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IPRO-325C

DESIGNING AFFORDABLE SHELTER SOLUTIONS FOR THE WORLD'S POOR

SHELTER- EVAPORATIVE COOLING SUBGROUP

Shelter Subgroup

- **Problem:**
  - 792 million people worldwide are malnourished
  - 5 million children die each year due to malnourishment.
  - Many of the rural poor buy in bulk and stockpile since they typically are not near markets
  - Food stored from the market or their own produce typically spoils before they can eat or sell it
  - 20% of fruits and vegetables are lost due to rotting during storage

- **Micro-Nutrient Malnutrition** (MNM) is a medical condition resulting from insufficient consumption of nutrients
  - 1 in 5 with MNM have access to fruits and vegetables but cannot store it

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Individual Roles

August Sylvain
4th year
Biology Major
Engineering Notebook

Casey Franklin
5th year
Architecture Major
Cultural Liaison

Carl Ekstrand
4th year
Civil Engineering Major
Funding Research

Amber Heinz
5th year
Architecture Major
Subgroup Leader

Mark Chiu
4th year
Architecture Major
Testing Coordinator

Justine Banda
4th year
Architecture Major
Minute Taker

Goals

- Design a cooling system that will help combat malnutrition by enabling the storage of fruits and vegetables for longer periods of time before decaying.

- Expand on Research from Previous Semesters
- Test In-Ground System vs. Existing Precedents
- Test Lid Designs
- Test Fruit Preservation in System vs. Out of System
- Make Recommendation on Most Efficient System Design
- Modify & Translate Construction & Use Manual
- Find Implementation Location, Connections, & Funding

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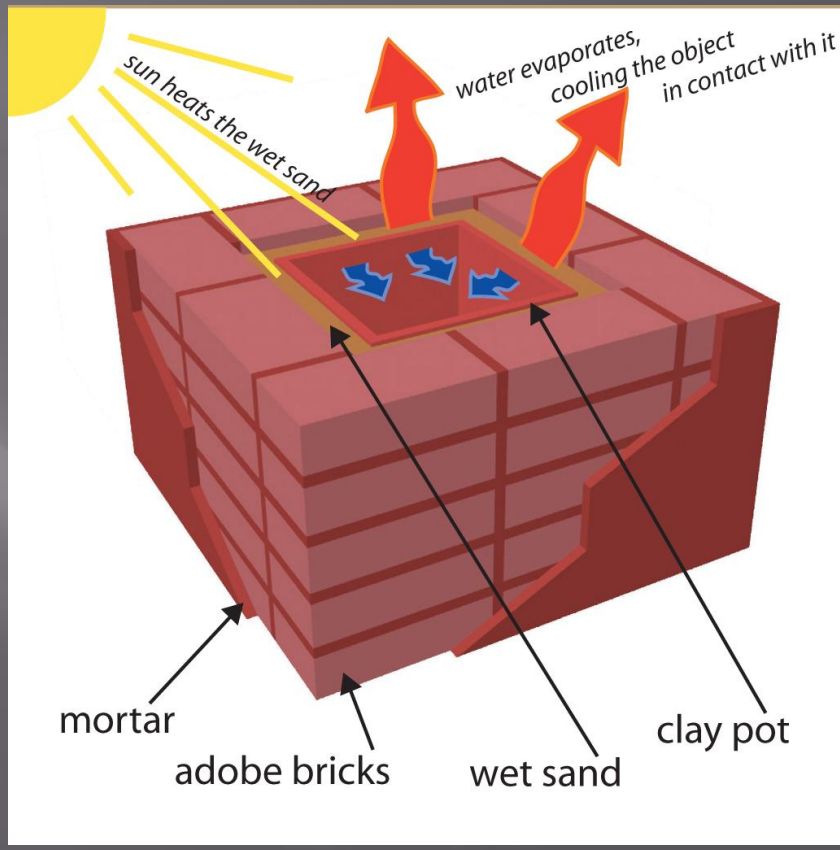
Progress:
Evaporative Cooling

- Theory:
  - Air temperature decreases as water evaporates
- Effect:
  - Objects or liquids that are in contact, become cooler



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Progress:
Location Research

- Ideal climate:
  - High temperature
  - Mid to low humidity
  - Breezes
- Most suitable regions of Peru for testing:
  - Coastline
  - More tropical areas.

