

Aeroponics

Aeroponics is the process of growing plants in an air or mist environment without the use of soil. Liquid nutrient solution is used to create micro droplets of water to spray the roots of the plants. Ideally, the environment is kept free from pests, diseases, direct contact with plants and a closed environment, so that plants may grow healthier and quicker. Two main benefits of aeroponics system is the quick absorption of water due to atomization of nutrient rich solution and the air composition (O_2) in the root zone which optimizes the plants for faster growth. It will be a great improvement to the current system of standing water. Not only will the plants have faster growth rate, which results higher yield per time, the plants will be less likely to be infected.

Advantages

- Crops can be grown where no suitable soil exists or where the soil is contaminated with disease
- Labor is reduced significantly
- High yields in high-density
- Conservation of water and nutrients
- More control of the environment

Disadvantages

- Initial cost
- Education cost of using the system
- Reaction of the plant to good or poor environment will be faster
- Research on controlled growing conditions for variety of plants

Pump

A water pump that can be submerged into the reservoir would be ideal. The pump must have enough pressure to satisfy requirements set by the mister and by the amount of water the roots will need. The price of a pump correlates to degree of control, accuracy, and the pressure needed. The expected and analyzed requirements for the pump are not harsh. However, for research purpose the pump will need to be accurate in the amount of water pumped and the pressure it generates.

Piping

There will be minimal amount of piping to decrease the pressure lost from the pump to the mister. The current proposed method of aeroponics involve PVC pipes that connect the water pump to the mister. The price of PVC pipes are not expensive and the project does not requires considerable amount. MSD also has sizable amount of piping left over for use. A concern about residue build up due to nutrient rich solution.

Mister/Spray

Various types of mister exists in the market, the project will most likely purchase a mister head attachable to PVC pipes. The price of the mister increases as the size of the water particles decreases. Further research should be done on ideal sizing of the particle. The team has verified various types of mister available in the verified vendor list (Home Depot, Lowes)

Conclusion

This subsystem would be beneficial in taking another step towards optimal environment for vertical farming project. The main goal of this subsystem is to provide adequate water and prove that aeroponics can work in vertical farming(rotational farming) design. Aeroponics also offers a noninvasive way to examine roots under development. This created further opportunities for research in the future. Reliable water delivery system is needed, the current Surculus system is inadequate for proof of concept or for future research.