

# Aquaponics Greenhouse Purpose

[Clean version of document by Catarina](#)

## **Purpose**

- Passive solar heating of MH4
- 100% essential/90% overall Food production for family of 2
- Experiment in efficient management that is practical for a household with outside jobs - 15 minutes per person per day requirement outside of plant propagation and harvest events

# Aquaponics Greenhouse Components

## Components

- Fish tanks
- Fish aquarium
- Chicken coop and vermicompost combo
- Dog house
- Perennials nursery
- Mushrooms towers
- Gutters for azola and duckweed
- Organoponics beds and containers with live composting
- Sprout tower
- Tropical fruit trees bed
- Annual propagation area
- Worm tower
- Compost tea tower
- Potato towers
- Duckweed and azolla troughs
- Potted Plants
- Storage: pots, soil bags, seeds, tools
- Work bench: potting, cubing, seeding, etc.
- Slop sink
- Structural wall bee panel

## Outside

- Stratification containers
- Cold frames
- Water catchment

## Secondary

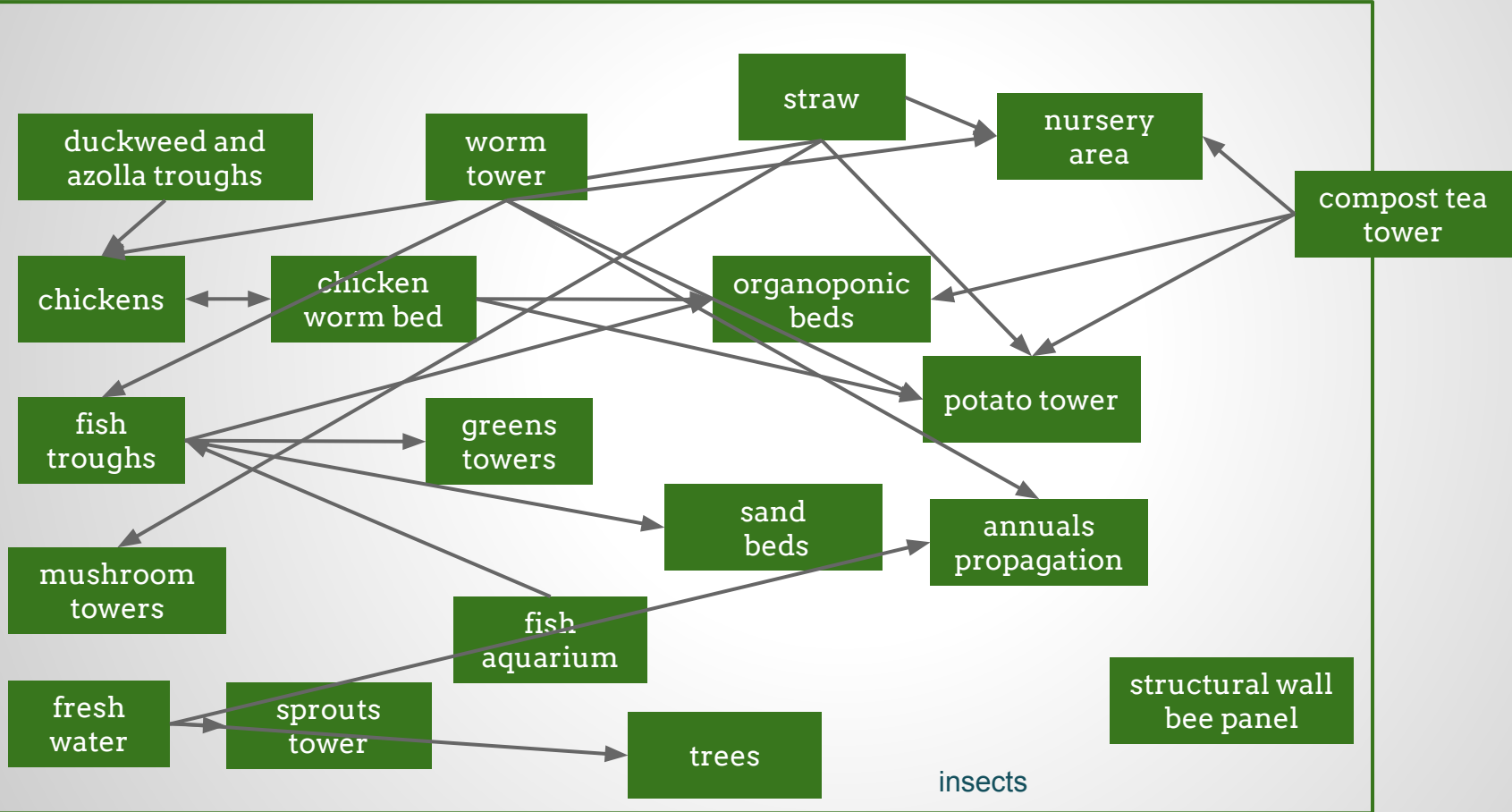
- Meal worm production
- Black soldier fly propagation from offal
- floating rafts
- Sand tower

