I. Abstract

We are trying to take co2 out of the air because it is polluting our planet. It is causing our earth to heat up faster than normal so that our icebergs are melting, we have more violent storms due to warmer oceans and more severe weather patterns causing a loss of habitat for humans and animals. We can't fix the damage done already but we can stop it from getting worse.

Our vision is to use renewable energy sources like solar panels and wind turbines to desalinate seawater. We would build hydroponic farms and use the fresh water to grow plants for food. The excess fresh water could be used for drinking, while the plants would also remove carbon dioxide through photosynthesis.

Green Farm

II. Description

1. Present Technology:

Our idea is to combine several technologies to create a “green” hydroponic farm. We propose to use wind and solar power to produce all the power needed to desalinate seawater, provide artificial light for photosynthesis, and run pumps. There is a ton of seawater in the world, which can be desalinated to make fresh water. By using solar and wind power to accomplish this, we are solely using renewable energy. Once you pay for the solar panels and wind turbines, the resources to power them are free and plentiful. We propose building a vertical farm to minimize land use.

All of the technologies to accomplish this project are available today (figure 1 and 2). Farming is common and the benefits of CO2 removal by growing plants is also known. The problem with farms is the need for large areas of reasonably flat land, which will decrease with population growth, and will not always be available. In addition, there are problems with irrigation for these plants. Desalination is currently not used for irrigation water.

Green Farm

Figure 1

Hydroponic farming exists, but it is only done in greenhouses on a small scale. We want to do vertical farming (see figures 2,5 and 6), recycling the water if possible. This will help the problem of shortage of land as large growing areas can be put in a small space.

Figure 2

Desalination exists and happens in a plant. It cleans out the salt from sea water. It makes fresh water that we can drink and use to water plants. There are several ways to desalinate water today. We plan to use reverse osmosis to produce the water needed.

Desalination increases the amount of fresh water but the process is expensive to do because it requires energy. Power outages can also cause issues with traditional energy methods. Wind turbines and solar panels will be used to produce the power required for desalination. The power could also be used for lighting the hydroponic farms. All of these technologies exist today. We envision combining these technologies.

A limitation in the desalination process is the amount of salt removed. About 450 pound of salt are in 1,000 gallons of seawater. It takes between 1 ½ and 2 ½ gallons of water to grow 1 plant. That means that unless we can filter, clean and reuse the water we can only grow about 500 plants for every 1,000 gallons. It also means that there is a lot of salt as a result of the desalination process.

2. History

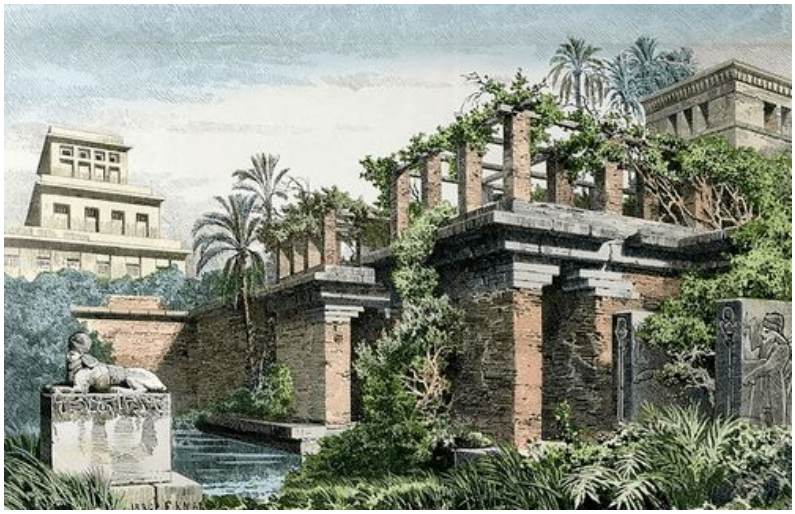

Figure 3

Hydroponic growing may be as far back as 600BC with the hanging gardens of Babylon (see figure 3). In 1000AD, the Aztecs had floating gardens. In the late 1200's, Marco Polo found floating gardens in China. In 1699, John Woodward discovered that plants derived minerals from soil mixed into water solutions. In 1930, the word Hydroponics was used by W.F Gerike. Many types of hydroponic growing were introduced and it has been used in commercial greenhouses as well as homes.

