

# **Vertical Gardens**

**Reducing Food  
Importation to Wrigley  
Institute**

# Concerns at USC Wrigley Institute

- How can you reduce food packaging?
- How can you create sustainable meals?
- How can you create an efficient garden?



# What is a Vertical Garden?



# Benefits of Vertical Gardening

- Local reuse of compost and reclaimed water from household wastes
- Low cost
- Minimal area required
- Alleviation of food shortages in low income areas
- Temperature insulation
- Reduce heat island effect
- Improve air quality
- Decrease stress and anxiety
- Green spaces help mental health

# Modern Implementations



<http://www.foodandwine.com/travel/mexico-citys-vertical-gardens-clear-air>





Made of metal frames and cloth to avoid damaging the concrete pillars

# Edible Garden in Long Beach



# Types of Vertical Gardens

- Fence Planter
- Self-Watering
- Garden Pots
- Stand Alone Planters





# Physical materials for Vertical Gardening

- Build a frame
- Plastic Sheet
- Plant Containers
- Irrigation system
- Fertilizers

# Drip Irrigation System

**Drip Irrigation System** : a type of Micro-Irrigation System that can potentially save water and nutrients by allowing water to drip down slowly to the roots of plants

Placing water directly into the root zone to minimize evaporation. Drip Irrigation System distribute water through a network of valves, pipes, tubing, and emitters in general.

Depending on how well it is designed, installed, maintained, and operated, Drip Irrigation System can be more efficient than other types of irrigation systems such as surface irrigation or sprinkler irrigation.

# Implementation

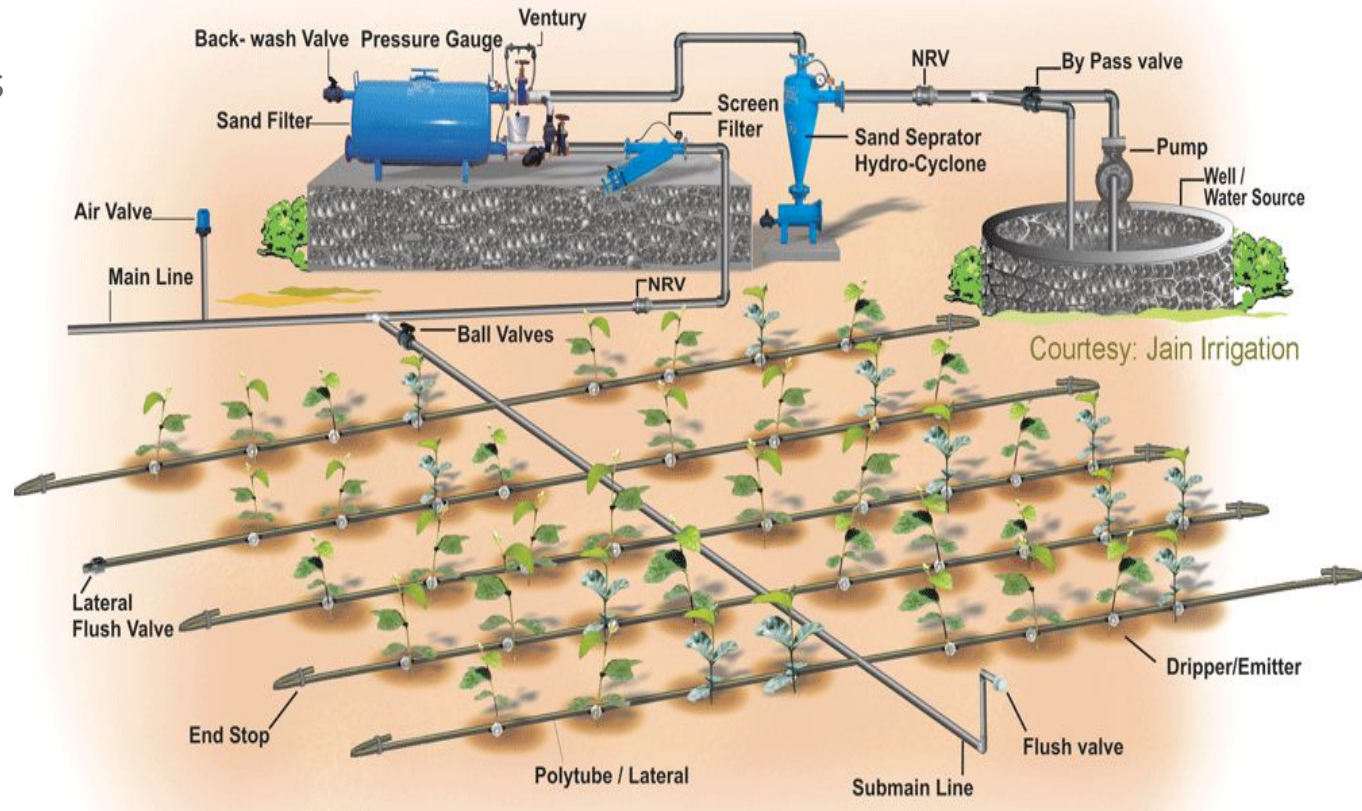
Items we need :

