Intro to Vertical Farming

Niraj Ray
Cultivate the City
nray@cultivatethecity.com

Rooting DC
Saturday March 3rd, 2018
Outline

- Introduction to Cultivate the City
  - What is vertical farming and why?
  - Crop selection in vertical farming
  - Different methods of vertical farming we use
  - Education through vertical farming at CTC

- Q&A
Who we are and what we do

- Social enterprise dedicated to increasing the capacity for food production in the city by giving residents access to the tools, education and resources needed to grow more efficiently, and spur a hyperlocal food economy.

- School Garden Management and Classes, Community Garden and Urban Farm Site Management, CSA, Restaurant Sales and a Rooftop Retail Garden Center

- By the numbers for 2017:
  
  20+ Sites, 1+ Acre of total space, grew and distributed <16,800 lbs. of produce
Map of DC CTC Locations
International Projects

- Panchgini, India - 2 acre trial plot (2014-2016)
  - Commercial Strawberry Farm
    - 96% reduced water use
    - Eliminated spraying of Copper Sulfate
    - 4X yield from same footprint, ½ labor

- Medellin, Columbia (2017-2018)
  - Vertical School Garden - Fundacion Marina Orth
  - Workshop Series for farmers, urban residents and students - Botanical Garden of Medellin
School and Non-Profit Farms

IDEA PCS

Gally Gardens

Youth Blossom Project
Rooftop Farming @ Nationals Park -

Crate Farming

- Filled with blend of lightweight, rooftop growing media
- Irrigated by micro-drip system with water soluble nutrient supplement as needed
- Weight load is a primary concern
H St. Farms

- Garden Center in NE, DC - atop a local hardware store
- Crop Production, Event Space, Garden Classes, Wholesale & Retail Sales, Showroom for Design/Build
- 4 Rooftop Greenhouses - 1,500 sq. vertical farm
What is Vertical Farming?

“Vertical farming is [any] type of farming that seeks to maximize production and efficiency per square foot by growing crops in multiple levels on a vertical axis.”

“This could be crops on multiple floors, stacked shelves (think standard nursery trays taken to an extreme), or even rooftop farming. Vertical farms may use hydroponic, aquaponic, or aeroponic growing techniques, sometimes eschewing soil as a grow medium to limit system inputs and facilitating soil restoration where it’s needed.”

-Evan Bromfield
Urban Vertical Farming Project

Vertical farming can also include traditional soil growing methods such as “forest farming” or Three-Sisters crops.
Why Grow Vertically?

- Urban Migration
- Climate Change
- Resilient Communities
- Maximizes use of space
- Minimize water, fertilizer and energy inputs
- Reduced physical labor/ lb vs. field crops
- Utilize otherwise unfarmable spaces
- Easy to install, relocate or replant
Key Factors in Choosing your Growing System

- Space
- Power Access
- Light Availability
- Drainage
- Weight (if on a rooftop or even indoors)
- Ventilation
- Pest Management
- Growing Media
- Crop Choice
Crop Selection - Here’s what we grow:

- Strawberries/ Pineberries
- Herbs: Speciality Mint/Basil, etc.
- Heirloom Hot Peppers
- Tomatoes
- Bell Peppers
- Ground Cherries
- Rosemary
- Lettuce
- Kale
- Coleus (Ornamental)
- Nasturtiums, marigolds and other edible flowers
- Green Onions/Chives
- Cilantro
- Thyme
- Sage
- Oregano
- Spinach
- Eggplant
- Collard
- Ethnic crops
- Cucumbers
- Grapes
Upcycled Pallet Gardens

• Easy to make from available materials- Pallets, Landscape Fabric, Wood and Screws
• Last at most 2 years outdoors
• Paint/Finish for longer use
• Use only Heat-Treated Lumber (look for stamp)
Root Pouch

- Fold up for easy storage when not in use
- Made from Recycled Plastic Bottles
- Comes in various colors and sizes
- Machine-Washable
- Lasts for 10+ years

Cost: $30
Healthy roots = whole lot of fruits!

