# 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

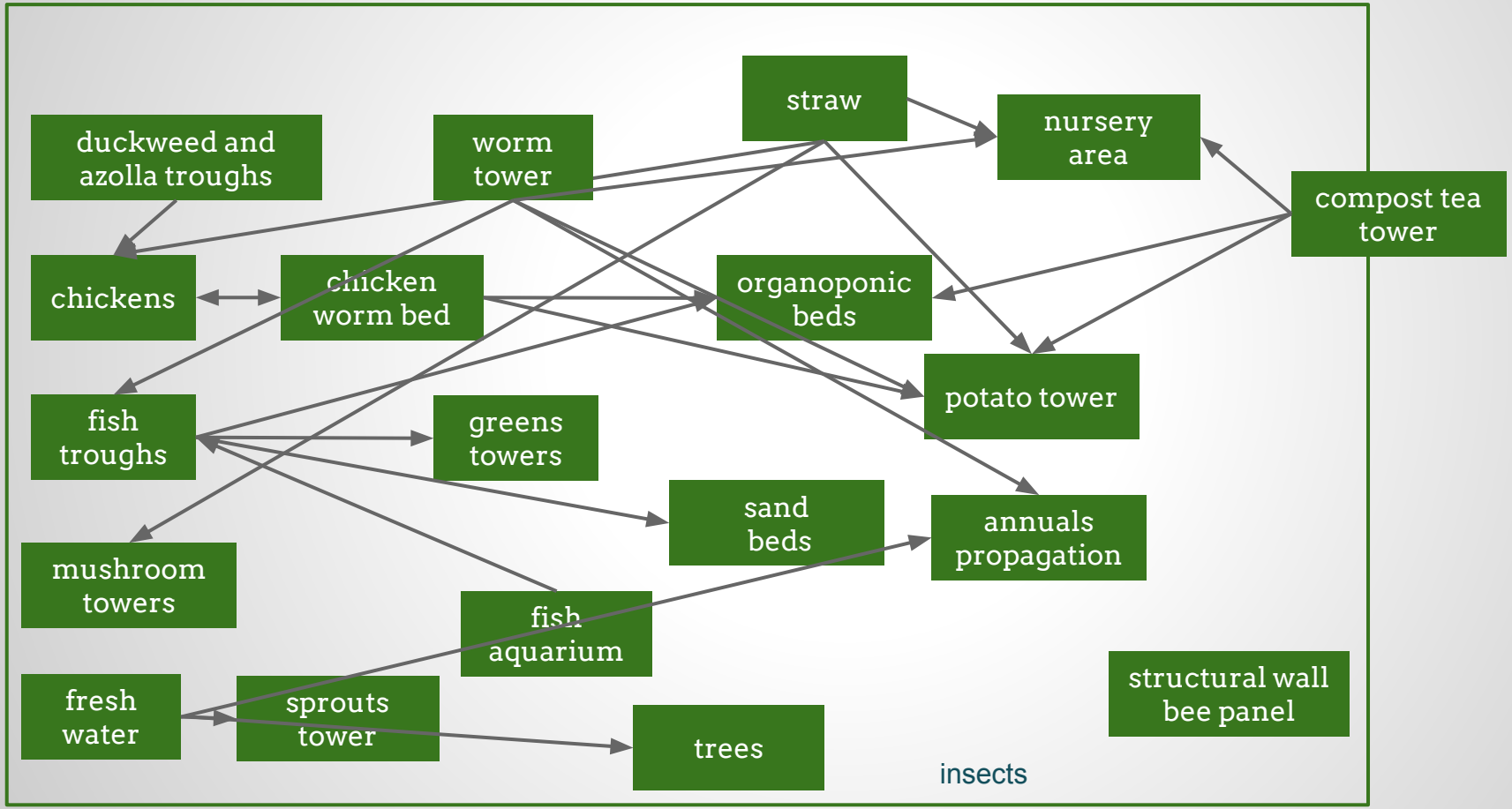
