

Window Box Wheat Garden User Manual

High Tech High
Spring 2016



Developed by:
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Motivation

In the beginning of this project we were asked to make a machine that solves a problem or makes it easy to do something in the bread making process. We thought "Well sure you can make a grinder or stove but what are those worth without wheat?" Gardening is hard. That is why a majority of people buy their fruits and veggies at the store instead of growing them themselves. Through this project we looked into big bread corporations like Wonderbread and we learned that those breads are so much more unhealthy than a homemade, three ingredient loaf. One problem is that no one is growing their own wheat. We knew that there has to be an easier way to grow wheat. A way with no worries that your wheat will grow, so we decided that we had to find that easier way. We know how time consuming it can be water something by hand. Making sure there's an equal distribution of water. Our design will solve that problem. We made our wheat garden equipped with a semi automatic watering system. We thought the best way to make watering easy was to do the simplest action. Pour the water. Our garden makes it so all you do is pour two cups of water into a funnel and then the soaker hose attached to the funnel will distribute all of the water evenly among the wheat plants. Our design purpose is to make growing wheat easy. We hope our design will make it possible for even the busiest person living in a studio apartment to grow wheat.

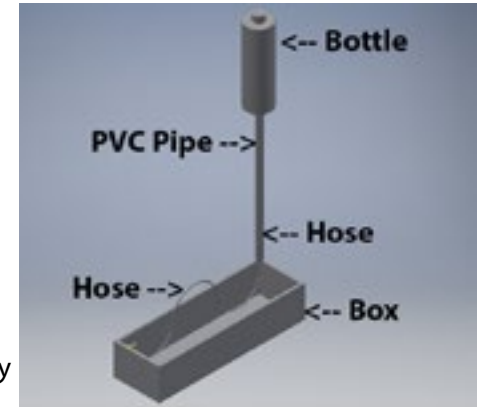


Design

Our machine is just a planter box with a PVC pipe to hold up a funnel and the soaker hose, which is laid out in the box. The machine can be made in a day with 1 or 2 people. The wheat garden can water the plants easier and slower, with no need for supervision if the water is spread out evenly.

A. The Wheat Garden

The garden has a custom cut wood block, which fits into a corner of the box. It is screwed into the box and has a hole for the PVC pipe to fit in tightly. The funnel has the soaker hose securely attached to the small, thin point. The funnel is strapped to the pipe and the soaker hose is spread out evenly among the box, which has a layer of dirt first. After covering it with more dirt, the seeds are added.