- Air Pruning results in robust root structure and prevents root circling
- Root zone aeration and temperature regulation
- Prevents overwatering, easy flush
- Beneficial bacteria and mycorrhizae thrive
- Minimize transplant shock - nest your pots
Zip-grow Towers and Farm Walls

- Intended for controlled environment or wall-mounted use
- Recirculating hydroponic system
- Require wall or rack for mounting
- <1 sq ft. footprint/tower
- Great for herbs and leafy greens
- Growing media made from recycled plastic- reusable (still require plugs)
- Can be used for live-market sales
- Easily combined with aquaponics

Cost: $60-$100/tower
Basic Aquaponic Zipgrow Layout
Tower Garden

- Suitable for indoor or outdoor use
- Recirculating, hydroponic growing system
- 5 sq ft. footprint of tower
- Up to 11 tiers high = 44 plants/tower
- Made from hardened polyurethane
- Requires rockwool for starter plants, but other media
- Water acts as ballast for system: free-standing
- Frequently used by restaurants for on-site gardens

Cost: $500+/tower
HOW TO PLANT A BEGINNER’S TOWER GARDEN

TOP
Basil
Cilantro
Dill
Mint
Parsley

MIDDLE
Arugula
Chard
Kale
Lettuce
Mustard Greens

BOTTOM
Cucumbers
Green Beans
Peppers
Tomatoes
Zucchini

www.TowerGarden.com
VEG Towers

- Intended for outdoor use
- Modular - usually 5 stackable pots, more than 20 plants/ tower, for 5’ tower
- 3 sq. ft. footprint per tower
- Uses coconut coir as primary growing medium - can mix in organic amendments as desired
- VEG tower can go directly into ground
- Pots are made from recycled Styrofoam - high R value insulates plants
- Low initial investment
- Drip-to-waste, top fed irrigation on pump and timer (can run off solar power)

Cost: $60-$100/tower
Outdoor Hydroponic or Organic Vertical Edible Garden (VEG) Tower
Coconut Coir

- Renewable, compostable growing media
- Pest and pathogen free
- pH neutral
- Drains easily, cannot overwater
- Self-watering mix- wicks easily
- Great for vermicomposting, mushrooms, amending garden soil and pots
- Compressed and light-weight
- Easy to make your own custom soil blend
- Great with kids!
Why Set Up Towers for Education?

- Interactive learning with futuristic technology
- Year-round laboratory
- Multi-level training (all ages/ community involvement)
- Therapeutic
- Foster environmental stewardship
- Agri-business training opportunity/ Fundraising
- Long term investment
Educational Programming

• Senior Citizens to Pre-K
• 20 different site locations
  • Theodore Hagans
  • Edgewood Gardens
  • Stationhouse Apartment
  • Gallaudet
  • Barracks Grow
  • Miner ES
  • IDEA PCS
  • & more!

• Internships, Volunteers
  • SYEP
  • The Washington Center
  • Urban Adventure Squad
  • Corporate Volunteers
  • And more!
Vertical Farming & S.T.E.M

1. Hands on activities

2. Problem solving

3. Collaboration

J.O. Wilson's Ribbon Cutting

J.O. Wilson's cisterns

J.O. Wilson's VEG Towers

J.O. Wilson's Shade Classroom
Education Through Vertical Farming

Designing, assembling and caring for the vertical towers
Education Through Vertical Farming

Garden activities

Cooking Demonstrations

Homemade Herb Butter

Trying fresh strawberries
Education Through Vertical Farming

Recycling cartons as planters

Problem solving

Helping at the market
Education Through Vertical Farming

Working in the garden

Strawberry & Salad Greens Day
Questions?
Discussion Topics

• Plant Selection
• Nutrient Management
• Pest Management
• Harvesting
• Market Opportunity
• Food Safety
• Water Use
• Education
Why Use Hydroponics?

- Saves space
- Reduced need for pesticides, fungicide and fungicides
- Eliminates unknown soil factors (i.e. nutrients and pathogens)
- Conserves water, energy and fertilizer
- Predictable results

→ Higher Yields
Integrated Pest Management

- Environmentally sensitive approach to pest management
  - Set action thresholds
  - Enforce cultural prevention methods
  - Monitor and ID pests
  - Use control methods if necessary—mechanical, biological, chemical

Source:
http://ipm.ifas.ufl.edu/pdf/IPM_Education-Leppla_060710.ppt