OSH

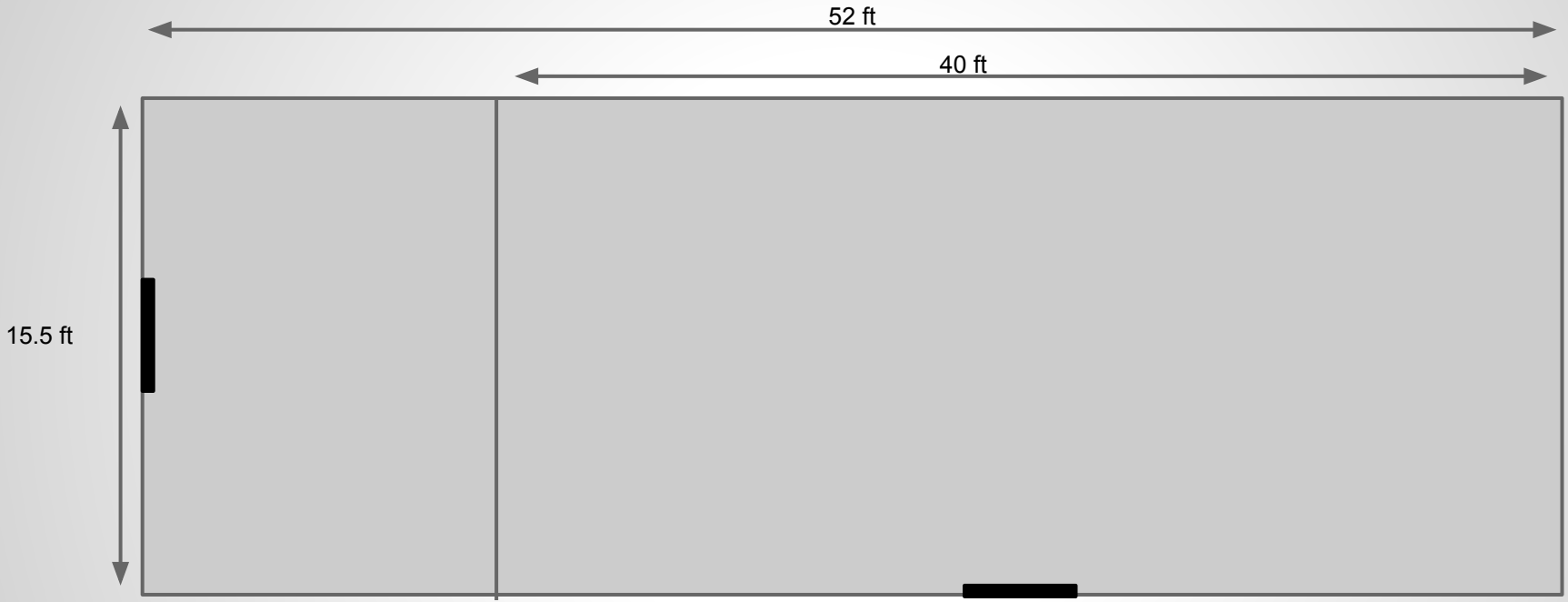
# Aquaponics Greenhouse Functional Requirements

