

ANNOORBOTS

GROWING THE POTAYTO-
POTAHTO, (*A ROOT-
VEGETABLE*) IN SPACE

TEAM #18098

BACKGROUND

How did the Team decided on this Topic?

- Every member of the team did a research and during discussion of everyone's research, the question of planting food in space and other topics came up.
- There was then a question, WHAT WILL YOU LIKE TO PLANT IN SPACE? Majority of the members then replied POTATOES ...!!!

Potayto-Potahto- Background



The potato is in a family called the deadly nightshades, but only some parts are deadly

The potato is a tuber and the tuber is not the part that contains the neurotoxin called **Glycoalkaloid**.

The part of the potato that has poison is the fruit (yes potato fruit), and the leaves. But we eat the tuber

Inside these fruits are what's known as 'true potato seeds' which are the actual seeds of a potato



Growing your potatoes



To grow a potato it ***takes around 1-3 weeks to see the potato plant start to emerge***, and **16-17 weeks** for it to be ready to harvest

For watering a potato it is ***best to use a soak hose*** to spray water directly in the ground *instead of using a sprinkler* or watering can

If using a seed potato make sure that the tuber is not exposed to the sun or it will not be good.

- ***What size container is needed to grow potatoes?***
A 10 liter container is good.
- ***What soil do potatoes grow in best?***
Well drained, light, deep, and loose soil. Regard that you need heavy soil in space.
- ***How much light does a potato need?***
A potato needs at least six hours of sunlight.

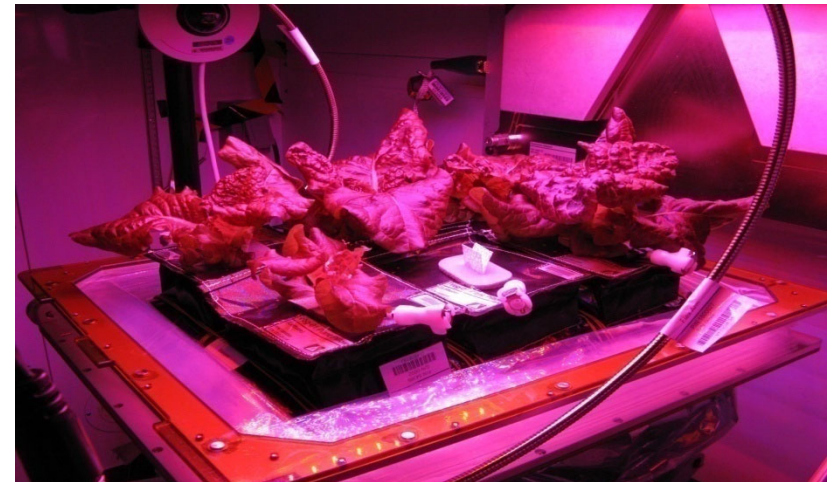
EXAMPLES OF PLANTING IN SPACE:



These astronauts are planting vegetables under lights and sensors.



These vegetables are held down by bungee straps. There are lights around it.



They planted vegetables in a lab and use controlled tubes for putting water.

PROBLEM IDENTIFICATION

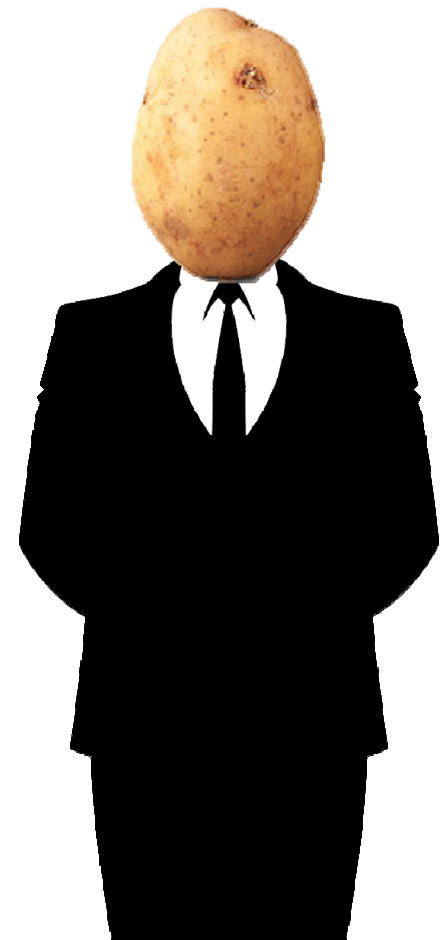
Though vegetables are grown on the International Space Station; we are yet to try *the all nutritious, the mighty starch* the potato.