3. Future Technology

More research may improve this overall process and make it faster and more efficient. Also, researchers could look at using plants with greater CO2 absorption power.

There needs to be research into uses for the excess salt. We had the idea to make bricks out of the salt and use recycled plastic to cover the bricks so they would not dissolve. Then the bricks could be used for the construction of dwellings (see figure 4).

Figure 4

There is a lot of waste water called brine which is the concentrated salt water that is left over after desalination. A future technology could use this brine to make bath salts, shampoo, or other products people use.

The plants grown will provide food and the growing cycle will take CO2 out of the air. The CO2 in the atmosphere today measures about 413.51 parts per million as of 2020 testing. The overall earth has warmed by about 0.8 degrees Celsius since 1880, but two thirds of the warming has happened since 1975. We are now seeing a warming rate of 0.15 - 0.20 degrees Celsius per decade.

Trees in the Amazon which have been a main source of carbon dioxide removal have been burned or cut down. The amount of loss of forest just in 2019 was almost 2.3 million acres or approximately 460 million trees. The Amazon rainforest produces 52,000 pounds of oxygen per acre per year which is 119,600,000,000 pounds of oxygen robbed from the earth. That translates to 22,080,000,000 pounds of carbon removal per year since each tree takes about 48 pounds of CO2 out of the atmosphere every year.

4. Breakthroughs:

The process itself has several benefits such as fresh water and food. The unknown is how much CO2 is removed from the air by hydroponic growing. Experiments could be conducted using various types of plants to find the best combination of food value with maximum CO2 absorption ability. This could be done by putting a specific number of a type of plant in a sealed chamber and measuring the levels of CO2 at the beginning, during and at the end of the growing cycle. This is needed to achieve the maximum benefit from such a project.

Figure 5

Green Farm

Figure 6

Green Farm

5. Design Process

First we thought about making a drone that sprayed a special mist that took co2 out of the air and also put the fires out. This idea did not go on for long because we got stuck on how to build it.

Our next idea was with drones as well. Our idea was to make a drone that absorbed co2. The drone would turn the co2 into a solid. We had to move on from that idea because we did not know where to put the solid block. Our next idea left the drone out of the process and focused on growing trees. Trees take too long to mature and too much time to grow.

We decided that farming was a good option because Co2 is absorbed in soil, but land costs are high, irrigation costs are high and there are fresh water scarcities. Based on these issues we decided that hydroponic farming might achieve our vision if we could resolve a few issues. Our issues are, how much freshwater is needed, the very high cost, and environmental issues it creates. The environmental issues are water and energy use. Since seawater is unlimited, this could be a good solution if we could desalinate to make the seawater fresh. The seawater needs to be fresh because most plants need fresh water to grow or else they will die. Then we had the problem that desalination takes a lot of energy. Since we wanted a green farm we decided to use wind turbines and /or solar panels to power the project. Putting these parts all together

made a GREEN FARM that takes co2 out of the air, produces food and fresh water.

Here is a drawing of the outline of our process:

