

# Event Horizon

A Space Out Presentation by  
Varun, Prompt, Joshua





# Problem Statement

- With a **large population** to feed, **food production** is ever more integral for survival. Exacerbated by the **limited space** available in a biodome, food production has a size-constraint which desperately needs a solution to combat.

Potential solution: Vertical farming and Cyanobacteria



# Assumptions

- Presence of the biodome means **oxygen generation is available**
- Oxygen generation means **electricity generation is available**
- Electricity generation means **manufacturing tools and power machines are available**
- Manufacturing tools and power machines means **mining ores and ice** is possible
- **Mining ores** achieves resources to build the farm
- **Mining ice** allows for water generation to sustain the farm



## Pros

- Less space required <sup>[1]</sup>
- Minimises water consumption <sup>[1]</sup>
- Conventional farming methods are not viable <sup>[2]</sup>



## Cons

- High sunk costs <sup>[3]</sup>
- High maintenance cost <sup>[3]</sup>
- Food variety is limited <sup>[4]</sup>



## Cons (cont'd)

- Sunk costs can be negated via steel manufacturing -> production costs are **immaterial**
- Maintenance cost boils down to artificial light (which should **already be present in a biodome**) and air conditioning (likewise)
- Food variety is a **non-issue** in light of world hunger



# Cyanobacteria

- Cyanobacteria, also known as blue-green algae, is an anaerobic bacteria, which can be used to as a food source, energy source, and also as a fertilizer for farming.
- Cyanobacteria was responsible for the great oxidation event, that filled the Earth's atmosphere with oxygen. Similar effect can be created on Mars, creating self-sufficient micro-biomes.



# Cyanobacteria (cont'd)

## Pros

- Can survive the harsh conditions of martian atmosphere, does not need protection of biodome <sup>[5]</sup>
- Very rich source of nutrients <sup>[6]</sup>
- Can be produced using minimal resources as biodomes are not necessary.

## Cons

- Not pleasing to consume

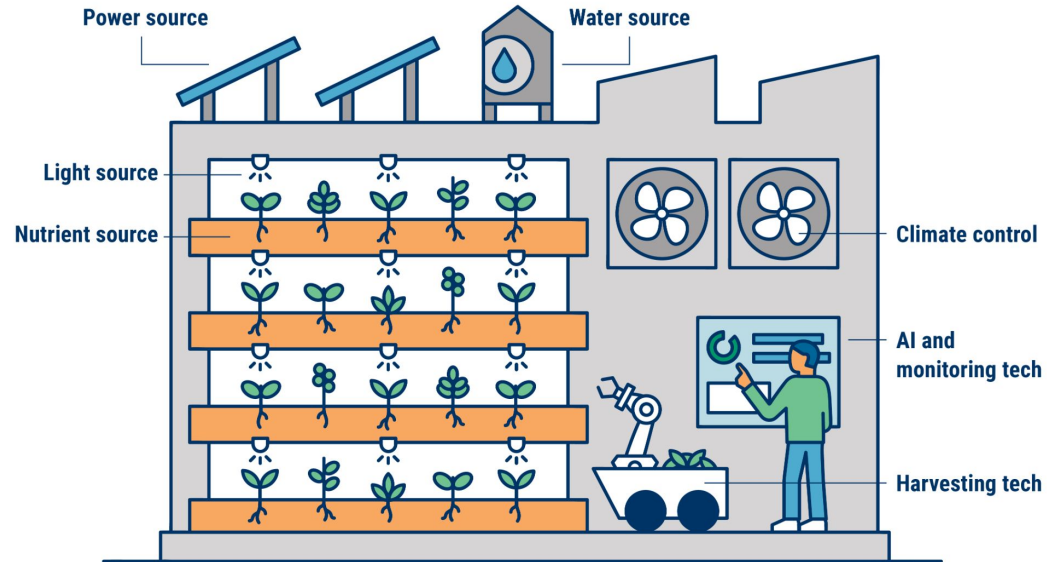




# Design



## Main components of a vertical farm





# Applying Artificial Intelligence & Automation

- Image processing / recognition <sup>[7]</sup>
  - Ensure plant is healthy and growing optimally
  - Determine harvestability of plant
- Using advanced robotics to transfer seedlings to farm beds <sup>[8]</sup>
- Lift to transfer farm beds to pallets
- Conveyor system to move pallets
- Automatic harvester to remove crops from farm beds <sup>[7]</sup>
- Final human interaction to prepare farm beds for future plants



# References

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- [6] Raechel Crane “Experts say algae is the food of the future. Here’s why.” [Experts say algae is the food of the future. Here’s why. \(cnn.com\)](#)
- [7] S. Birrell, J. Hughes, J. Y. Cai, and F. Iida, “A field-tested robotic harvesting system for iceberg lettuce,” *Journal of Field Robotics*, vol. 37, no. 2, pp. 225–245, 2019.
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Images from:

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