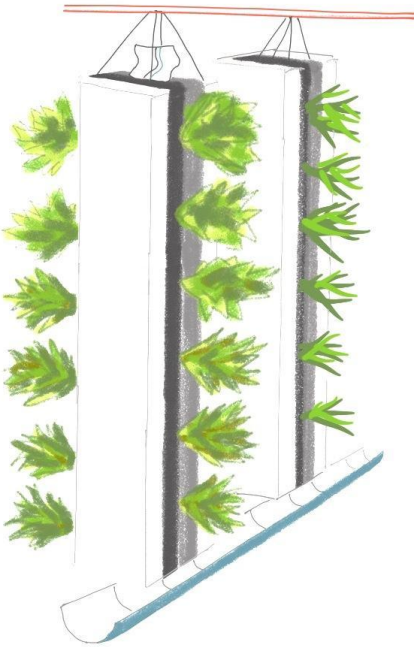
Soil Sandwich

Technology
28 Feb 2018

Research Project Proposal



Description

This vertigrow technology can be used in a Hydroponic or Aquaponic system setting. The technology provides an economical way of harnessing a plants root system in a soilless environment, while enabling the provision of water and essential nutrients at the highest possible crop to surface area ratio. An initial design of the technology has been made and with further development in an aquaponic setting the technology can be tested, improved upon and demonstrated.

Objective

Demonstrate, Expand & Innovate;

- The **vertigrow technology** setup can demonstrate sustainable, cost effective urban food production technology using a limited space.
- Fill nutrient gaps and provide **food security** by using this technology for inner-city food production to create affordable local fresh food.
- Find novel ways to use the Soil Sandwich as an **integrated city-wide technology** on rooftops.

Develop and test the 'Soil Sandwich' technology based on vertical crop production in an aquaponics setting, with focus on ease of assembly and scalability. Mastering these features will allow **flexibility of adoption** in urban settings.

Justification

Why Urban Farming Technologies resonate with many urban settings around the globe;

- Challenging inner-city food distribution
- Lack of affordable healthy inner-city food options
- Increased cases of obesity and other diet based health issues
- Underemployment
- Low awareness of healthy eating habits with the lower income population
- Social exclusion due to food poverty

Design

In an aquaponics system the interdependent production of fish and crops are integrated and will allow users to benefit from the protein and fats from the fish and the minerals, fibers and vitamins of the greens. The use of hydroponics or aquaponics for the 'Soil Sandwich' technology is interchangeable, aquaponics being the more dynamic approach. Apart from testing the technology the system could facilitate the testing of other Aquaponics based technologies. For a top view system diagram, please view Appendix 1. In order to better manage the water flow and nutrient cycling, the system includes a series of 'Dutch buckets'.

The initial design of the Soil Sandwich is open to amendment during development but is defined by its vertical nature, ease of construction and its ability to gain the highest crop to surface ratio possible.

Development phases

The project can be divided into 4 phases where the end of each phase marks a milestone in the development of the system.

Phase 1

Development of:
- Fish Tank with cover / Clarifier / Retention tank / Pump & aeration systems
- Suspension system for ‘Soil Sandwich’
- Material acquisition ‘Soil Sandwich’

A complete design of the initial ‘Soil Sandwich’ technology will be finalized.

Phase 2

Development of:
- Dutch Buckets
- Initial ‘Soil Sandwich’

Preferably test 2 variations of the technology (variables: number of plants, sandwich tension, method of assembly and material retention, foam density).

Introduction of:
- fresh water (Tilapia) fish (10 fish, about 1 pound each),
- Temporary bio-filter system embedded in the clarifier

Phase 3

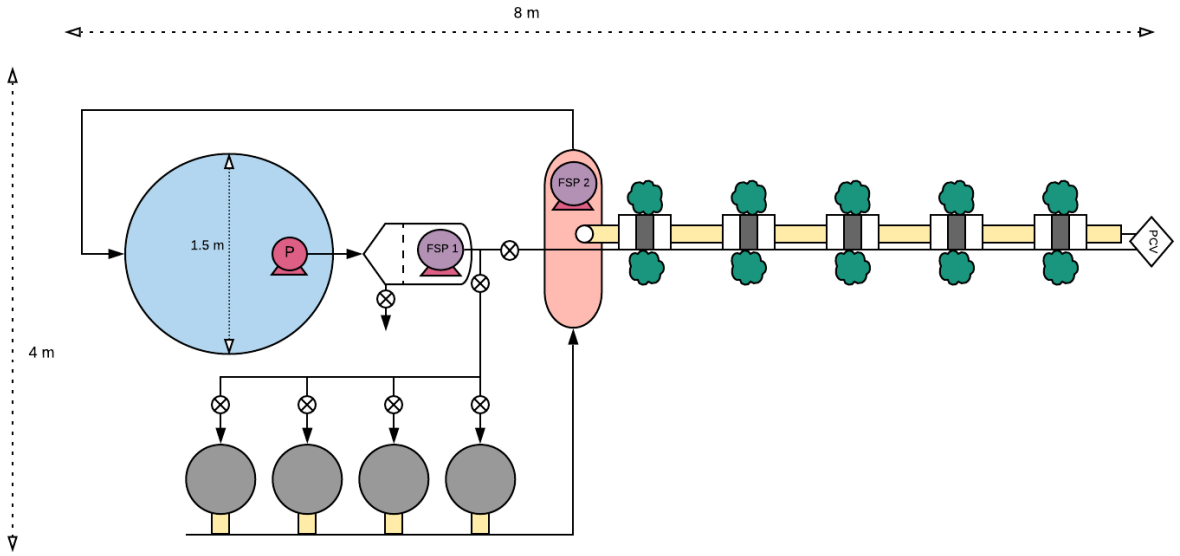
Evaluate the functioning and ease of handling of the Soil Sandwich and make the necessary adjustments. Make sure the system can run solely on the soil sandwich technology using 5 – 7 Soil Sandwiches.

Phase 4

In this phase the soil sandwich technology will be researched with numeric data and analysis of the growth rates of the crops and fish. The overall performance and assembly/use of technology will be documented.

Appendix 1.

Soil Sandwich System Setup (Aquaponics Setting).
Aiming for optimal water, space and nutrient use.



Valve

Float Switch Pump

Continuous Pump

Soil Sandwich. Holding up to 12 crops in one sandwich. This device optimises vertical crop growth by combining its functionality as a biofilter and suspention/extension technology

Dutch Bucket, Used in this setting to buffer the nutrient cycling when the nutrient concentration becomes too high.

Pressure Controll Valve. At a specific pressure this valve will open and allow a small volume of water (1-5 L) to pass through.

Clarifier. This will make sure all the larger particulate matteris removed before flowing to he soil sandwiches. The clarifier can also be used as biofilter to allow innitial conversion of ammonia untill the soil sndwiches are ready.

Fish Tank. Used in this setting to accomodate 10-35 fish (e.g. tilappia). The water comming from the fish tank is filled with nutrients comming from the excement of the fish.

Collection tube. For gravitational flow towards the retention tank.

Retention tank, used to controll the run off water flow.