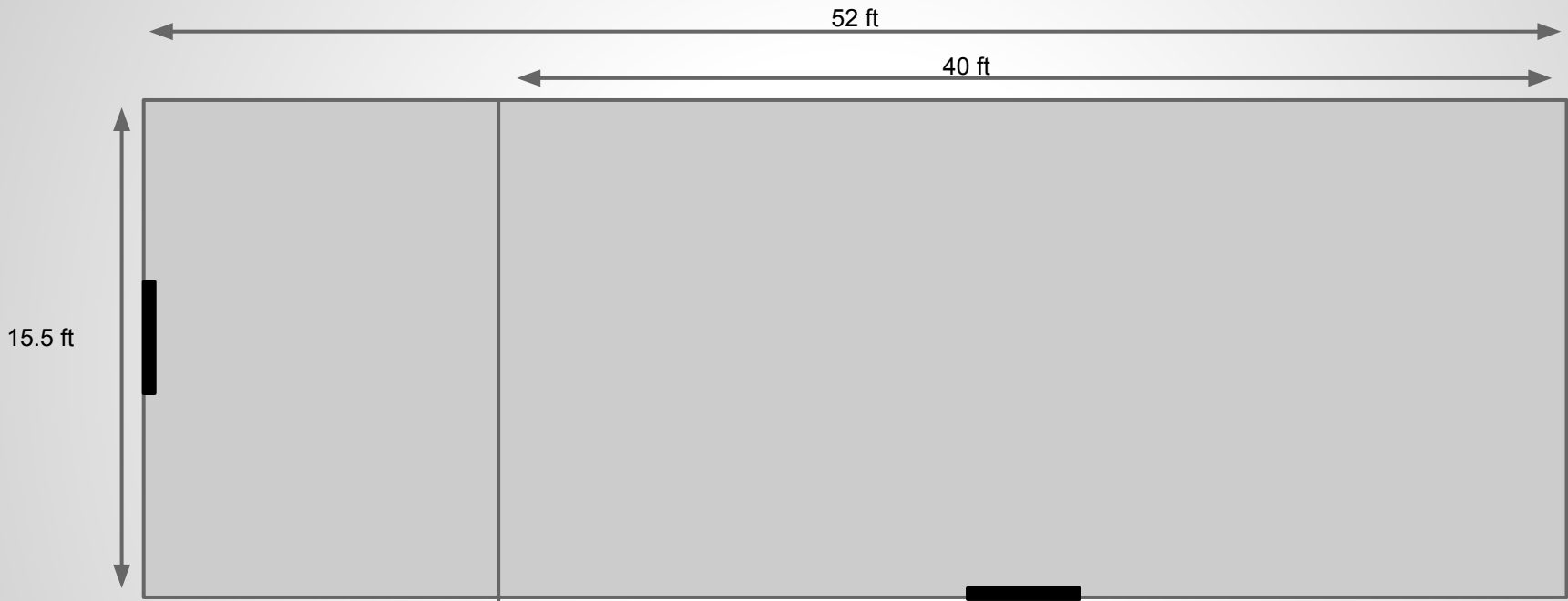
# Aquaponics Greenhouse Functional Requirements

## Nonlive Requirements

- Mouse-proof structure
- Electricity - for lights and fans
- Ventilation system (summer and winter)
- Automatic outside access door for chickens
- Doggy door for dogs
- Hydronic heating
- Window screen - so we can control bugs
- Cool room for cool weather vegetables
- Irrigation tubing for everything growing in compost
- Water catchment

