

# Creating a Sustainable Hydroponic System: Eliminating the use of pesticides, herbicides, and ground-born diseases.

Heal the World 2011  
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There is a need to eliminate the dependence on pesticides/herbicides to grow food and prevent food born diseases from being transmitted to humans.

## Approach

Design an Ebb and Flow greenhouse on top of the Wedge to grow pesticide free tomatoes and lettuce to be used in Morgan Commons.

## Background

- Hydroponic is latin for "working water".
- Science of growing plants without the use of soil but instead an inert medium consisting of nutrient solution containing all essential elements needed by plant for its normal growth and development.
- First recorded hydroponic culture: Hanging Gardens of Babylon, Floating Gardens of Aztecs, and the gardens of the Chinese.
- Early 1930's W. F. Gericke commercialized what had previously been only lab experiments, termed the micro cultures as hydroponics.

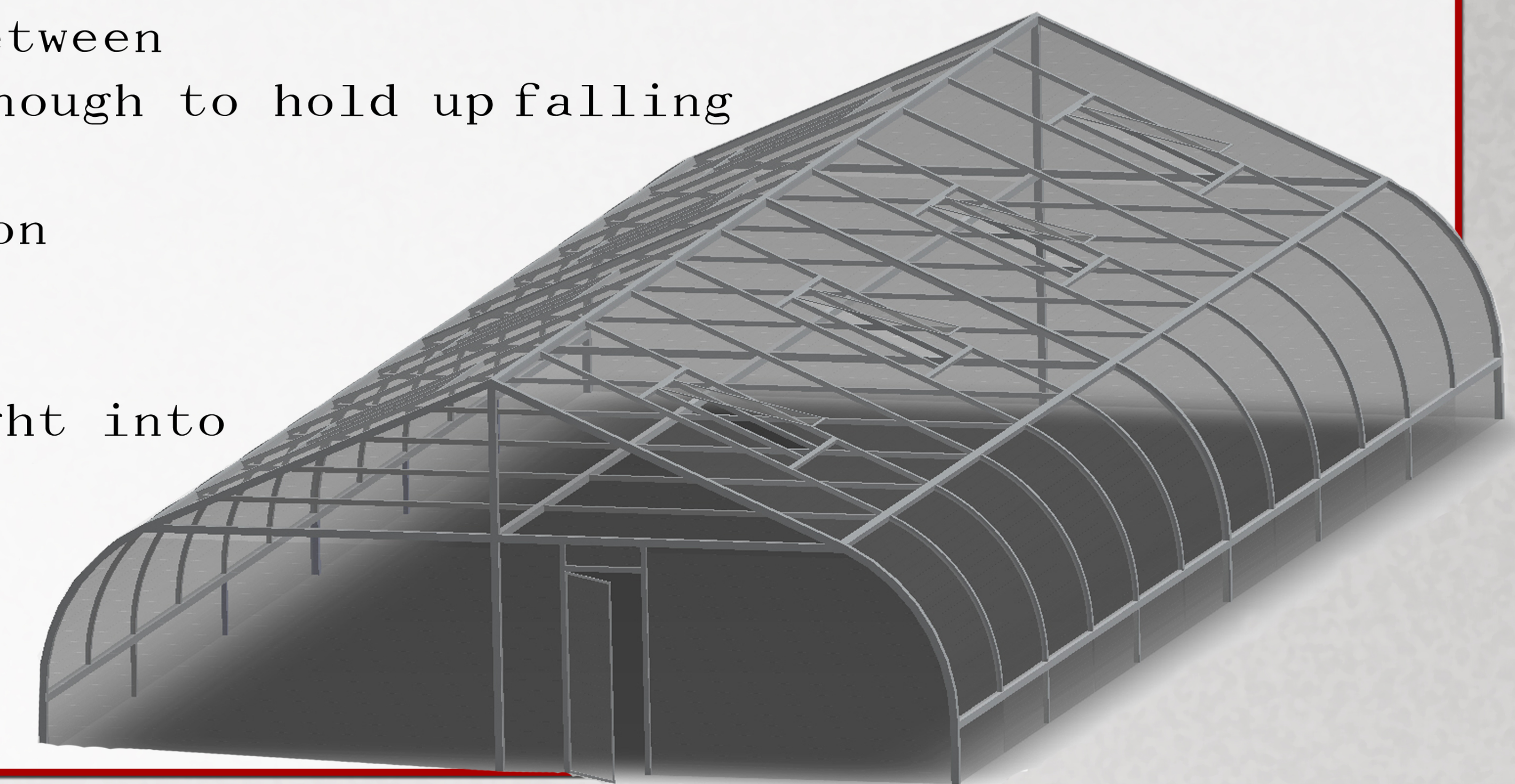
## Ebb and Flow

- Best for plants smaller than 24" tall.
- Nutrient solution stored in reservoir and pumped trays with submersible pump.
- Pump is controlled by a timer:
  - o Temporarily floods growing trays with nutrient solution
  - o Then drains solution back into reservoir

## Plan and Design

The proposed idea for the Greenhouse is to use an ebb and flow hydroponics system in combination with natural and artificial lighting to grow tomatoes and lettuce for campus.

- Helps regulate the temperature and lighting.
- Frame
  - o Provides the structural support and defines the amount of growing space there is available
  - o Gothic Arch
    - straight sides rising to curved corners and an angled roof
    - o Thirty foot by sixty-four foot greenhouse
- Siding
  - o Polycarbonate
    - A two-ply ten-millimeter sheet
    - o Made up of two separated sheets of polycarbonate sheet separated by straight dividers ten millimeters long in between
      - Strong enough to hold up falling snow
      - Insulation
- Heating
- Ventilation
  - o Open skylight into the room.



## Conclusion

The final step would be to take the CAD model and put the plans to action. Approval from WPI administration would be needed, as well as talking to Chartwell's to see if they would incorporate the hydroponic food into the schools existing diet. When the greenhouse is fully functioning with both crops being successfully grown, approximately 252 heads of lettuce per harvest would be produced, resulting in 1008 heads per year, along with 2160 pounds of tomatoes per harvest. The greenhouse would use about 59.16 kW of power per day. If applicable, this greenhouse would provide a healthier, more organic combination to the food provided in DAKA.

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