Face it, this one little brown plant has nearly everything for long term stay in a not very fertile area. **So why hasn't been in space yet?**

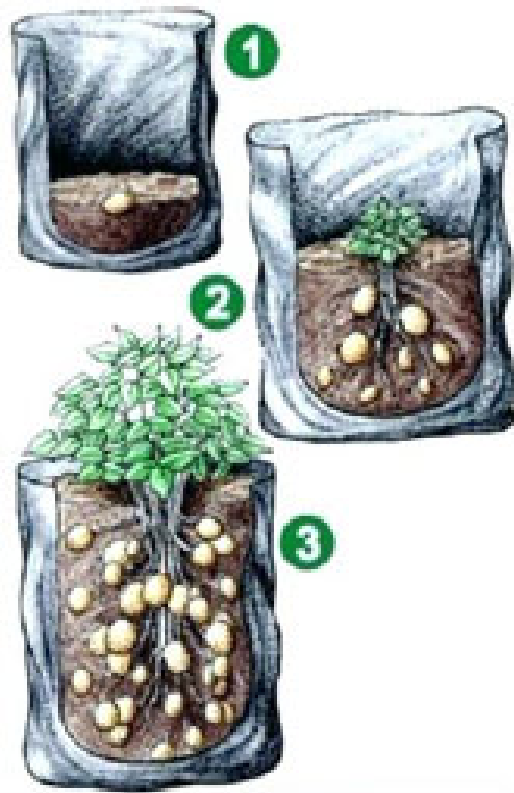
It's not like there will be crumbs, and we doubt it'll be any harder to pull it from the soil than it is on Earth.

However we see *the problem with trying to grow plants with long roots in space*. The setbacks of having messed up and have dirt flying around.

This and a few other reasons are why these little miracles from the Earth haven't found their way to space yet.



Growing and Harvesting Potatoes on Earth in Bags



HOW DO WE
DO THIS
EFFICIENTLY
IN SPACE
WHERE
THERE IS
ZERO-
GRAVITY?



THIS WHOLE PROCESS OF ADDING SOIL WHILE GROWING AND ALSO HARVESTING
WILL HAVE TO BE RE-ENGINEERED IN SPACE BECAUSE OF ZERO-G

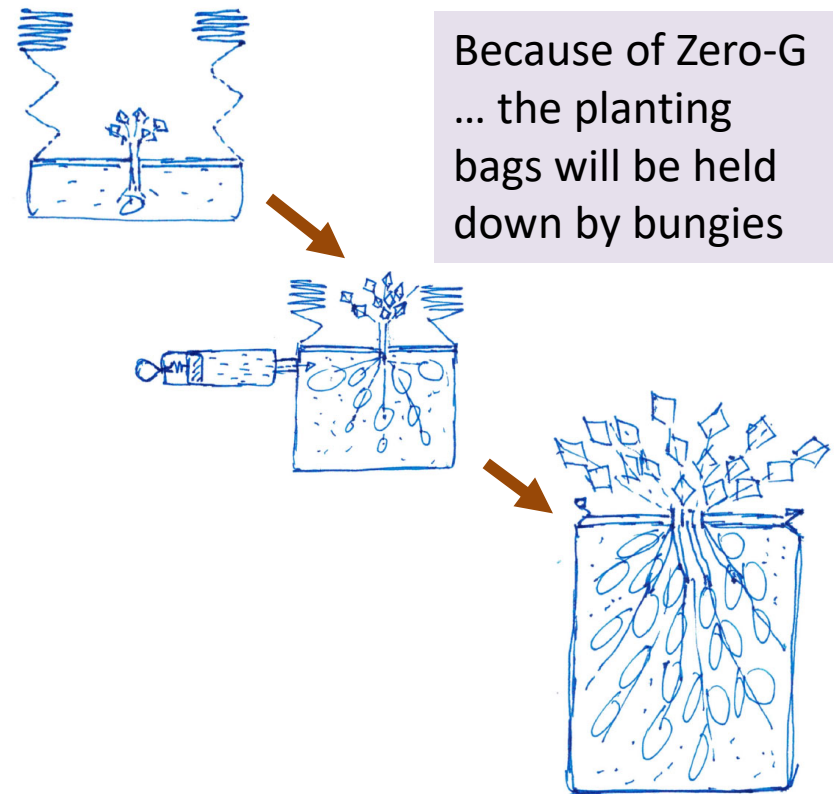
PROBLEM ANALYSIS

- Similar housing units with LED lights and sensors will be used to provide enough light (6 hours/day).
- The dirt or soil if escaped, could cause a multitude of problems in itself, hence it has to be sealed
- Potatoes have oddly long roots hence the bag will be extended during its growth and soil, water and nutrients added while the seal is still intact.
- When the potatoes are matured, a special harvesting chamber will be use to vacuum the soil (since everything will be floating).
- The potatoes will then be vacuumed through another exit and pressure washed with water to remove any further dirt or soil.

