

Hydroponic Farming - Project Shortlist #1

Hydroponic Farming Right Now:

Hydroponic Farming is the process of growing crops using a water based solution rather than soil. It takes up less space, less water but is more expensive than traditional farming. While seawater couldn't be used itself as the solution that the crops grow in, it can be desalinated to be able to be used to grow the crops.

While this hasn't been tested in the ocean, in Spain, where 80% of the water supply is for agriculture, has tested the use of desalinated ocean water in hydroponics. "The implementation of a hydroponic system improved yield, water productivity and specific greenhouse gas emissions with respect to soil cultivation." There were differences in energy consumption and also greenhouse gas emissions, but Seawater Greenhouses in London were able to create a greenhouse that used seawater to cool greenhouse gases, to make water suitable for hydroponic farming. I don't know how it works, but it seems that it is a good idea.

Also, hydroponics (contrary to the name) uses as much as 80-90% less water than traditional farming. This is because the nutrients and water can be reused for the plants, making it more sustainable.

Aeroponics is another viable option, rather than having a plant's roots submerged in the nutrient rich water, it is sprayed and saves even more water (95%), and could be worked on instead as a subset of hydroponics.

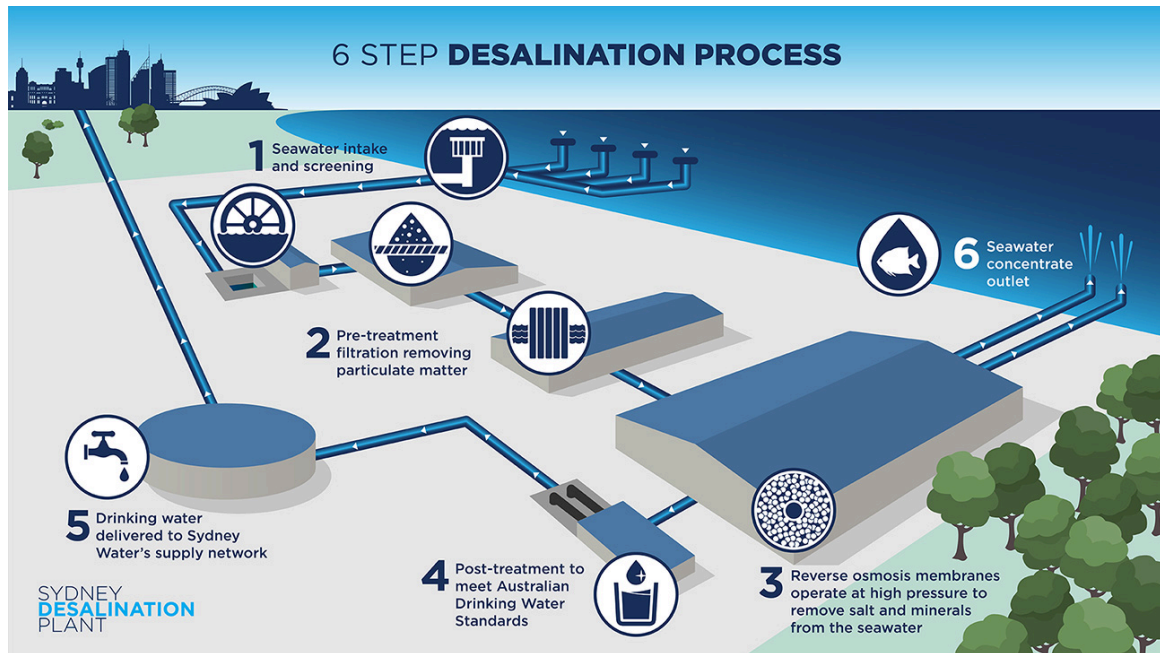
Hydroponic Farming in the Future:

Hydroponic Farming has the potential to be used, when correctly done, as an alternative to shipping food into drought-infested areas. These places might include in the Sahara Desert, or in Outback Australia. Hydroponic Farming also would be able to be used not just in underwater exploration, but for space exploration as well.

How can Hydroponic Farming be sustainable long term while on ships:

A barrier that makes hydroponic farming less sustainable is the amount of resources required. Especially out in the ocean, a desalination plant would need to be used to make it usable for farming, and desalination plants are very large. A way that we can propose for our project is to somehow make a desalination plant (outline key features, maybe go out to find IRL desalination plant to see the scale on which it needs to be done, then brainstorm and create a better, more efficient or smaller model that could go into ships and be used in hydroponic farming).

Parts of a Desalination Plant:



Tying to the Project Brief:

Only 5% of the ocean has been physically visited, and only 20% has been mapped by satellites on Google Maps and other devices. A barrier to expeditions to explore the oceans is longevity and self-sustainability, which can be overcome partially with the help of a reliable food and water source. Hydroponic farming is a way to do this as it can use the seawater that it is in, desalinate it for water or crops, and grow said crops to be able to eat while exploring. An alternative could include shipping supplies for food and water, but that would be inefficient with time, money and energy. This is because the supplies might be wasted on the voyage and might not work long term.

Other Links to use in future if picked:

<https://www.unisa.edu.au/media-centre/Releases/2023/floating-sea-farms-a--solution-to-feed-the-world-and-ensure-freshwater-by-2050/>

<https://www.mdpi.com/2073-4441/12/2/518>

<https://scholarexchange.furman.edu/scjas/2022/all/140/>

<https://www.nal.usda.gov/farms-and-agricultural-production-systems/hydroponics#:~:text=Hydroponics%20is%20the%20technique%20of,%2C%20hobbyists%2C%20and%20commercial%20enterprises.>

<https://thesaladtable.com.au/blogs/news/how-to-grow-a-sustainable-future-with-hydroponic-gardening#:~:text=Cultivating%20a%20Sustainable%20Future,and%20resilience%20against%20environmental%20challenges.>

<https://psci.princeton.edu/tips/2020/11/9/the-future-of-farming-hydroponics>

<https://www.grozone.com/2023/04/28/underwater-farming/>

<https://en.wikipedia.org/wiki/Hydroponics>

<https://axaxl.com/fast-fast-forward/articles/going-green-with-hydroponics#:~:text=1.-,Water%20Conservation,%2C%20soil%2Dbased%20farming%20methods.>

<https://www.saferbrand.com/articles/best-water-for-hydroponics#:~:text=Distilled,that's%20best%20for%20your%20garden.>

<https://airgarden.com.au/blogs/news/aeroponics-vs-hydroponics#:~:text=However%20when%20it%20comes%20to,aeroponics%20saves%20you%2095%25>