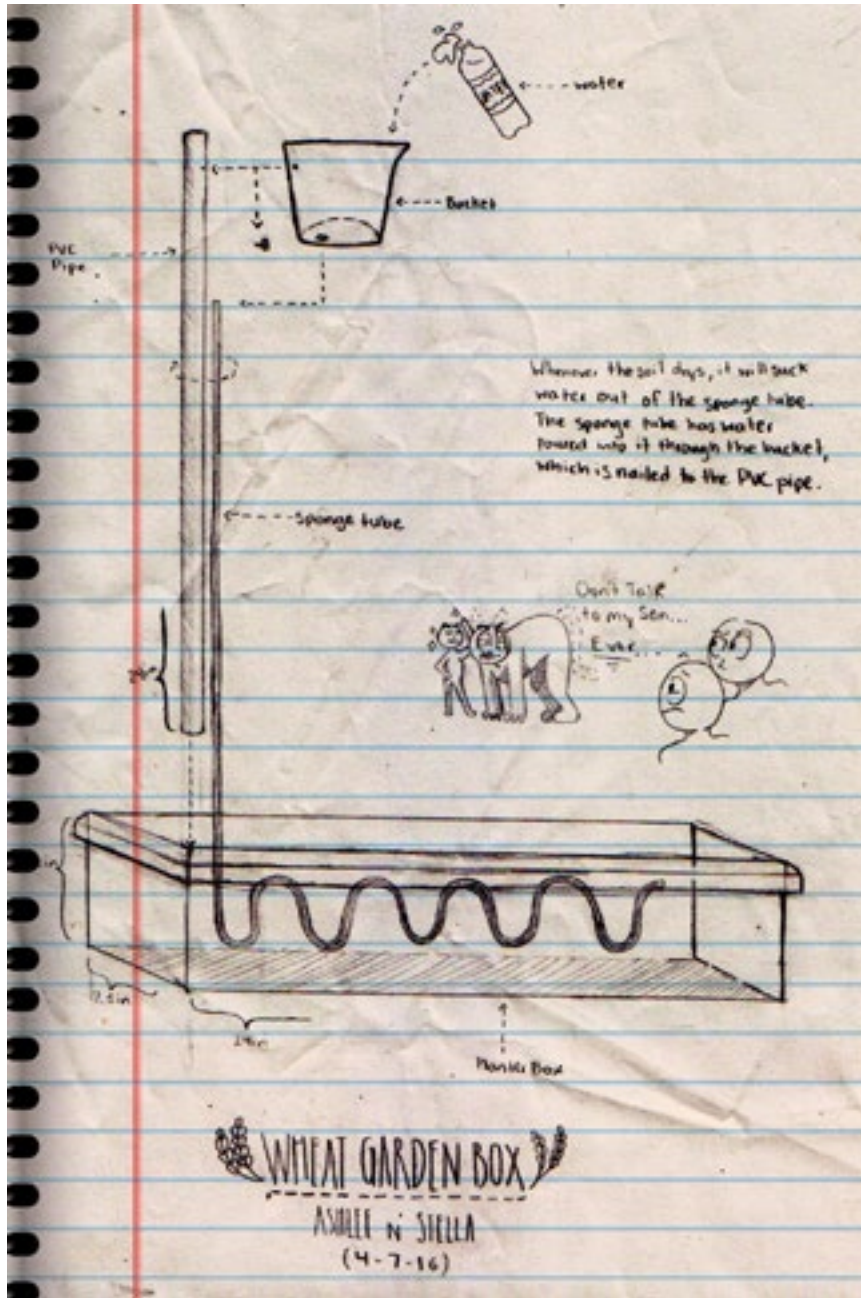


This is a model for the window box garden made to grow wheat.

B. Design Process

In early stages of our wheat garden, we planned for it to have a fancy watering system. A water pump would pump water from the water tank at the bottom of the wheat garden up the inverted waterfall (a tube that would carry the water up to the sprinklers). A timer would be connected to a switch and at a certain time, the switch to be flipped and would turn on the water pump so the inverted waterfall becomes active. The inverted waterfall would run for one minute before the timer flips the switch off shutting it down. When water reaches the top of the inverted waterfall it runs through a top PVC pipe and falls into the sprinklers that are drilled into the pipe. The sprinklers would be spaced evenly across the top pipe so each area of wheat gets watered evenly. The poles holding the sprinklers up would be adjustable, making the height able to increase with the growth of the wheat. Hard Red Wheat grows to four feet so we made our poles a bit higher than the expected height of the wheat. After explaining this to people at Ace Hardware, they told us our idea wouldn't function. They

suggested to use a soaker hose. We decided to trust them and bought a soaker hose. Our new design has a soaker hose attached to a funnel, which goes down a PVC pipe into the planter box.



Wheat Garden CAD Design (Done by Joel)



Planter Box:

The planter box is 2 feet long and 5 ½ inches tall and 7 ½ inches wide. It is where the soil and soaker hose will be placed. The PVC pipe will be attached to the tank. This is the base of garden.



PVC Pipe:

The PVC Pipe holds the bottle and soaker hose up. It gives the water from the bottle enough leverage to travel through the soaker hose.



Bottle:

The bottle is connected to the soaker hose. The bottle transports the water into the soaker hose slowly and safely.



Soaker Hose:

The soaker hose is the gem of the garden. The hose slowly gives water to the dry soil.

User Instructions

Congratulations! If you're reading this, that means you have your very own window box wheat garden! Aren't you lucky! Now the real fine and dandy aspect of the window box garden is that you don't have to worry that much about watering because all you have to do is pour two cups of water into the bottle and your wheat is watered. I mean do you know how healthy growing your own wheat is and now you can do it with minimal effort!

Planting Your Wheat

To plant your wheat in the window box wheat garden, you just have to follow these simple steps.

- Get around 100 wheat seeds (That's about how many the planter box can hold.)
- Make sure you plant your wheat before the third week of April. When planting your wheat you must plant it 1-2 inches into the dirt.

Pro Tips

- Make sure you place your planter box in a place where the wheat can get at least 6 hours of sunlight.
- It is also important to not let your wheat get too hot or too cold (keep your wheat between 70 and 75 degrees fahrenheit).
- Make sure not to overwater your wheat or the wheat will contract diseases.

Watering Your Wheat

One of the biggest problems when it comes to growing your own wheat is the watering but the Window Box Wheat Garden will raise your chances of keeping your wheat alive. Here are some ways the Window Box Wheat Garden helps water your plants.

- A common problem when watering a plant is sometimes you miss part of your crops and only some of your plants grow. It's hard to water in hard to reach places. Not with the Window Box Wheat Garden! The thing that makes this garden so special is the soaker

hose that's essential to the design. All you have to do is add two cups of water a day to the bottle and the water will be carried through the soaker hose and dispersed evenly among all of your wheat.

- Another problem is you forget to water your wheat. Everyone does it but with the Window Box Wheat Garden there's actually multiple reasons that this problem is invalid.
- It's very easy to water your wheat garden and it only takes a few seconds to fill a cup and pour it into a bottle unlike the traditional way of watering that is time consuming. Because of the time efficiency people are less likely to not be able to water their wheat because of busyness.
- Because of the soaker hose element, instead of just watering the crop, the roots suck everything up very quickly, some water even stays in the soaker hose which stretches out the amount of time the wheat is being watered so the wheat can go longer between waterings without dying.
- If you're going on a vacation you don't need to get someone to water the wheat everyday, we know it's ideal to water the wheat everyday but your wheat can go up to four days without watering.
- Lastly, the watering system only uses gravity to water your plants. This means there's no chance of it short circuiting or catching on fire. Also you don't need to place your windowbox near an outlet.

