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Hydroponics Gardening Systems for the L'Arche Erie Community

Scholars of Excellence in Engineering and Computer Science (SEECS), Gannon University

Designing Hydroponic Garden Systems for the Homes of L'Arche Erie

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Abstract

The Gannon University Scholars of Excellence in Engineering and Computer Science (SEECS) Program has been tasked with developing and implementing an efficient hydroponics gardening system for the L'Arche Erie community. The SEECS class was divided into three groups, each assigned a different L'Arche home and each system has been designed according to the specific location.

L'Arche Erie is a faith-based community that provides unity and growth to those with intellectual disabilities. L'Arche Erie owns various homes where their core members can live and are given the opportunity to personally and professionally develop.

Requirements

- Easy to use and access for the core members of L'Arche
- Minimal maintenance
- Efficiency to maximize production rate
- Proper nutrition and lighting conditions

Constraints

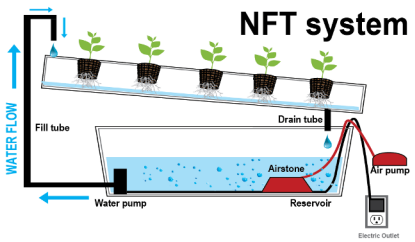
- Size (dependent on home)
  - Cannot fit and maintain a large, complicated hydroponic system
- Cost relating to:
  - Energy use (pump size and amount of lighting)
  - Building materials ($200 budget per system)
  - Maintenance over time (replenishing nutrients and water supply)

Operational Cost Analysis

	Nutrient Film	Drip System
Power of pump (kW)	0.025	0.1
Operating time (hours)	8,760	8,760
Electricity cost (KWh)	$0.1136	$0.1136
Cost per year	$24.89	$99.51

Nutrient Film Technique

- Nutrient rich water is pumped from a reservoir into a larger tube/pipe
- The gentle slope of the pipes use gravity to allow a thin layer of water to continuously run across the plant's bare roots
- The water returns to the reservoir to be cycled through the system again



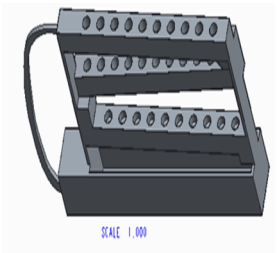
Nutrient Film Designs

Rose Home

- Adequate natural lighting
- Growing only herbs

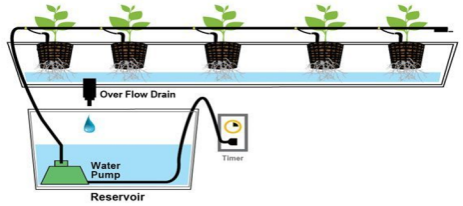
Hearts Garden Home

- Adequate natural lighting
- Growing spinach and herbs



Drip System

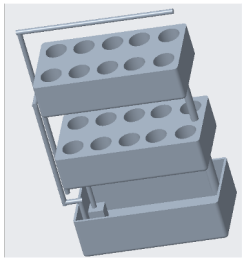
- Nutrient rich water is pumped from a reservoir and distributed to the base of each plant through individual tubes
- The water drains through the plant roots, collecting in the tray and uses gravity to drain into another tube to be individually distributed to the plants on the next tray
- The water returns to the reservoir to be cycled through the system again



Drip System Design

Oasis Home

- Not adequate lighting: requires built in lighting
- Larger design: requires larger pump size
- Growing lettuce and herbs



Future Plans

- Finish construction
- Compiling a user/operation manual for each home
- Purchase/grow plants
- Implement final products into the homes