NAU NORTHERN ARIZONA UNIVERSITY
College of Engineering, Informatics, and Applied Sciences

Memorandum

Design4Practice (D4P) Program

To: Dr. Trevas

From: Vertical farming capstone team Leader

Due: 7/19/2020

Re: Analytical Tasks Assignment

The Vertical Farming team decided that we would use a 120-gallon aquarium to house the fish in our aquaponics system. The reason for this is because we wanted a large tank that would allow a lot of fish to be used to create enough Ammonia for our system. The 120-gallon aquarium will be a 4 foot long X 2 foot wide X 2 foot high this will give enough space for the fish to swim free as well as provide cover for them to hide. The added benefit of a large footprint is that the team will be able to use the gutters that will house plants as a lid on the tank. The height of the tank is low enough that a normal 8-foot ceiling will house 6 foot more to work with to accompany our vertical farming aspect. The rule of thumb for an aquarium is for every one inch of fish they should have one gallon to swim this gives the fish room to grow using the same equation. The team decided to not fill the aquarium completely and to figure out the volume of all the Rain gutters that will be used to see what the overflow volume would go to when we have a power outage. The team accounted that the gutter is 4 inches by 4 inches by 4 foot so if the team had exactly six and a quarter gutters that length, we would have one gallon of water with 5 mm of water in each. That is the depth that the water should cover the roots by in order to give the right amount of moisture without creating root rot.

1 Inch of fish = 1 gallon of water (rule for adding fish into aquarium)

120-Gallons is about 120 inches of fish so if the fish grows to about 6 inches max then that means that this tank can house 20 fish

2 ft X 2 ft X 4 ft = 16 ft^3 of water (volume of the tank)

16ft^3 of water X 7.481 = 119.688 gallons (volume conversion)

8 foot ceiling - 2 foot tall tank = 6 foot space to farm (max height to work with for the vertical farming)

4 inch X 0.19685 inch (5mm water depth) X 48 inch gutter = 37.795 inches^3 (volume of water in each gutter)

37.795 inches^3 = 0.16361 Gallon (volume conversion)

231 inches^3 = 1 Gallon (volume conversion)

15 rain gutters X 37.795 inches^3 each = 566.925 inches^3 (total volume in gutters of water)

566.925 inches^3 / 231 inches^3 = 2.454 Gallons of water in all of the gutters (volume conversion)

References

1) Yunbi Xu, Jiayang Li, Jianmin Wan, “Agriculture and crop science in China: Innovation and sustainability”, The Crop Journal, April 2017, vol 5, issue 2, pg. 95-99

2) Ali AlShrouf, “Hydroponics, Aeroponic and Aquaponic as Compared with Conventional Farming”, American Scientific Research Journal for Engineering, Technology, and Sciences, vol . 27, No. 1, 2017