INNOVATIVE SOLUTION – GROWING THE POTATOES

- A 10-liter circular container that folds in, like a slinky, will be needed
- The container will be manually raised every once in a while to get as many potatoes as possible.
- A pump will be used to bring in soil every time the container rises.
- The soil will have nutrients and sponges to hold water
- ***A little bit of water through a tubing system will be used in a consistent fashion***, thus protecting it from growths that may develop if not given this water.

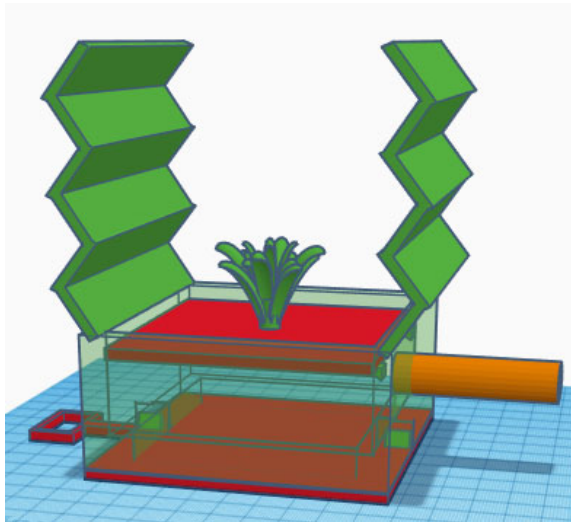
IMPLEMENTATION



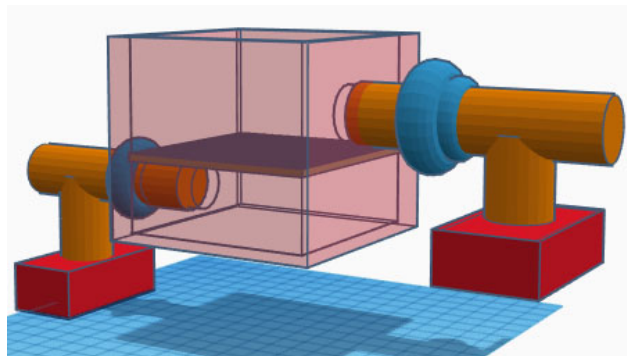
We will be using **3D software (TINKERCAD)** to design our growing and harvesting models for the potatoes

3D TINKERCAD IMPLEMENTATION

We will be using *3D software* (TINKERCAD) to design our growing and harvesting units models for the potatoes