# Aquaponics Greenhouse Ecosystem

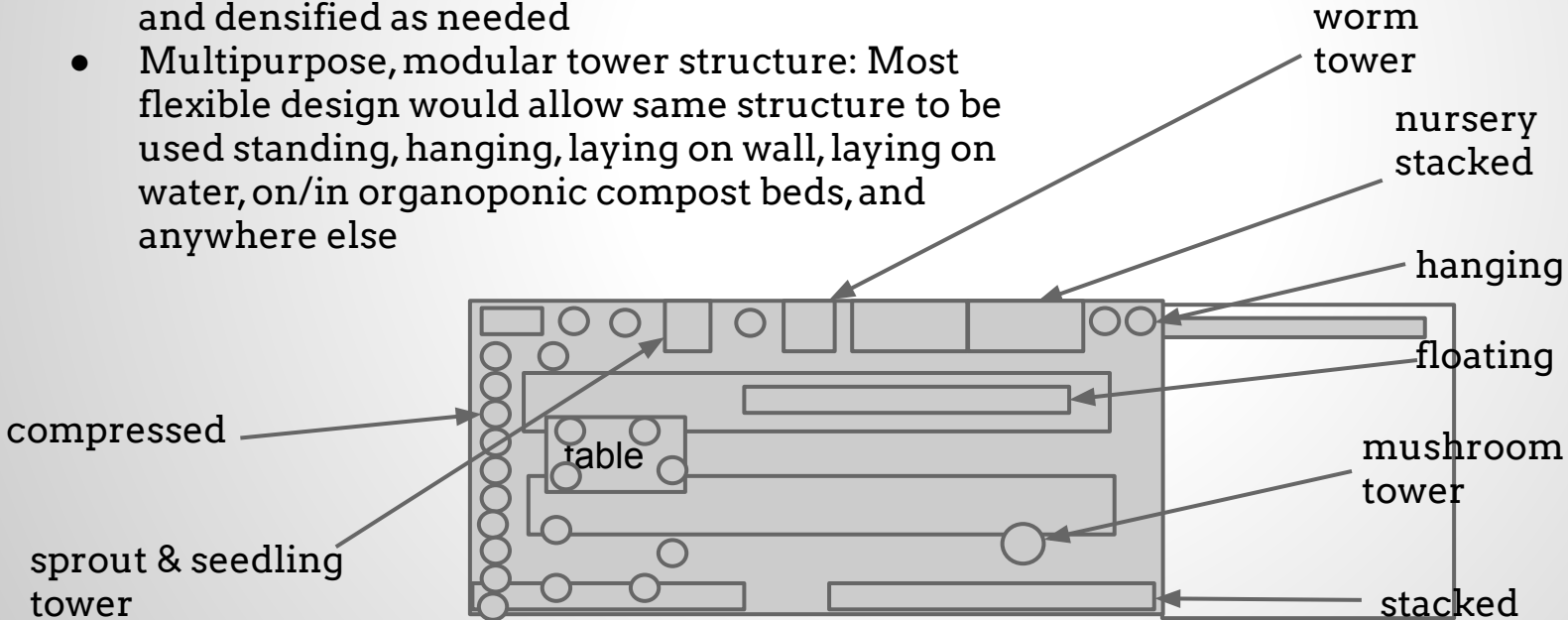




# Vertical Grow System Choices

How to design a highly modular system that can be reconfigured at all times, and well-integrated with a body of water

- Use hanging structures that can be reconfigured and densified as needed
- Multipurpose, modular tower structure: Most flexible design would allow same structure to be used standing, hanging, laying on wall, laying on water, on/in organoponic compost beds, and anywhere else



# Chicken Coop

## Requirements

- Automatic door
- Automatic water and food
- 

## Secondary

- Me

# Aquaponics Greenhouse Prep



Road Gravel

Greenhouse Foundation

Sprout Tower

Open Source Nursery

Elaine Ingham  
Soil Food Web  
Compost Tea

Hydronics Install

Heater Install

**Motivate by**





# Value Proposition for Aquaponics Greenhouse

- Vertical Growing Beds
- Self-cleaning Chicken House install
  - Automated doors
  - IoT Monitoring
  - Automatic Watering and Feeder
- Mushroom install?
- Organoponics bed install?
- Towers: Lettuce - cilantro - spinach - cress - mustard - install
- Hydronics Install
-

# Milestones: Aquaponic Greenhouse

- Mushroom install?
- Organoponics bed install?
- Lettuce - cilantro - spinach - cress - mustard - install
- Hydronics Install
- Towers Install

# Aquaponics Greenhouse Workflow



organoponic medium mixing - 2 beds of 4x8

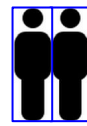
mushroom build

sprout tower build

compost tea reactor build

Sand Bed build

Worm tower build



tools and work  
structure building

Motivate by



Nov 6

Nov 7

Nov 8



# Site Layout and Prep

Tool Storage

House

Greenhouse (52' long=13 panels)