**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

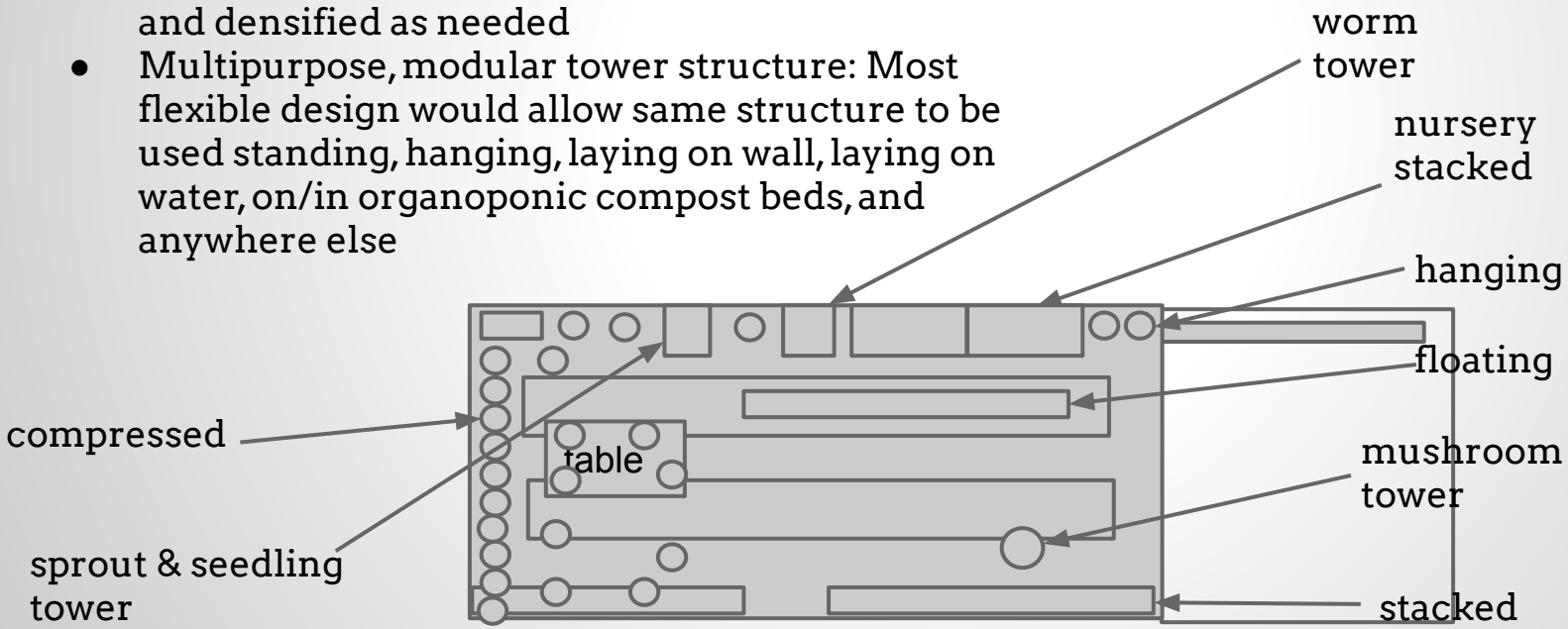



52 ft
40 ft
15.5 ft

# 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**

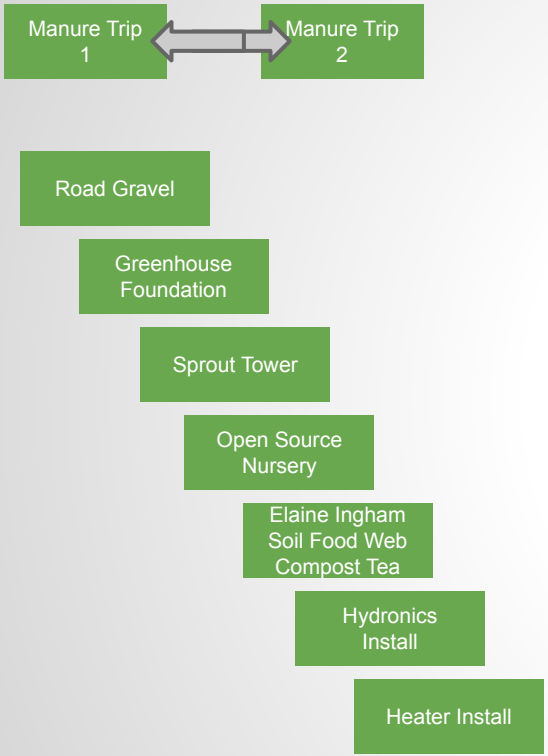
- Automatic door
- Automatic water and food
-