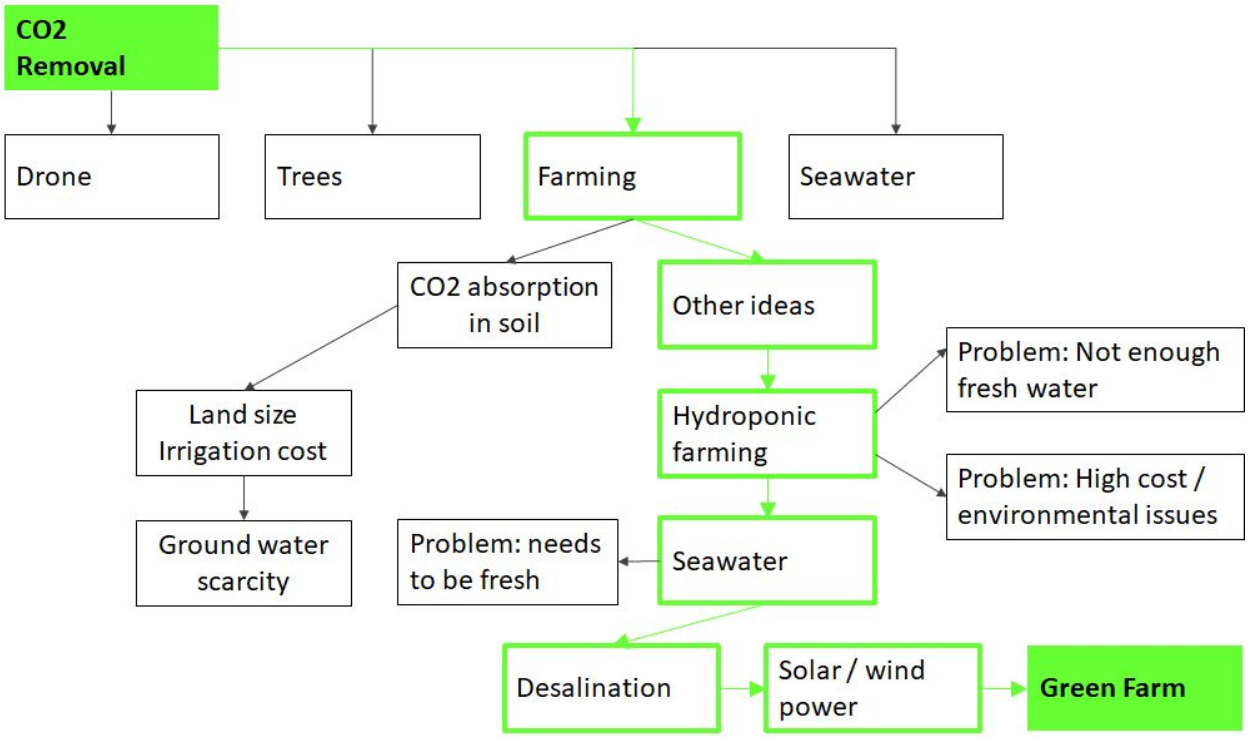

Figure 7

6. Consequences

We think that this idea has many benefits especially in dry island areas. Here are the positive consequences:

– take CO2 out of the air

– provide food

– make fresh water

– can take unused solar and wind power and use it for everyday things

An extra benefit would be finding a use for the excess salt.

We can think of a couple of negative consequences:

– Desalination produces excess salt that would need to be disposed

– it's expensive

- time commitment. Plants do not grow overnight and require maintenance to be healthy.

-expensive machinery

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WEBSITE IMAGE DESIGN PROCESS PAGE: Chart designed by team

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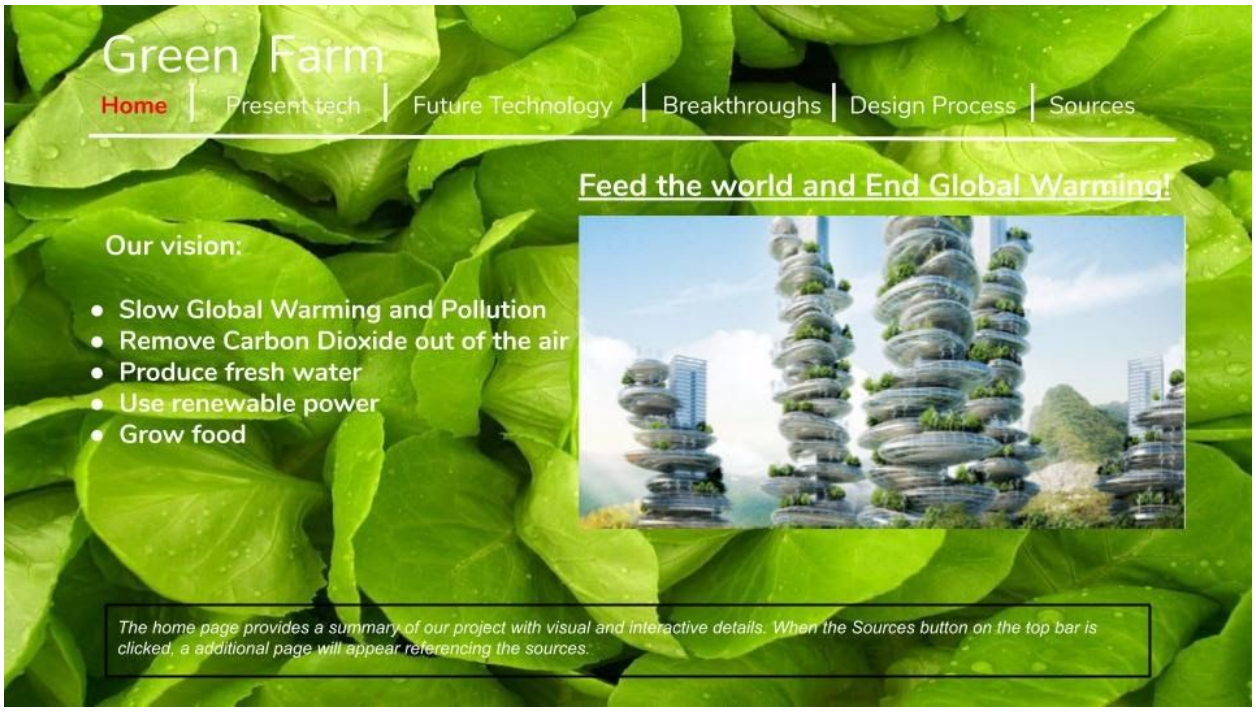
IV. Web Design