[sand pile](#)

dung  
pile

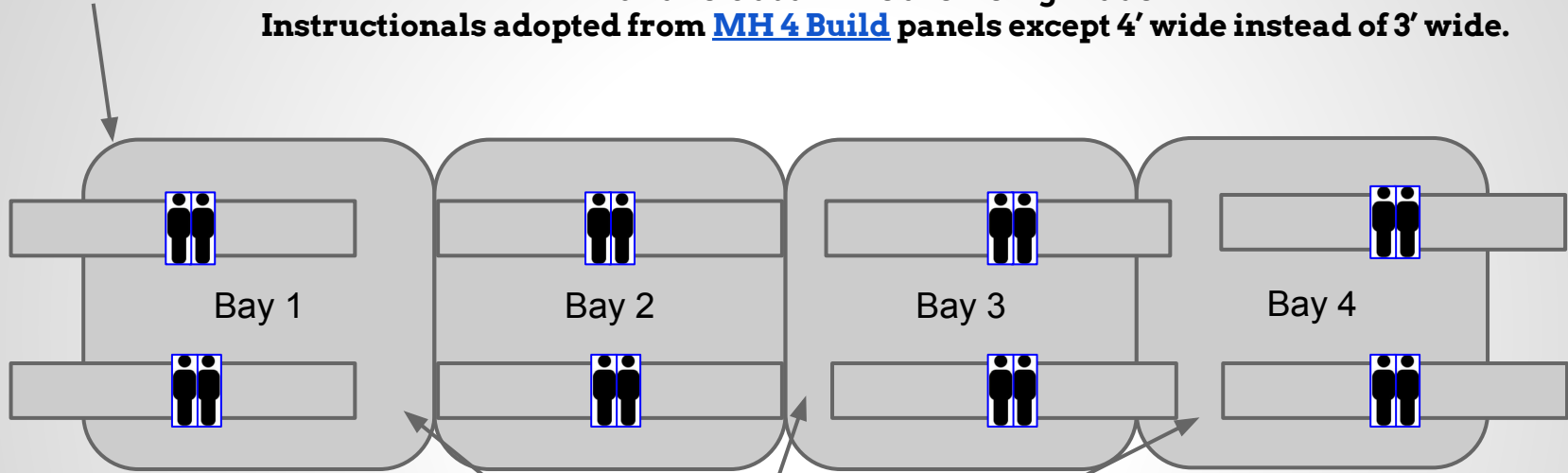
straw  
pile

workshop  
Bays are  
16x16'.

# Shop Layout Day 1

8 Panels at a Time are Being Made

Instructionals adopted from [MH 4 Build](#) panels except 4' wide instead of 3' wide.

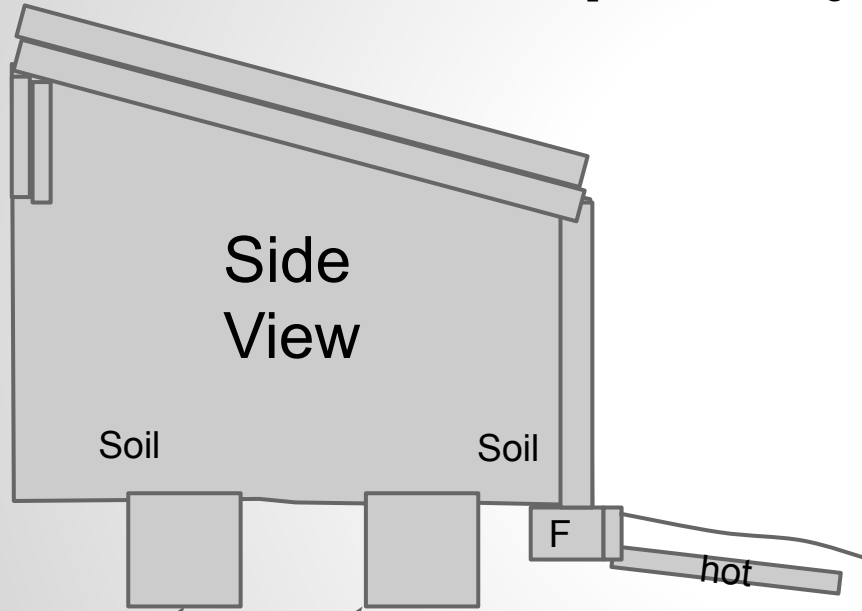


Spacing between panels is 4'  
so people can move around  
panels



# Aquaponics Trough

Technique for building an in-ground pond 1m x 1m in area



[2] 1m x 1m long ponds

See [double linear pond concept](#)