**Secondary**

- Me

OSH

# Aquaponics Greenhouse Prep




**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

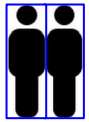
mushroom build

sprout tower build

compost tea reactor build

Sand Bed build

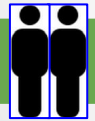
Worm tower build



tools and work

structure building

**Motivate by**

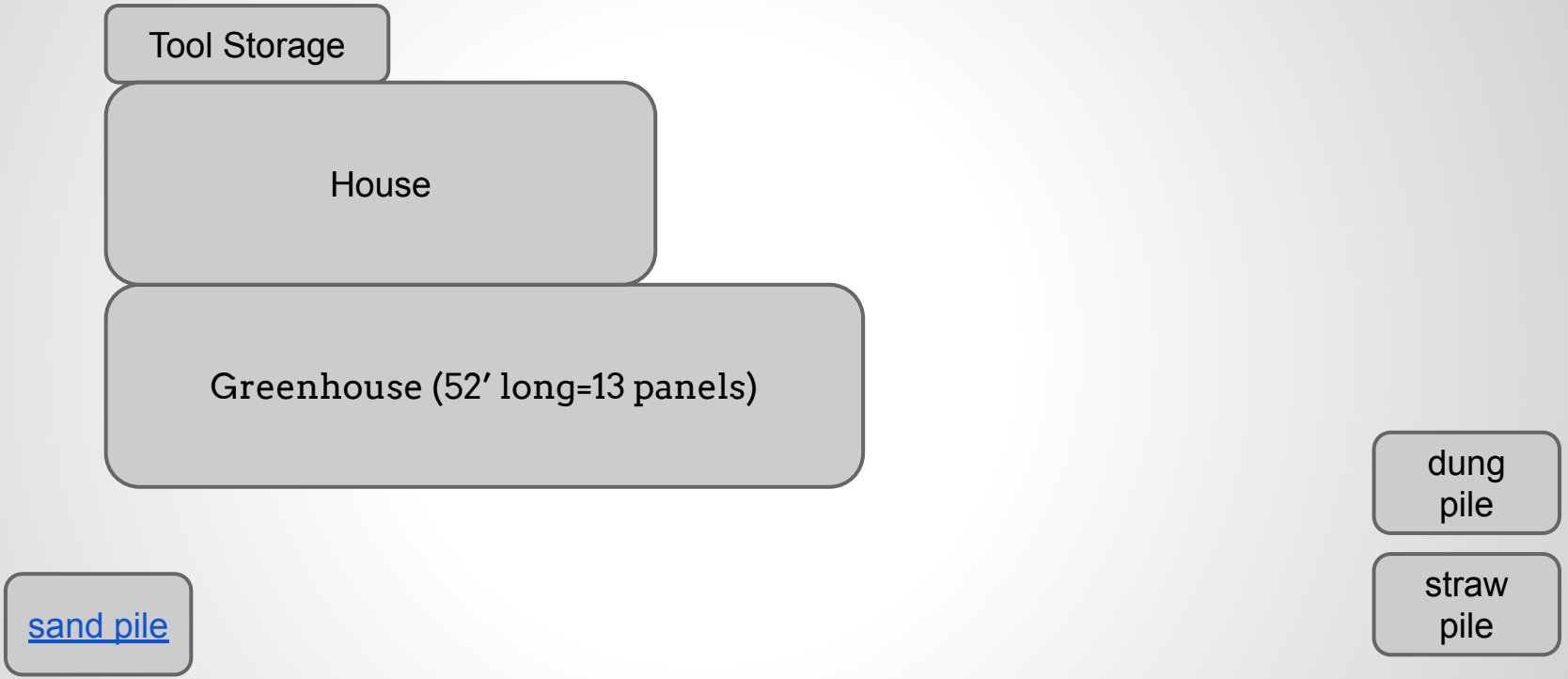



Nov 6

Nov 7

Nov 8

# Site Layout and Prep

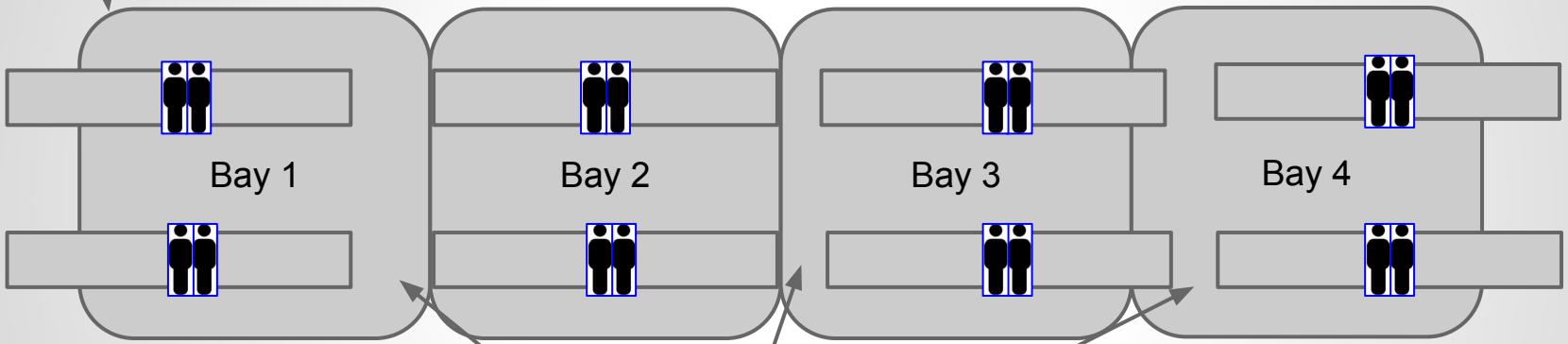


workshop Bays are 16x16'.

