Economic Gardening and Irrigation

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INTRODUCTION

The world is striding toward a water crisis, leaving many low-income families without an affordable source of healthy food(figure 1). Many solutions for making healthy foods accessible have been considered, but in a complex society, this is a long process.

Other groups have considered making it easier for individuals to grow/source their own food, including healthy greens. Cost, maintenance, and space are important factors.

This research project studies the effectiveness of an inexpensive way to build an irrigation system that could be used indoors or in a small space.

The goal of this experiment is to take the first steps into creating a better way to help people get fresh vegetables on the table.

(Figure 1) Leafy greens

RESEARCH METHODOLOGIES

Creating the irrigation system:

The watering system was designed around the idea of simplicity so only basic materials were used. ¼" external diameter ⅛" internal diameter rubber hose was punctured at 0.5"-1.5" intervals with a pin of 1/32" diameter.

Two bottles used were standard Crystal Geyser Sparkling Mineral Water bottles. These bottles were chosen for having a more useful geometry for attaching to a hose, and for the rigidity of the bottle itself.

Testing of the irrigation system:

A tube 2 feet in length was attached to Bottle A (the feeder) of 8oz (240ml) volume. Bottle A was suspended directly above the tubing. The tubing was placed in Bottle B (the recipient) to collect the water. The water was poured out every half hour and measured.

Data and Findings

This data (figure 3) demonstrates that the amount of water accumulating in bottle B (the recipient) is indeed dependant on the number of holes in the tube.

Water output in the tube with 32 holes is about 4 mL per hour. We predict bottle A (the feeder) would drain in 60 hours.

Water output In the tube with 44 holes is more variable, averaging about 56 mL per hour. We observed bottle A emptied in just 4 hours.

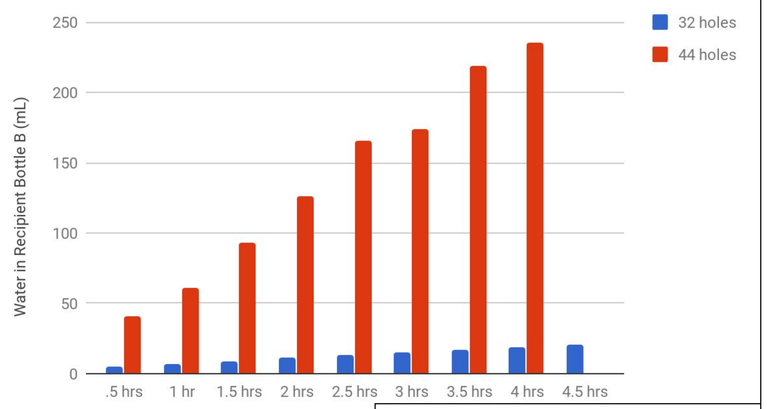


Figure 3

This is a graph of water output of two different tubes with differing numbers of holes. The blue is with 32 holes; the red is with 44 holes. Readings were taken every 30 minutes.

Cost

In the cost aspect of this project the materials for a large garden totalled at around $20 which is similar to a small professional system that is pre-assembled. The area that can be covered by $20 of materials is much larger and on the order of 10 square feet.

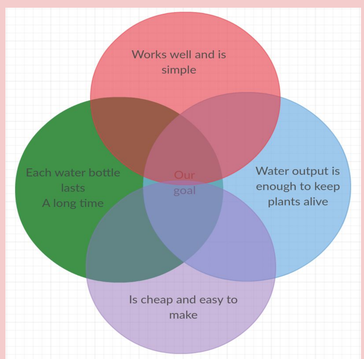
This shows us that the system is both effective in its purpose, but is also cost effective after set up.

This opens up a whole new set of experiments revolving around placement of the holes and how to maximize water output. This data suggests that somewhere between 32 and 44 holes is a reasonable starting place to optimize duration and output of the feeder water bottle.

DISCUSSION, ANALYSIS, AND EVALUATION

Variable for the experiment

The variable in this experiment is the amount of holes in the tube itself. An increase in the number of holes will increase water output per minute but decrease overall water bottle life. Balancing bottle life and water output is important for creating something that functionally fulfills the role of an irrigation system.



(Figure 2)
A store-bought drip system.

CONCLUSIONS

After analyzing the results of the tests, it was clear that this system left room for some improvements and refinement, but It is still considerably cheaper than a store bought drip system.

Next Step:

The next steps to this project would be setting up multiple variables for the desired plants. A chart would allow a maker to customize their system with little effort. Although we only tested a few variations of the system, the few small changes we made had huge effects, which suggests that this system is incredibly versatile.

Some of these variations would be focused on clusters of holes around the plant roots, increased water bottle size, and even different styles of tubing.

Implications:

The implications of this project are that there is indeed a future in homemade watering systems. It very well may be the next step in getting food to those who need it.

ACKNOWLEDGEMENTS / REFERENCES

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