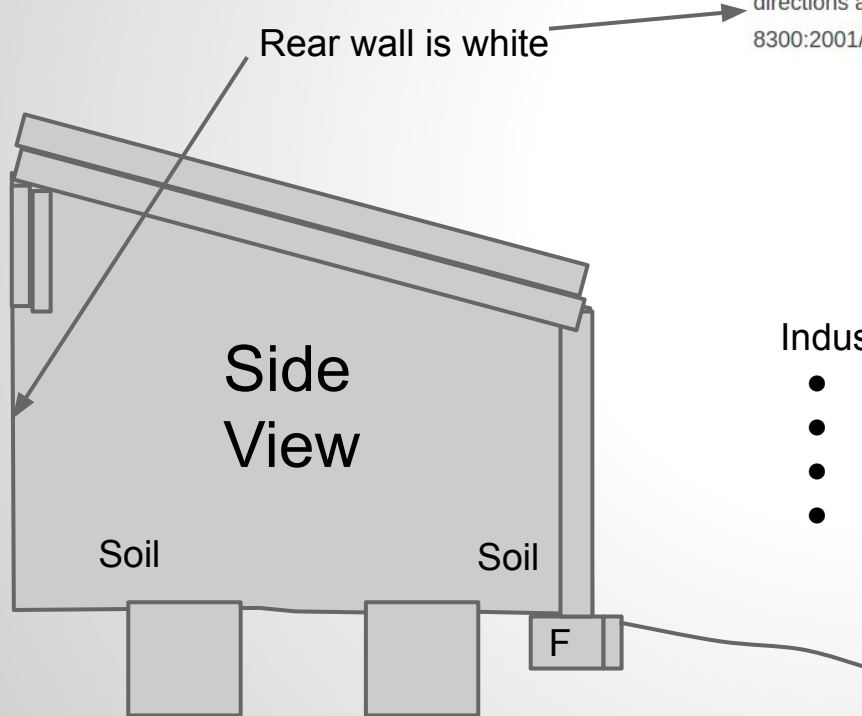
# Vertical Beds

Using all the available light and space in a greenhouse

What is LRV Light Reflectance Value?

Light Reflectance Value (LRV) is the total quantity of visible and useable light reflected by a surface in all directions and at all wavelengths when illuminated by a light source. (ref. British Standard BS 8300:2001/A1:2005)

Rear wall is white



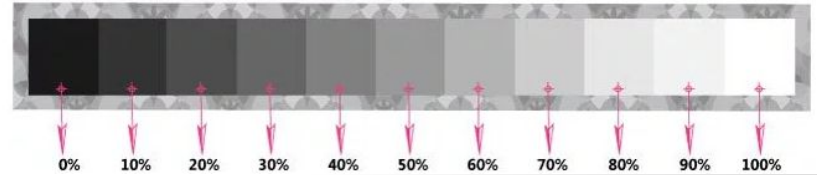
Side  
View

Soil

Soil

F

LRV Scale (not the same as grayscale) © LORE SAWAYA



Industry standards:

- [Tower Gardens](#) - vertical pvc towers
- [Sky Greens](#) - vertical plant elevators
- [Aerofarms](#) - LEDs + mist + vertical
- [GLT](#) - mobile edible wall units

# Vertical Beds 2

Using all the available light and space in a greenhouse



Comparison to regular methods: 3-6x the growing density by going vertical

- lettuce
- basil
- arugula
- mint
- kale
- cilantro
- chard
- spinach
- Bok choy