# Shop Layout Day 1

**8 Panels at a Time are Being Made**

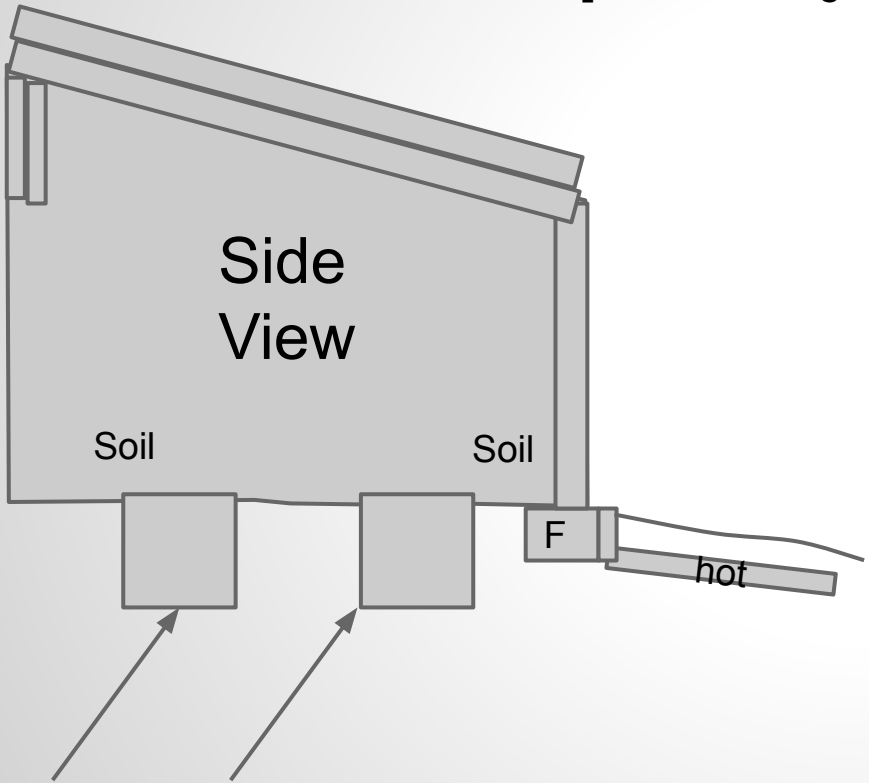
**Instructionals adopted from MH 4 Build panels except 4' wide instead of 3' wide.**




**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**



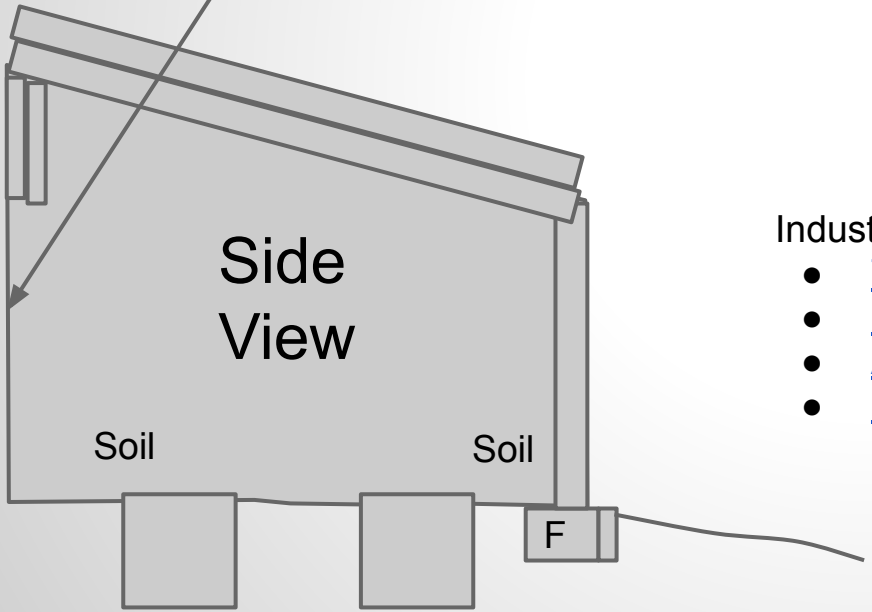

[2] 1m x 1m long ponds

See [double linear pond concept]