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Progress:
Location Research

- Terrain:
  - Andean Ridge divides the country into two sections
  - Large effect on climate within the country resulting in a total of 8 different climates

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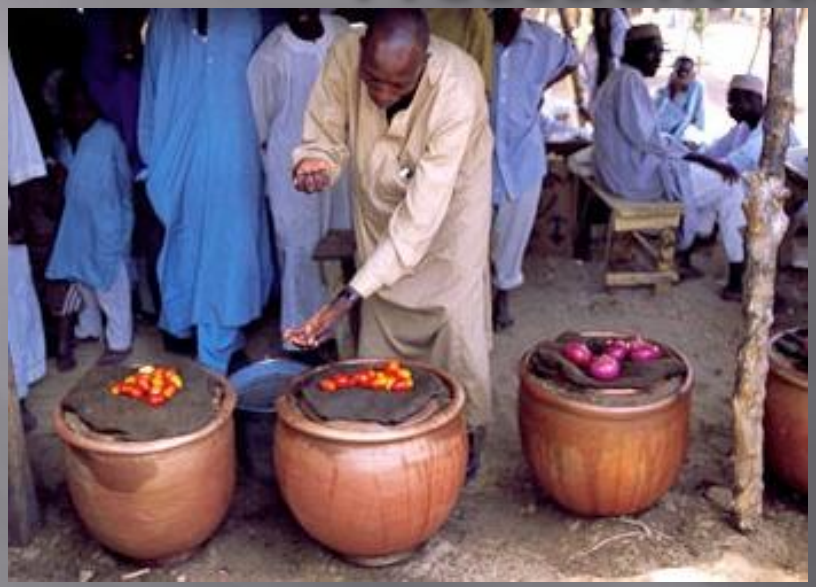
Progress:
Precedent Research



Zeer Pot System

Static Cooling System

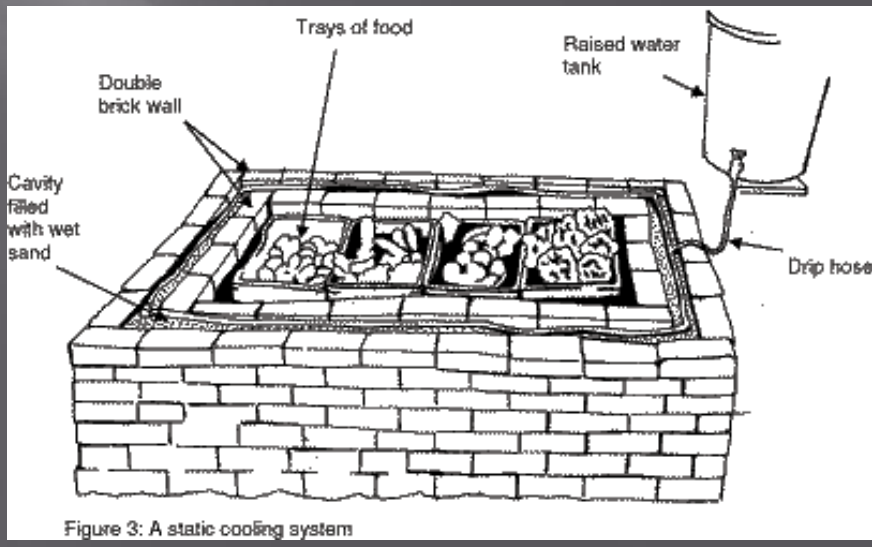


Figure 3: A static cooling system

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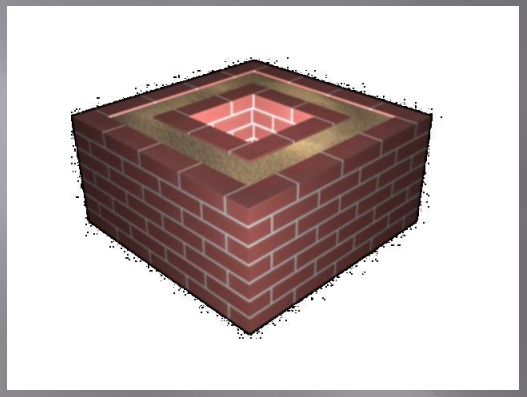
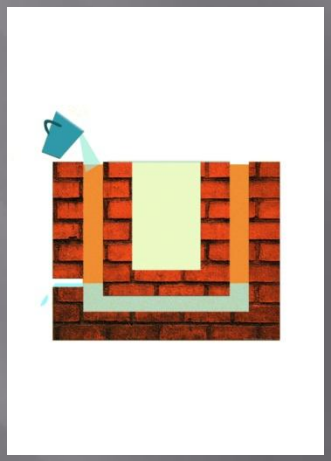
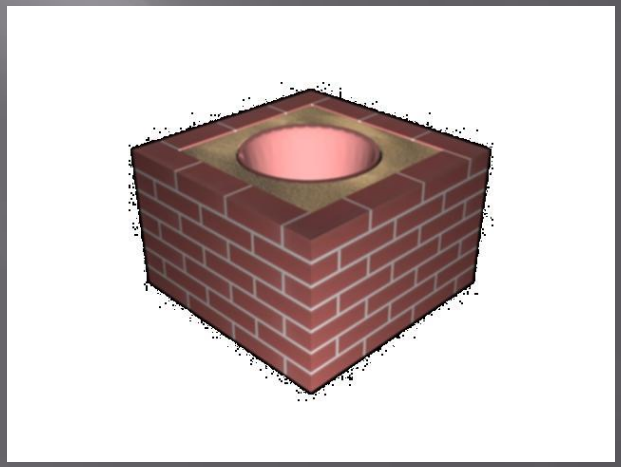
Progress:
Past Semesters Precedents