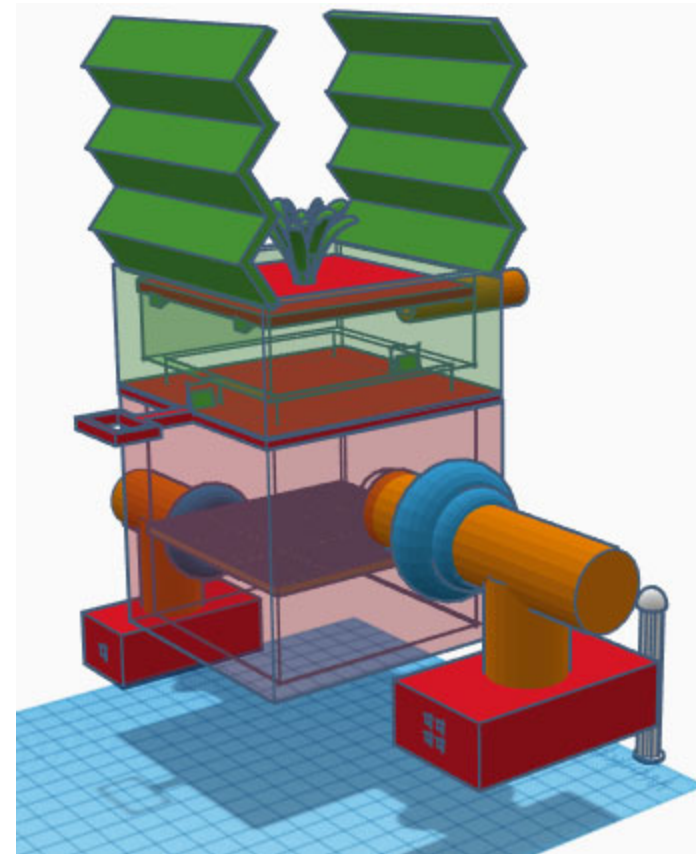
GROWER UNIT



HARVESTING UNIT



Combined
GROWER and
HARVESTING
Units

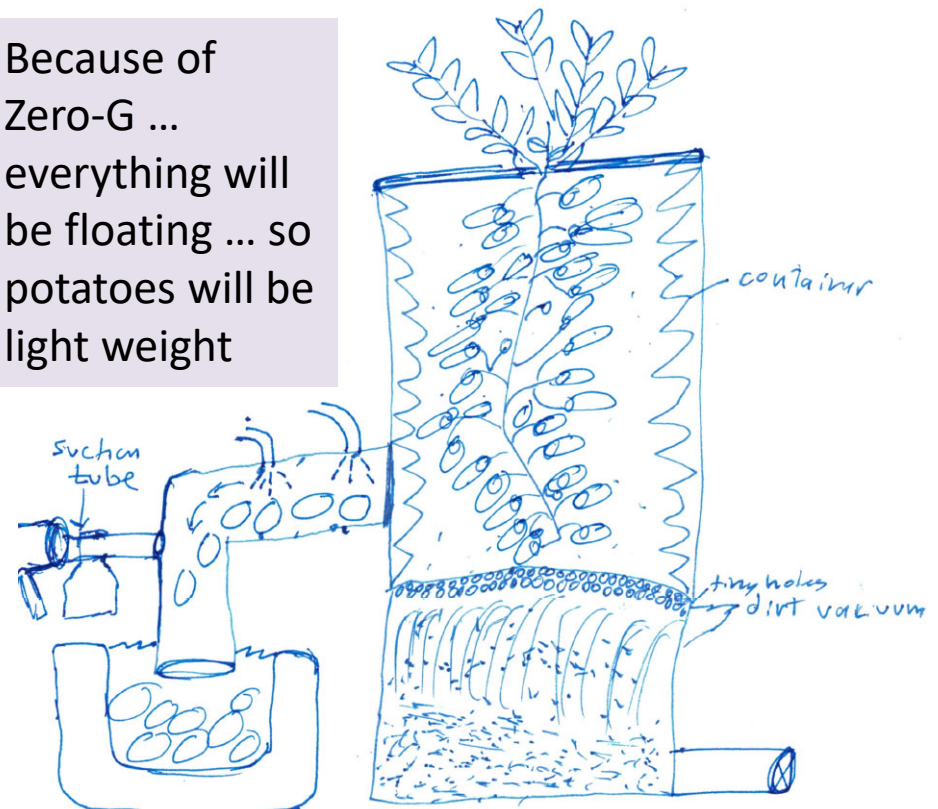


INNOVATIVE SOLUTION – HARVESTING THE POTATOES

- The matured potatoes in its original and now large slinky container will be moved into a *special harvesting chamber*.
- The bottom part will be opened up and there will be small holes at the bottom of the chamber for the dirt to be sucked through it.
- The container will have two vacuums, the first one will suck all the dirt through the bottom small holes.
- The second opening will be on the side of the harvesting chamber with bigger holes for potatoes to pass through.

IMPLEMENTATION

Because of Zero-G ... everything will be floating ... so potatoes will be light weight

