PSU Orchard Irrigation

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INTRODUCTION

- Purpose:
  - To make an irrigation system that is powered by solar energy
- Scale:
  - 1/8 of an acre
  - Use for dry season only- June through September (~18 weeks)
  - 30 fruit trees of various species
- Plan:
  - Use a rainwater catchment system with a solenoid valve to pump rainwater through piped channels to irrigate fruit trees.
  - Channels are half pipe PVC
  - Solenoid valve set on timer, powered by a solar panel.
  - System must be removable per ODOT requirements
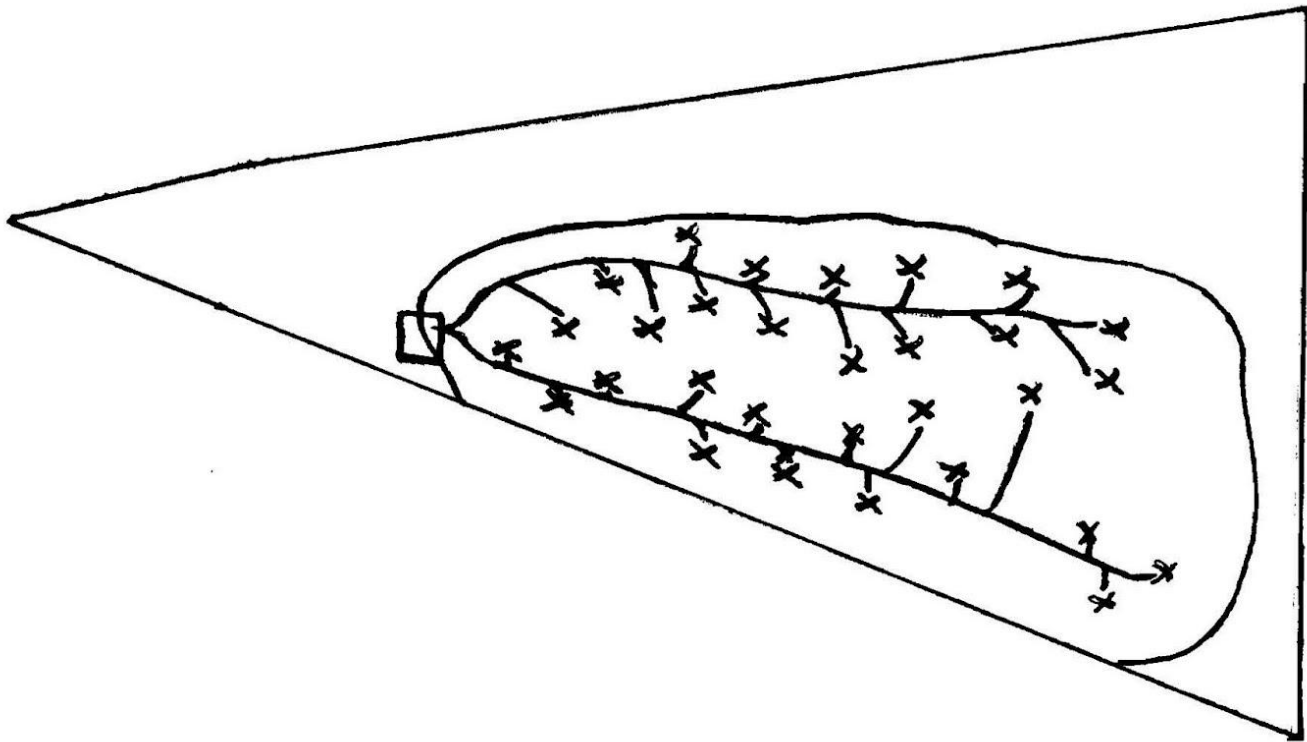
WELCOME TO THE PSU ORCHARD!
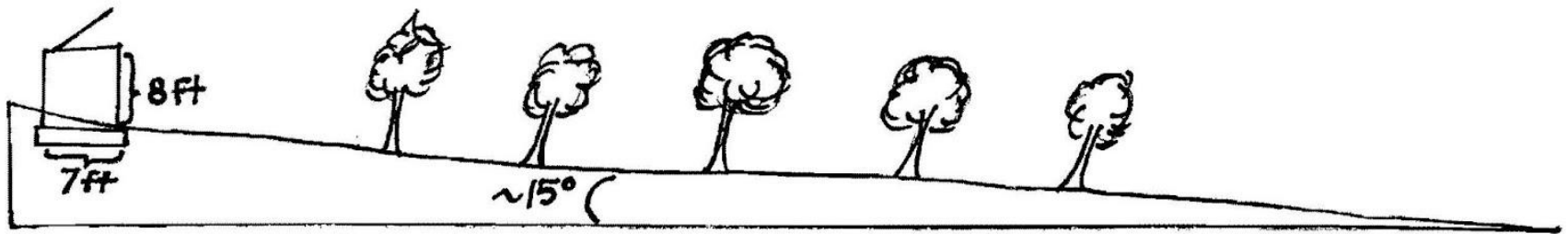
AERIAL VIEW OF THE ORCHARD

Facing North

Facing South

IRRIGATION MAP

SLOPE DIAGRAM

CALCULATIONS

- Water Needs: During dry season (June-September) each tree needs about 4-6 gallons of water per week.
    - 6 gallons x 30 trees x 18 weeks = 3240 gallons of water
- Water catchment system:
    - Maximum structure size feasible: 7' by 7' (49 square feet)
    - 1 inch rainfall per square foot = .623 gallons