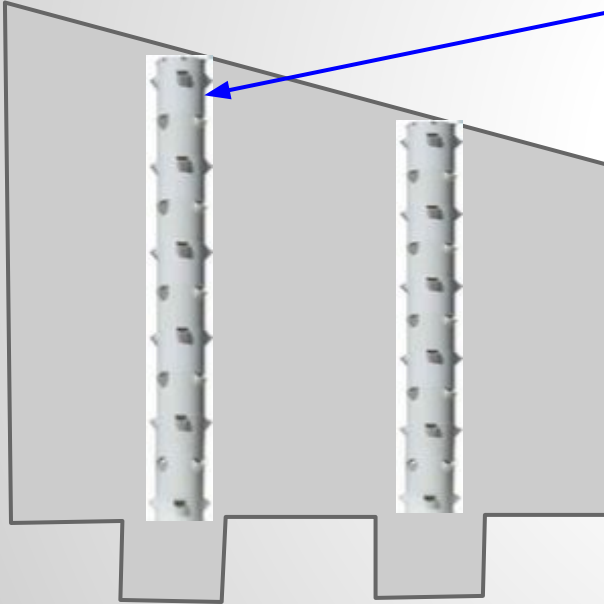


# Open Source Vertical Beds

Use trough combined with vertical pipe

## Requirements:

- Pumping of water to the top of pipe



Option 1: [4" pvc pipe](#)  
\$7 for 10'. See video in [build instructions](#).

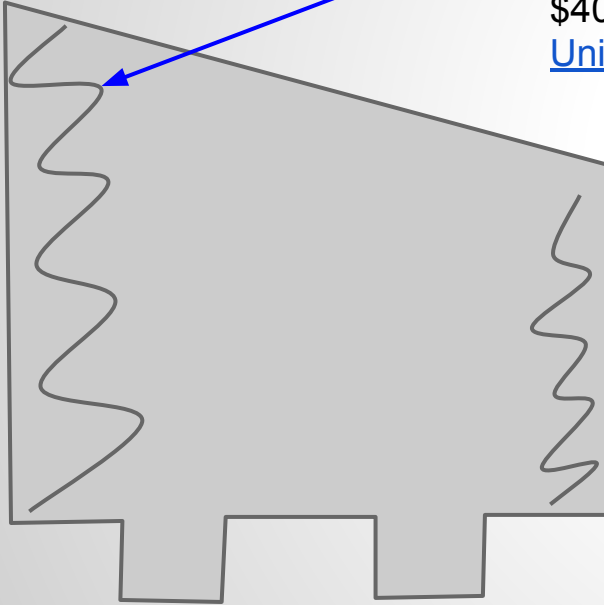
Option 2: [V-Towers](#)



# DIY Vertical Wall

Use trough combined with vertical pipe

[4" corrugated pipe](#) on  
front and back walls  
\$40 for 100 feet.  
[Union](#).



**Example:**

- Pumping of water to the top of pipe



# Grow Media

Use trough combined with vertical pipe

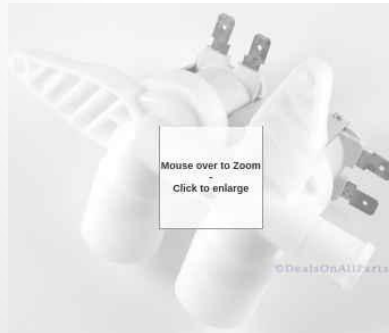
## Types:

- [Clay pebbles](#) - \$23 for 50 liters
- [Matala filter medium](#) - rock wool ?

# Controls

Timed cycling of solenoid valves via an arduino

- Use APduino
- Use 10-20 zones for full control including misting
- Uses 5-10 double [water solenoids](#)
  - Can a water solenoid be back-fed so there are 2 output channels and one input channel?



# Infrastructure Tasks

Planting Rate Research

Water Tanks

Propagation Workshop

Plant 5000 Hazelnuts

Plant 5000 Chestnuts

Plant 5000: Peach, Apple, Aronia, Mulberry, Plum, Pawpaw, Wlanut, Sugar Maple

Husk Hazels

Greenhouse Foundation

Stratify

Lay Out Keylines

Pond Dig

Seed Hazels

Build Greenhouse

R&D Infrastructure: Development Template, Wiki Templates, Interviewing, Build Teams, Get Parallel Teams Going, Basic Protocols for Collaboration, CAD infrastructure, Video Infrastructure

Gravel

MH 3 Hydrant Regulator

Modular House Development

Modular House Build May 1-3

Microtrac

Road to MH 3

Greenhouse Interior

Bulldozer Finish

Greenhouse Design for MH4

Faculty House Interior

Keyline Plow

Water System Design

Faculty House GH

Foundation

Planter

Workshop infrastructure: Hablab, campsite, water pressure

Electric Design

Stove + Heat X

3D Printer Workshop

3D Printer Workshop

3D

3 D

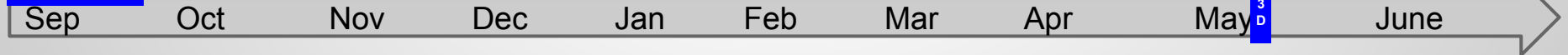
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Gas / Internet



1 4

2

1 4

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