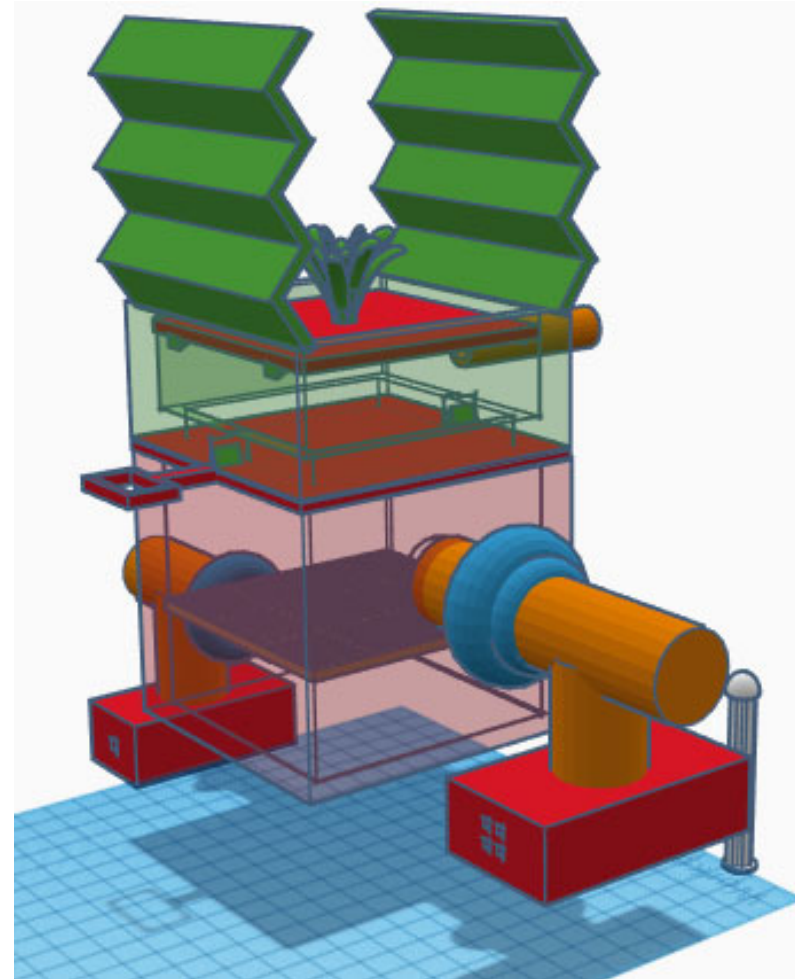


We will be using **3D software (TINKERCAD)** to design our growing and harvesting units for the potatoes

TEAM SOLUTION – HARVESTING THE POTATOES (cont.)

- When the soil(dirt) is all taken out, the first vacuum will be turned off.
- The second vacuum will then be use to pull the potatoes through the bigger openings on the side of the chamber. It will have high-pressure water jets, to clean the potatoes.
- The bag will have to be ripped off and secured in the harvesting chamber so it cannot be sucked out when the potatoes are being pulled out..
- Because of Zero-G ... everything will be floating ... so potatoes will be light weight

3D IMPLEMENTATION



COST & MANUFACTURING

Major Parts

- Durable elastic plastic bag
- Aluminum base
- See-through Plexiglass (for harvester)
- High-Powered Vacuum Pump

Actual Dimensions

Grower: 18 x 18 x 48 in. = 1.5 x 1.5 x 4 ft. at max

Harvester: 18 x 18 x 18 in. = 1.5 x 1.5 x 1.5 ft.

Manufacturing

This will be *custom manufactured* since it is not for mass production.

Cost Breakdown

- Elastic Plastic: \$200
- Pumps: \$400
- Aluminum building material: \$400
- Plexiglass: 100
- Sponge (etc.): \$50
- **Total Cost: \$1500**
(with manufacturing cost of \$350)

SHARING

The ***Museum Education Manager***, Mr. Joseph Vick, at the US Space & Rocket Center in Huntsville, Alabama.

Our school and community through our AnnoorBot website: <https://annoorrobotics.com/>

SOURCES OF INFORMATION

Nightshades(picture): <http://sylviahu99.wixsite.com/healthbeautyfitness/single-post/2015/06/01/Nightshade-Family>

Potato Fruit(picture): <http://www.lessnoise-moregreen.com/2015/06/potato-fruit.html>

Potato Plant(picture):

Growing Potato in a trash bag(picture):<http://roshaa.com/blog/the-superb-brownie-house-by-linebox-studio/>

Harvesting Bag Potatoes(picture): <https://www.youtube.com/watch?v=HM5-yLqoEM8>

Nightshades: <https://en.wikipedia.org/wiki/Solanaceae>

Potato Fruit: <https://www.cultivariable.com/potato-what-you-should-know-about-fruits-on-your-potato-plants/>

Veggie led lamps(picture): <https://www.spacestationexplorers.org/pi-profile/veggies-in-space-trent-smith/>

Veggie bungee straps(picture): <http://spaceref.com/international-space-station/nasa-space-station-on-orbit-status-12-march-2018---continued-work-with-veggie-03.html>

Veggie water tubes (picture):

https://www.nasa.gov/mission_pages/station/research/experiments/1294.html

TEAM MEMBERS

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