. By Rosebud immersing themselves within the community with a new platform of outreach, the implementation of urban agriculture could be more easily facilitated through further outreach and educational opportunities. The more people learn about sustainability and urban agriculture, the more likely individuals and businesses across the Tampa Bay Area will fight to bring this form of food production in order to ultimately: increase food security, make healthy and nutritious food more accessible, and further combat climate change.

Outcomes of the Team Project:

Over the course of the semester the PCGS team and I have worked very hard to overcome a myriad of obstacles, which has ultimately resulted in a fully functioning aquaponic system that has proven to work efficiently. One major obstacle that we were able to overcome was getting the bell siphons to work properly and reliably. Unfortunately we were unable to get one of the systems operating due to the inability to

get the bell siphon operating, so for the time being it is not being used. However, as a team we were able to successfully initiate the bell siphon on the second system, with the help of Professor TH who assisted us in creating an air pocket for the system to fill and drain properly into the fish tank. To this day the system is fully operational with rows of leaf lettuce, sweet pepper, spinach, and cucumber which I took the time to sprout over the course of 3 weeks. Another obstacle that we as a team were able to overcome was the experiment with the sump tank. On the second system (the one that is operating), we made the decision to eliminate the sump tank all together, instead of pursuing our initial experiment to see which sump tank method worked better. We chose to do this because while the system was able to separate solid waste, unfortunately the water that was draining from the tank was splashing out and not being properly facilitated into the grow bed. In order to prevent water from splashing, we found a PVC pipe on the Rosebud property, drilled numerous small holes, and placed it into the system. The small holes not only prevent the fish tank water from splashing, they also prevent solid waste from entering the grow bed. Another obstacle that we were able to overcome was the ability to clean the fish tanks naturally with the introduction of sucker fish. The sucker fish were able to eat some of the algae, which resulted in the water clearing significantly in the fish tanks. We also chose to keep the one tilapia that was in the fish tank initially and the sucker fish as our only fish in the tank, instead of purchasing more tilapia.

(Pictured: Clear Water in the Fish Tanks)

Student Reflection:

Over the course of the semester, I have learned a substantial amount about sustainable food production with the hands-on experience I was able to gain at Rosebud. I entered the project having no prior knowledge about aquaponics. However,

by the end of the semester I now understand the process behind how a CHOP aquaponic system works, and am able to apply that knowledge to any further sustainable food or urban agricultural endeavors I may be a part of in the future. Being able to be a part of this project, and have it successfully work is not only extremely empowering in regard to myself, but also gives me hope that this way of farming could truly be a future choice for sustainable food production. A CHOP aquaponic system is a system that I feel could be easily implemented into cities and homes across the world because it is a system that can be easily learned and applied by anyone who is willing to give it a try. In addition to not having any prior knowledge regarding aquaponics, I also had no prior knowledge about sprouting seeds. Although by the end I was able to successfully sprout the seeds for the system using rockwool, that was provided by Rosebud, in order to germinate the seeds over the course of the 3 weeks that I had them.

(Pictured: Fully Sprouted Seeds Prior to Being Placed in the Aquaponic System)

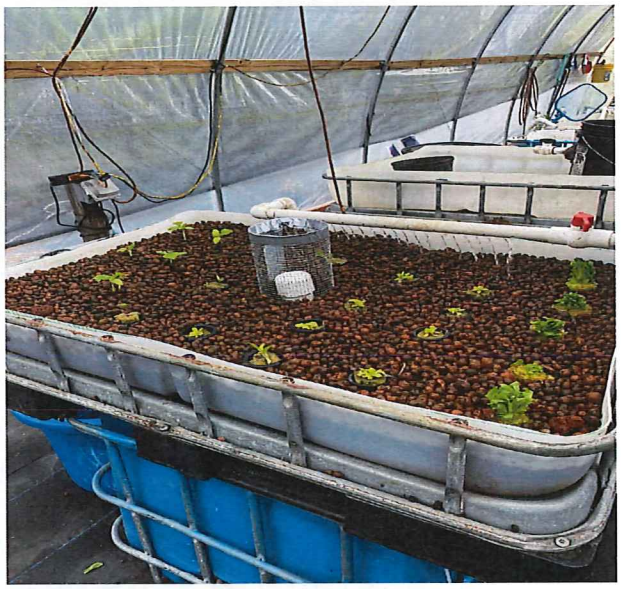
Recommendations:

In regard to my experience with the CHOP aquaponic system at Rosebud this semester, I feel as though one of the biggest challenges we had to overcome was getting the bell siphon to properly initiate, which ultimately was the make or break factor in getting the entire system to function. I feel as though a possible solution to this problem could have been to purchase a new bell siphon entirely, instead of spending the time and energy on a faulty bell siphon that was provided. Perhaps this could be a practical solution for the aquaponic system that we were unable to successfully operate this semester as well. In regard to the current state of the functioning aquaponic system, an insight into a possible future problem that could occur would be with the PVC pipe we chose to use as both a sort of sump tank alternative and the drainage system for the water from the fish tank into the grow bed. Since the PVC pipe is filtering the solid waste, it may need to be monitored and cleaned out a few times a week so the

solid waste can be cleaned out and won't potentially clog up the pipe, which could make it so that water is unable to flow into the grow bed.

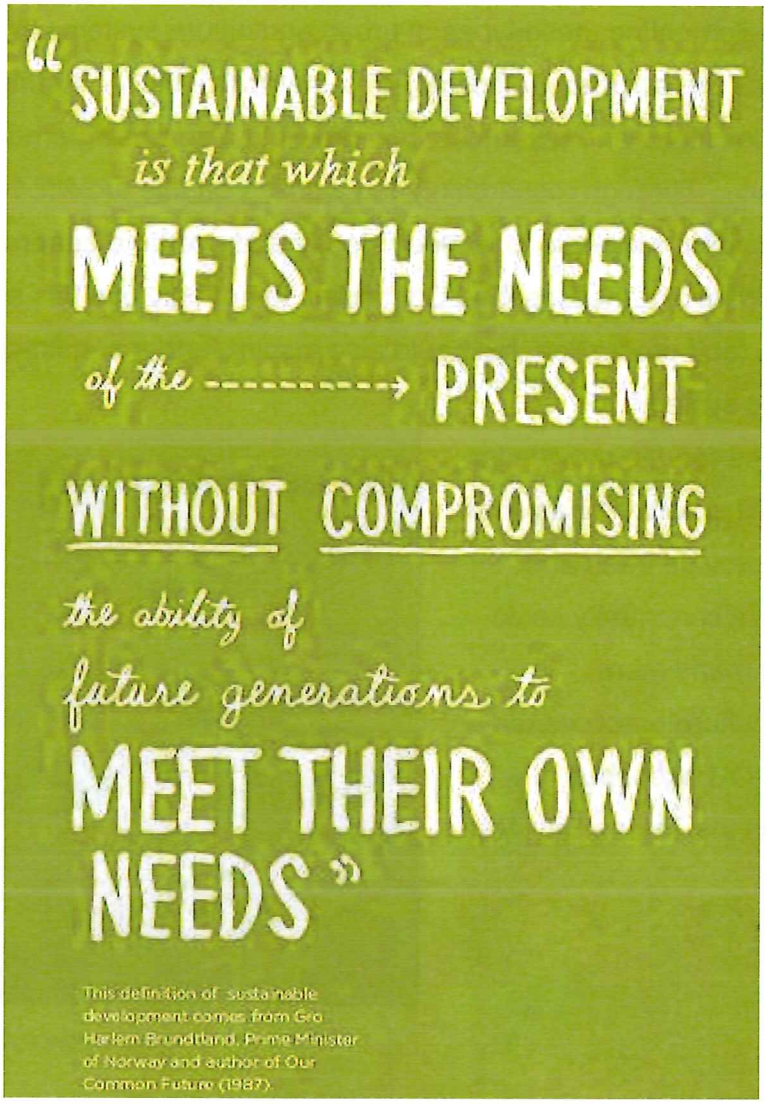
Conclusion:

Overall, the hands-on experience working with constructing the CHOP aquaponics systems at Rosebud has taught me a tremendous amount about the importance of implementing these types of urban agriculture systems into mainstream farming, as well as the surprising efficiency of systems like these. Aquaponics systems use significantly less land and resources, but can yield a surprising amount of food in such a small space. Through researching and working on this project, I am given hope that this CHOP system will serve to work efficiently and overtime generate food. This system could help inspire the Rosebud Continuum to not only use this aquaponic system for future food production, but could also inspire further construction of more CHOP aquaponic systems to eventually produce food to provide for the community. The ability for a center like Rosebud to provide fresh and healthy food to the community could open the door to many more sustainable agriculture practices not only within Land O' Lakes, but potentially across the Tampa Bay Area.



(Pictured: Fully Functioning CHOP Aquaponic System)

Closing Vignette:



(Middlebrook Hall UMN, 2011)

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