- Pump (pressurized water source)
- Water filters
- Backwash controller(timer) - automated system
- Pressure control valve
- Distribution lines
- Smaller diameter polyethylene tube
- Poly fittings and accessories (to make connections through tubes)
- Emitting devices (emitter or dripper, micro spray head):

# Implementation

Implementation Skills

High efficiency  
and sustainability





# Cost Analysis – Drip Irrigation

1. Pump : \$23.95
2. Water Filters : \$15.45 Controllers : \$24.99
3. Valve : \$4.30
4. Distribution Lines through Polyethylene tube : \$14.98
5. Poly fittings and accessories : \$14.57
6. Emitters : \$8.74

Total Expense :  $106.98 * 10 = 1069.8$

# Drip Irrigation vs. Other Irrigation Systems

Drip Irrigation vs. Surface Irrigation

Drip Irrigation vs. Sprinkler Irrigation

Main Difference is its high efficiency in using hydroponic water sources and nutrients which makes the system sustainable in its own model. (water efficient, labor efficient, sustainable)

At \$0.22 per kilowatt hour and a 40-minute run time every day (more often than needed in many situations) this would amount to around \$0.22 per month for drip

# Farming as a Manufacturing Process

Establish a system:

- Planting
- Trimming
- Pest Control & Maintenance
- Harvesting

Start small & refine your system

# Nutritional Goals

3 daily meals for 80-100 individuals

Estimate 300 meals/day

Average daily caloric consumption per person = 2,500 kcal

Average Macronutrient Intake = 56 g - 97 g of fat, 282 g - 406 g of carbohydrates, 63 g - 219 g of protein, 35 g fiber



# Menu Selection

Utilize all of ingredients to reduce waste

Meatless Mondays: Using proper plant proteins

Take inspiration from other cuisines - use ingredients efficiently & look for meals without meat components

Example: Bones and roots can be used for stock - Beef Bone Soup in Korean Cuisine

# Comparative Analysis

## Adjusted June 2017 Totals:

Net weight = 6,889.33 lbs

Cost = \$16,364.97

Net weight of meat = 691.30 lbs = 10.03%

Cost of meat = \$2,507.33 = 36.39%

# Recommended Crop List

Protein sources: quinoa, beans

Vegetables: onions, yams, potatoes, leaf lettuce, tomatoes, herbs

Herbs: thyme, basil

# Crop Selection Criteria

Nutritional Value: calories, fats, proteins, carbohydrates, minerals, & vitamins

Required space

Germination period

Required labor/maintenance

Invasive species

Staple Ingredient

Economically Efficient



# Future Value & Permanency

Dense urban locations like Los Angeles

Shifting dynamics: mega farms to more, smaller farms

Tradeoff: Cost vs. Production efficiency