Brick 'N' Brick

Pot 'N' Pot





Pot 'N' Brick

Three systems' efficiencies were tested against one another

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Progress:
This Semester

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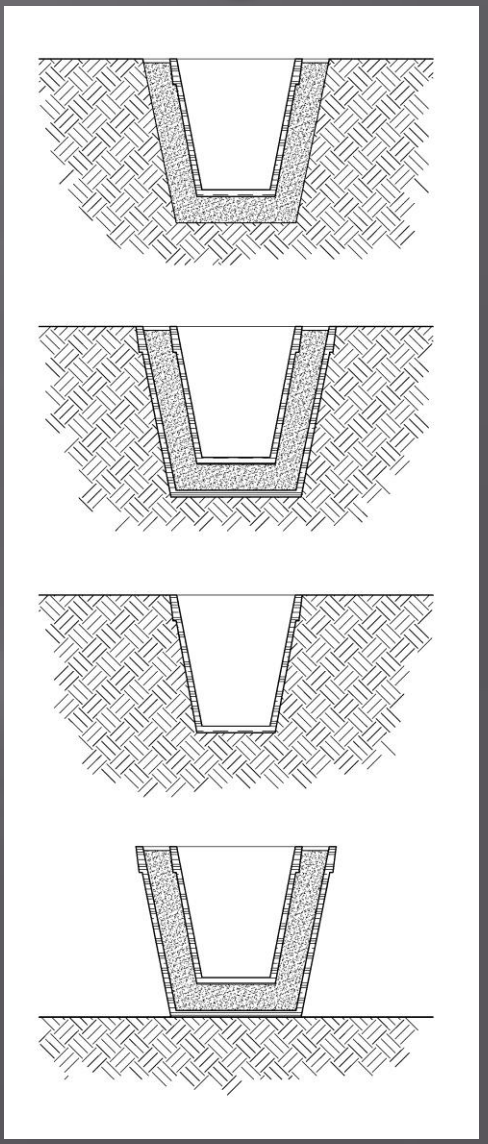
Progress:
In-Ground Testing