Well there you have it, everything you need to know to have successful wheat growth with your very own Window Box Window Garden! Have fun and enjoy your home grown wheat.



Testing and Calculations

Wheat Growing Necessities

- Wheat seeds need to be planted by the third week of April
- Wheat seeds should be planted 1 to 2 inches deep
- Wheatlings should have at least 6 hours of sunlight each day
- The wheat should have a growing temperature between 70 and 75 degrees fahrenheit
- They cannot be over watered because it can contract diseases
- The wheat seeds, once planted, should be over with about 5 centimeters of dirt
- Our wheat is dominant and will overpower other plants
- The wheat should take about 120 days till harvest
- The wheat should have around 2 cups of water a day
- The wheat seeds can be scattered when planted as there is no official way to spread them out

Testing the Soaker Hose

We first cut a hole in the bottom of a big soda bottle and then we cut a piece of the soaker hose from the coil and taped it to the hole in the bottle. We used a lot of tape. Then we took it outside to test it out but when we poured the water in, the hole started leaking and the bottom of the soaker hose was spilling out. We forgot to close it up so we just taped it. It still leaked a lot.



The next day, we melted the bottom of the soaker hose to close it, then we used hot glue to keep the area around the hole closed. When we went outside and tested it, the water was dripping out of the soaker hose, but it was happening too fast.



We want to get a new bottle because our current one has holes all over. We decided to drill a hole through the cap and put our soaker hose in that way because the cap is strong while the bottom of the bottle is flimsy and easy to make holes. So once we drilled the hole in the cap and got the soaker hose in we sealed the top of the soaker hose so the water would drain slower and we poked holes in the side of the hose. We filled the area inside the cap around the soaker hose with hot glue to seal leaks but then the cap wouldn't screw into the bottle because the glue was in the way. And it wouldn't screw all the way so there were a lot of leaks so we hot glued the cap to the bottle so there wouldn't be leak. But then none of the water was getting out because the holes we poked in the hose weren't big enough so we had to take all of the glue off the bottle so we could unscrew the cap. Then we made a bigger hole and then glued it back up and then it drained the water perfectly. The hose drained all the water in 2 minutes and 10 seconds.

Appendix: The Treacherous Wood Piece & Its Tyranny

Day 1:

We started by measuring a hole the size of the PVC Pipe onto a wood piece, we also figured out how far it should be from the edges of the wood.



Day 2:

When we cut the hole, we had thought it would be big enough but it actually wasn't. We ended up having to file the hole.



Day 3:

We made it fit



Day 4:

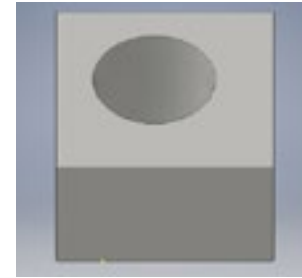
So we were cutting an angle on one side to fit the slanted sides of the planter box, but we filed the wrong side.



The Week After-

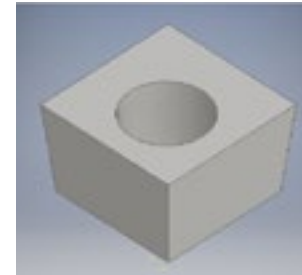
Day 1:

The wood piece has cracked. Time to make a CAD Model. We got the measurements and the hole done.



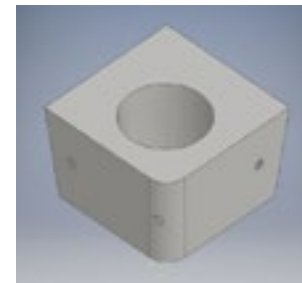
Day 2:

The angles for the wood piece replica are in progress.



Day 3:

Done. With the angles, holes, curved edge, and everything. Now we need to print it.



The Wheat Growth

Day 1:

Our teacher told the people who wanted to grow wheat to plant the seeds in the boxes we made for our first project.



Days later...

Yeah we got sprouts, we can hook you up too.



Weeks later...

Mwahaha! Our wheat garden is complete. Gaze at its completion.



Lesson Learned/Future Development

Our final product ended up being amazing. Trying to place the PVC pipe in the planter box securely was harder than expected. But after 2 weeks, we figured out a way that makes it work. In the future, the way to attach the PVC pipe to the planter box should be done first. The measurements of the corner of the box should be precise when cut on the wood piece. We also suggest waiting for the garden to finish being ready before adding the seeds. Also, put a weight next to the PVC pipe to keep it from falling over. And to slow down the drip rate, hot glue both openings, and the side going in through the funnel should have a small hole pierced in it.

