ENGINEERS IMPACT ON URBAN FARMING
Development of Urban Infrastructure

Reducing:
- The usage of physical spacing
- Building up on environmental energy consumption
- Transportation cost
- Impacts on a green society

“Vertical Greenhouse”
- Resist climate changes
  - Climate made fit for all year round
  - Enclosure of sun’s heat and the capability of maintaining moist environment

dpi.nsw.gov.au
“Greenhouse”

**Types of Greenhouse**

- **Lean-to** – a half greenhouse attached to a building
  - A limitation of light exposures
- **Even-span** – a full size greenhouse with one gable end attached to a building
- **Window-mounted** – a glass enclosure greenhouse allowed to be attached to either the south or the east side of a building
- **Freestanding Structures** – a structure freely placed on any end of the building

[Images of different types of greenhouses]
Materials

- **Frames**
  - Quonset
  - Gothic Arc
  - A-frame
  - Post and Rafter
  - Tri-Penta
  - Dome
  - Slant Leg
  - Gable Roof

- **Coverings** (Fiberglass, Double-wall Plastic, Glass)

[Images of greenhouses and diagrams of frames]
Heating System

- Measured in British thermal units (Btu per hour): energy used to heat one pound of water by one degree Fahrenheit

\[(1 \text{ btu per hour} = 0.29307107 \text{ watts})\]

- Sunlight storage - solar panels
  - Photovoltaic effect
  - Crystalline silicon (thickness of 2cm)

- LED (Lighting Emitting Diodes) - artificial lighting
  - Low in power usage (6 watt for about 2-3 plants)
  - Emission of wavelengths and light efficiency
Absorption of Sunlight

Maximum - Minimum sunlight locations

- South / Southeast
- East
- West
- North

Importance of Solar Panel’s Angle

- Summer - Decrease around 10 degrees
- Winter - Increase around 10 degrees

_Sunray should be perpendicular to the collecting area_
Ventilation System

- Natural - roof vents with louvers
- Mechanical - usage of exhaust fan

- Humidity Control
  - Prevent high temperature (decreasing fungus’ growth)

- Temperature Control
  - Prevent the trapping of solar radiation (Greenhouse effect)
  - Controlling the conditions of plant’s growth

- Carbon dioxide/Oxygen
  - Draws in oxygen -> increase rate of photosynthesis to produce carbon dioxide

- Air circulation
  - Warm air rises
  - Cool air settles
Water Supplies

- **Irrigation System**
  - Drip Tubing – reduce evaporation and runoff
  - Overhead Misters
  - Mat Irrigation
  - Perimeter Irrigation

- *Water are mainly stored in barrels*
- *Acquire constant checks on water temperature*


- **Waterways**
  - River and Ponds - mostly runoff waters
  - Municipal water system - high cost
  - Groundwater - aquifer zone (clean evaporated water)
  - Rain collection - little in amount received

_Distribution Uniformity (DU)_
- measuring the distribution of irrigation system

(The approximated amount of the usage of water for one acre is around 22,000 gallons of water per day)
Green Roofing

Benefits

- Remove heat on the surface of the roof (energy reducing)
- Prevent further air pollution
  - Decrease gas emission level
- Lower heat wave
- Reduce runoff rain water (flooding)
- Landscape view

commons.bcit.ca

greenroofs.com
Extensive Green Roof

- Used for ecological protection layer
- No permanent irrigation system
- Plant’s height growth are approximately 6 inches or shorter (Ex. Moss, herbs and grasses)
- Low in maintenance
- Mostly used by single family or residential buildings
Semi-Intensive Green Roof

- Occasionally irrigation system
- Plant’s height growth are approximately 6 to 12 inches (Ex. Grass, herbs and shrubs)
- Moderate in maintenance
Intensive Green Roof/roof garden

- Used as park/garden
- Permanent Irrigation System
- Plant’s height growth are approximately 6 inches or more (Ex. Lawn, Shrubs and trees)
- High in maintenance
- Full scaled public park
“Green”

• Building the structure of greenhouses
  – Production of organic plantation all year round
  – Reducing the cost used for transporting, heating, and watering
  – Uses of solar panels other than electricity
  – Effective ventilation systems

• Designing the usage of the Green Roofing
  – Increase the amount of unpolluted air
  – Advancing the view of the environment on the roof
  – Decreasing the chances of floods