Pot (In Sand)
Variable: Ground temp + substrate

Pot-In-Pot (In Ground)
Variable: Ground temp + evaporation

Pot (In Soil)
Variable: Ground temp + substrate

Pot-In-Pot (Above Ground)
Control: Traditional Zeer-Pot design



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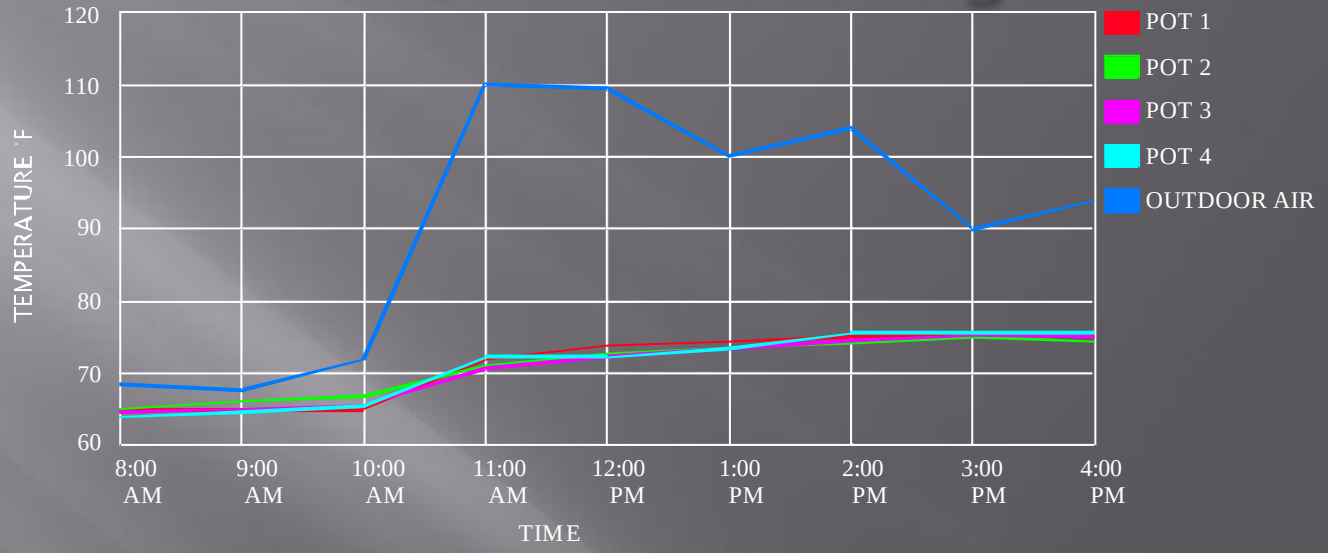
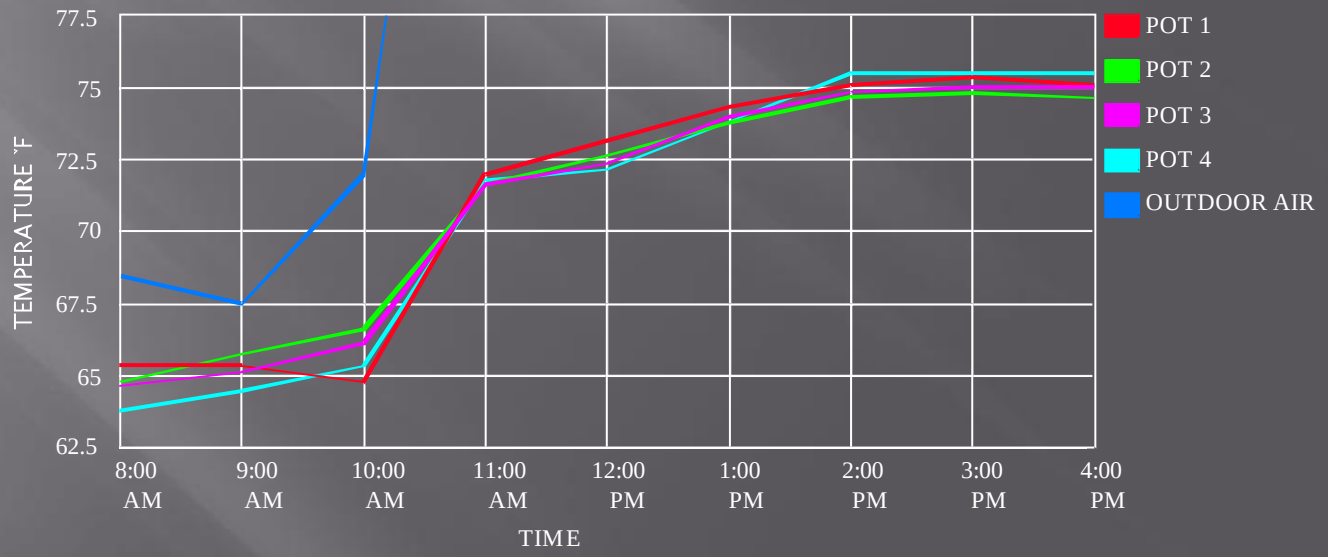
Progress:
In-Ground Testing





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Progress:
Connections & Funding

- Start Researching Possible Connections with Other Organizations
- Start Contacting Potential Connections
- Start Researching Possible Sources of Funding

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Continuation Plan:
The Rest of This Semester

- Research:
  - Potential Implementation Site Locations
  - Potential Funding Options
  - Connections with Other Organizations
- Design:
  - Lids
- Testing:
  - Lids
  - Fruit Storage Duration
- Analysis:
  - All Test Results
  - Recommendation on Most Efficient Design
- Manual:
  - Modify & Translate

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Obstacles & Resolutions

- Problem: Climate Differences Between Chicago & Peru
  - Temperature
  - Rainfall
- Resolution: Relocating Testing to Indoors

- Problem: Locating Previous Semesters' Work
- Resolution: Increase Communication with Members from Previous Semesters

- Problem: Variance in Testing Results
- Resolution: Establish a Baseline

- Problem: Stolen Equipment
- Resolution: Replace Equipment and Restart Testing

Anticipated Challenges

- Challenge: Controlling Temperature Inside Testing Enclosure
- Alternative: Measure Results over a Range of Temperatures & Note Differences in Results

- Challenge: Finding Connections and Funding
- Alternative: Personal & Group Fundraising

- Challenge: Communicating with Target Region
- Alternative: Obtain Knowledge to be Able to Operate Independently

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Questions/Comments?