Introduction

South Texas Advancement Resource (STAR) presented us with a project to provide a design for vegetable production on a pilot plot of their 200-acre farm located on the East Slator Ranch.

The pilot plot is a 5-acre development on the farm designated to create a rural garden. The rural garden includes high tunnels and a 4.5-acre traditionally irrigated garden area.

The project consists of three main parts: crop selection, the design of an irrigation system, and the design of the garden layout.

Design Objectives

❖ Crop Selection: select suitable plants based on soil type and extreme weather conditions (semi-arid region), and create a rotation plan to take advantage of the growing seasons and maximize production.
❖ Garden Layout: consider wind and weather data to determine the best place to plant the crops, and incorporate the use of high tunnels.
❖ Irrigation System: create a system that maximizes efficiency and reduces evaporation and runoff.

Crop Selection

Beets - Mint - Eggplants - Cucumber
Selected based on chance of survival in the area’s extreme weather conditions and soil type (USDA Hardiness Zone 9). Crop coefficients $\approx 1$ to reduce evapotranspiration loses.

Crop Rotation Plan and Water Requirements

Gardens Specifications

High Tunnel Garden

- Produces 210 plants per high tunnel per season
- Row width: 24 in
- Space between rows: 30 in
- Plant spacing: 24 in
- 6 rows of main crop (eggplant or cucumber) per high tunnel

Traditional Garden

- Produces 42,656 beets and 22,344 mint plants per season
- Row width: 1 ft
- Space between rows: 2 ft
- 86 rows of beets total, 48 rows of mint total
- Plant spacing: 1 ft

Irrigation System

Drip Irrigation

❖ Drip irrigation selected to minimize evaporation and runoff
❖ Affordable & removable drip tape for design flexibility
❖ Smart control system to easily make changes to and monitor irrigation method
❖ Fertigation allows for precise control

Rural Garden in a Food Desert

Innovative Farming Solutions
Ana Chen Reyes - Jacy Gray - Madison Hodges
BAEN 480 - Capstone Project

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Costs & Benefits

The project is feasible

<table>
<thead>
<tr>
<th>Section</th>
<th>Capital Cost</th>
<th>Operating Fixed &amp; Variable Costs</th>
<th>Total Costs</th>
<th>Projected Revenue</th>
<th>Deficit</th>
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<tbody>
<tr>
<td>Crop Management</td>
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Assuming 50% of the crops make it to the market with a 50% margin on price