    - Average rainfall in Portland (October - May): 31.38 inches
    - Potential rain capture from 1 square foot (October - May): 19.54 gallons
    - **Projected rain capture during non-summer months: 957.46 gallons**

    - Average rainfall in Portland (June - September): 4.53 inches
    - Potential rain capture from 1 square foot: 2.82 gallons
    - **Additional rainwater capture during summer months: 138.18 gallons**

CALCULATIONS

- Water catchment (cont'd):
  - Wettest potential rain capture for year: 2,052.6 gallons
  - Tank need range: 1000-2000 gallons
    - Chosen tank: 1500 gallons

- Solar Panel:
  - Timer: Battery powered, 9V
  - Solenoid valve: <10 watt
  - Solar Panel: needs to produce at least 10 watts
  - Angle: 56 degrees

- Water valve:
  - 6 gallons a week per tree = .85 gallons per day per tree
  - Total gallons per day = 25.5 gallons
  - Flow = dependent on tank volume, trial/error for timing

CALCULATIONS

- Structure:
  - Tank dimensions: 80" (~6.7') diameter, 70" (~5.9') height
  - Height off the ground: 1.5'
  - Structure height at highest point: 8.5'
  - Structure height at lowest point: 8'
  - Dimensions: 7' length x 7' width
  - Platform: 1' height
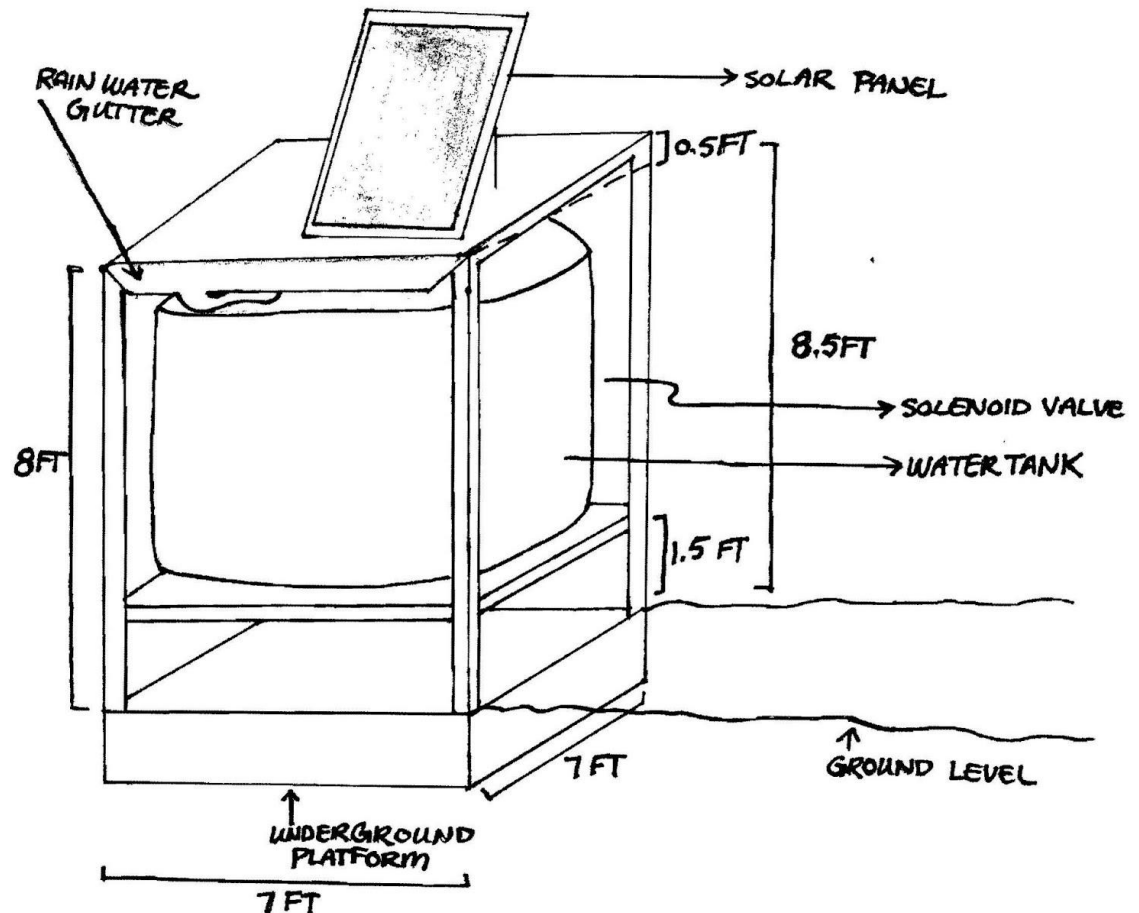
COST OF MATERIALS

Description	Cost
1500 Gallon Tank	$1,994.99
15 Watt Solar Panel Kit	$ 94.95
Solenoid Pump	$ 98.55
Coil Connector	$ 30.75
Timer	$ 84.04
Gutter system	$ 50.00
Structure	$ 200.00
Channel piping (2" PVC)	$ 161.00
Miscellaneous	$ 50.00
Total cost	$2,764.28

Conclusions

- Amount of rainfall and size of structure possible, being fully dependant on rain water irrigation is impossible.

- Project will be used to lessen the need for hand watering, protect orchard from drought.

- Secondary proposal: use shed in community garden as a secondary rain capture site.

- Someone would need to check water volume twice a month.

- Project is feasible under grants made to student sustainability projects.