# Vertical Beds

**Using all the available light and space in a greenhouse**

Rear wall is white




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)


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

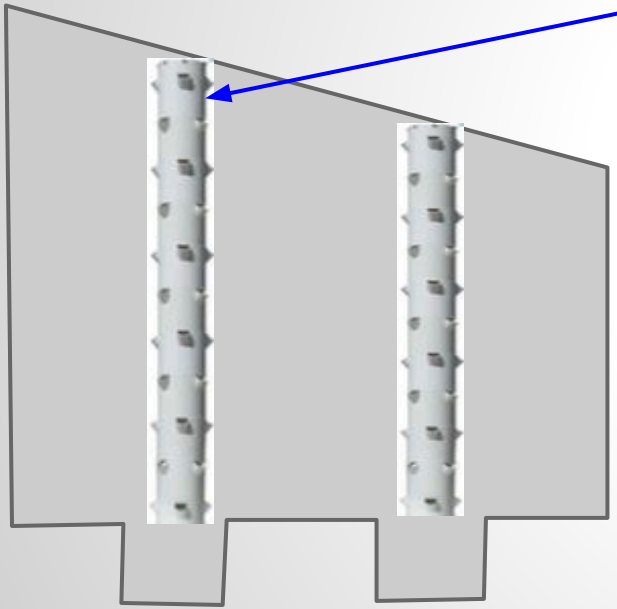
- lettuce
- basil
- arugula
- mint
- kale
- cilantro
- chard
- spinach
- Bok choy

# Open Source Vertical Beds

**Use trough combined with vertical pipe**

**Requirements**:

- Pumping of water to the top of pipe

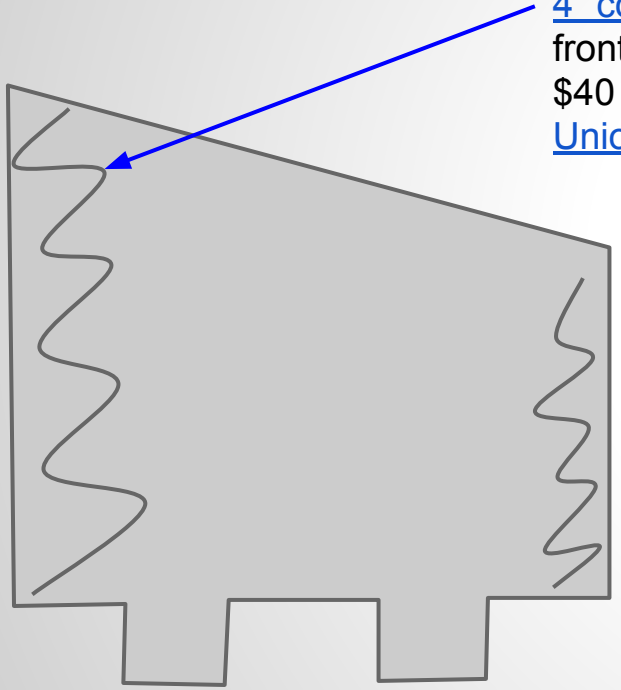


Option 1: [4” pvc pipe]
$7 for 10’. See video in [build instructions].

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**

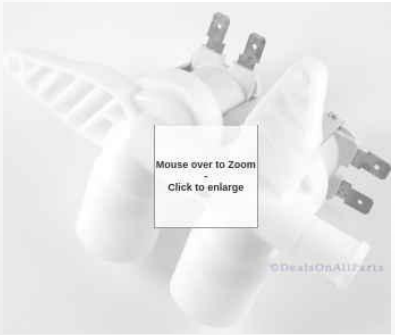
**Types**:

- **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