Project 18418: Vertical Farming - The Surculus

Background

The world's population is growing rapidly while the world's usable farm area is shrinking. Vertical farming tackles this issue by allowing crop growth inside through the aid of technology. The Surculus is an example of this advanced technology. This device is designed as an eco-friendly and cost efficient way to solve the farmland plight.

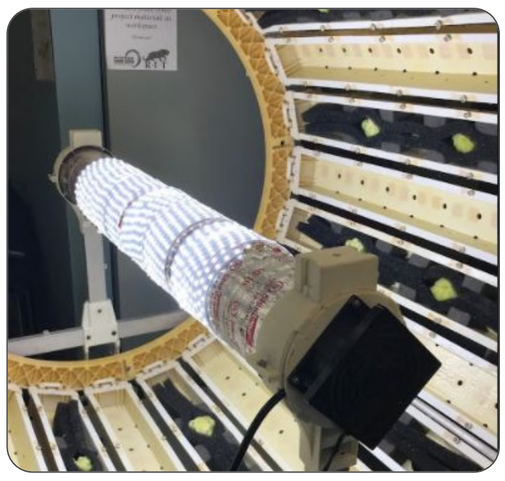
Requirements

Customer: Minimizes plant growth time, simple plant installment/removal, accommodate various kinds of plants, energy efficient, reduce water use, easily scalable, lightweight but sturdy, simple and efficient assembly/installation

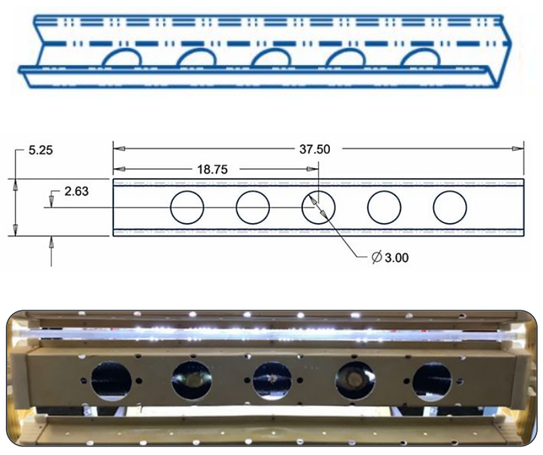
Engineering: Initiation to harvest cycle, time to plant seedlings, system lifetime, low daily maintenance hours, module is easily assembled, minimizes water use, module is lightweight, dimmable, minimize energy use

Subsystems

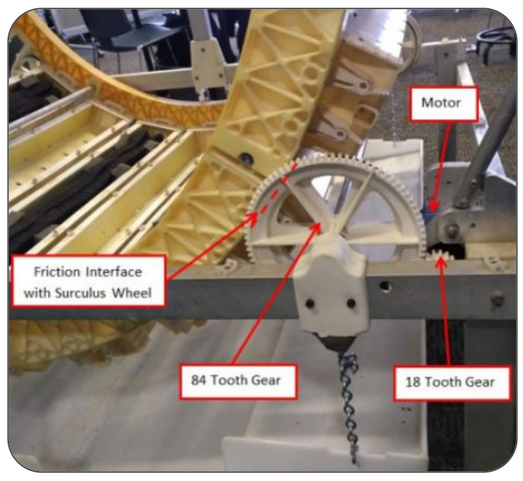
LEDs



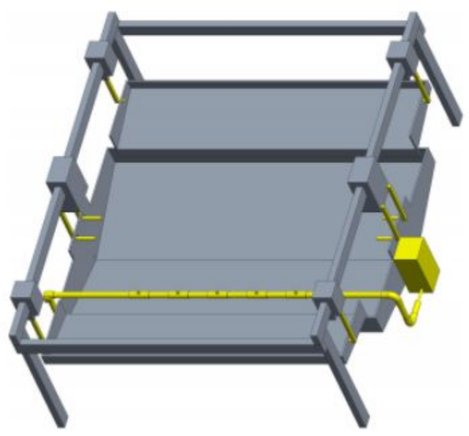
Trays



Motor



Aeroponics

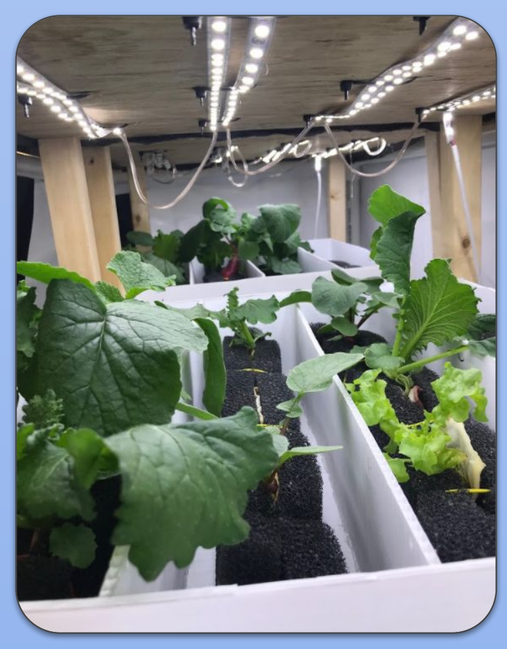


Benchtop Testing

Purpose: Benchtop experiment to identify best parameters for plant growth
Experiment Type: Fourth resolution, full factorial design with one full repeat

Factors:
- Vegetable type
- Watts per plant
- Light exposure time
- Nutrient levels

Results for Best Performance:
- 3 Watts per plant
- 16 hrs of light exposure
- Recommended nutrient levels



Performance v Reqs

Performance:	Requirement:	Meets?
8 Gal/day	Minimize Water Use	✓
3.4 W/Plant	Minimize Energy Use	✓
115.5 lb	Module is lightweight	✓
Yes, 10-100%	Dimmable	✓
20 min	Low daily maintenance hour	✓
30 min	Time to plant seedlings	✓
Yes	Module easily assembled	✓
Est. years	System lifetime	?

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