Page 1.



Green Farm

Page 2.

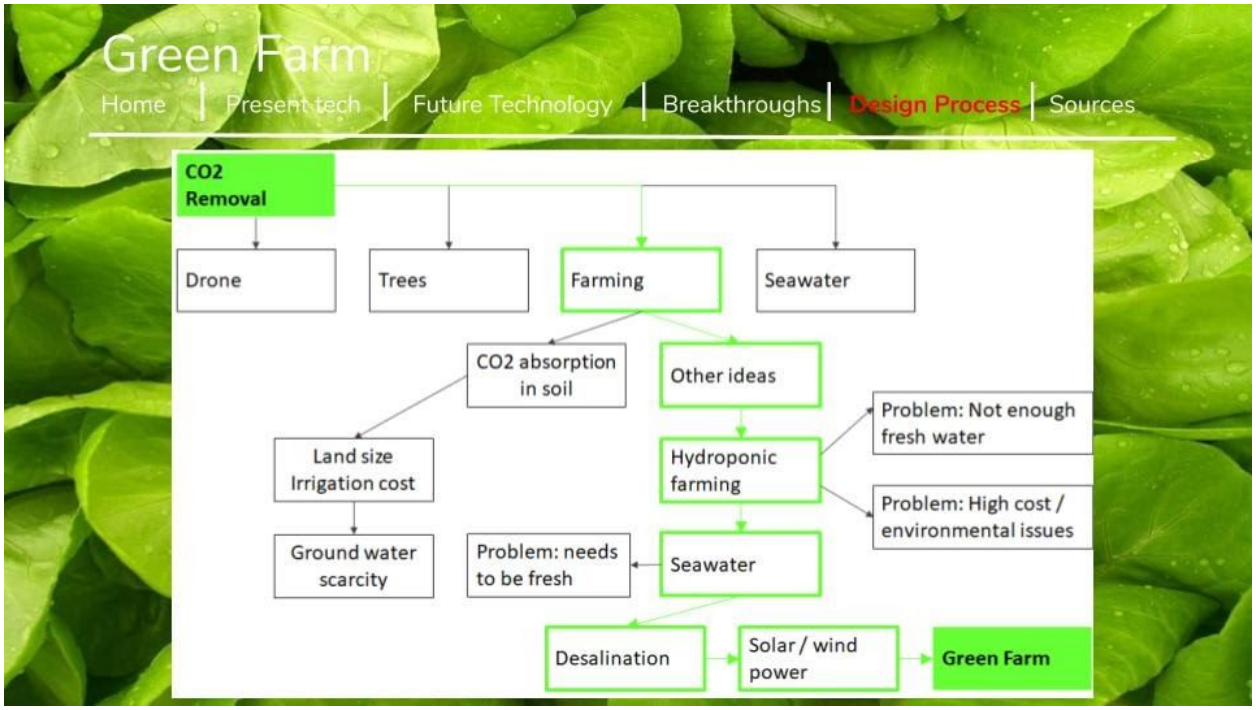
Green Farm

Page 3.

Green Farm

Page 4.

Page 5.


Green Farm
Home | Present tech | Future Technology | Breakthroughs | Design Process | Sources
CO2 Removal
Drone
Trees
Farming
Seawater
CO2 absorption in soil
Other ideas
Land size Irrigation cost
Hydroponic farming
Problem: Not enough fresh water
Problem: High cost / environmental issues
Ground water scarcity
Problem: needs to be fresh
Seawater
Desalination
Solar / wind power
Green Farm