Hydroponics 5
GNG1103[D]

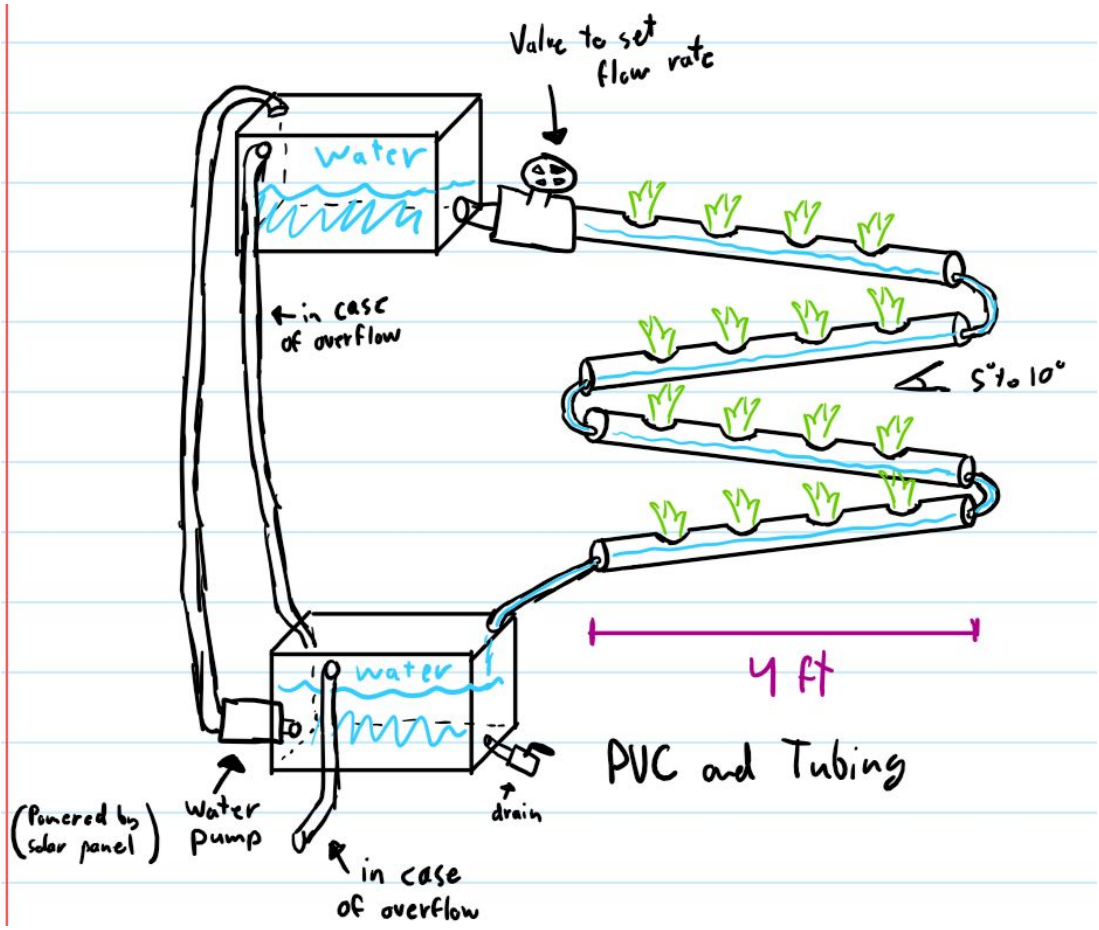
Project Deliverable D: Conceptual Design

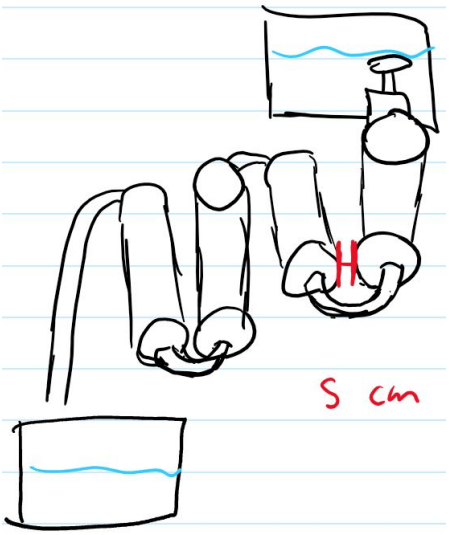
Introduction

After identifying various requirements that our product has to satisfy and comparing a few commercial designs to provide a good standard for each design criteria, we are now ready to produce a fair amount of conceptual designs based on these standards. Furthermore, we will analyze these concepts as a team and possibly modify them or create better ones. Finally, we will pick the best ones for our first prototype and evaluate them with our design criteria.

concepts:

1.





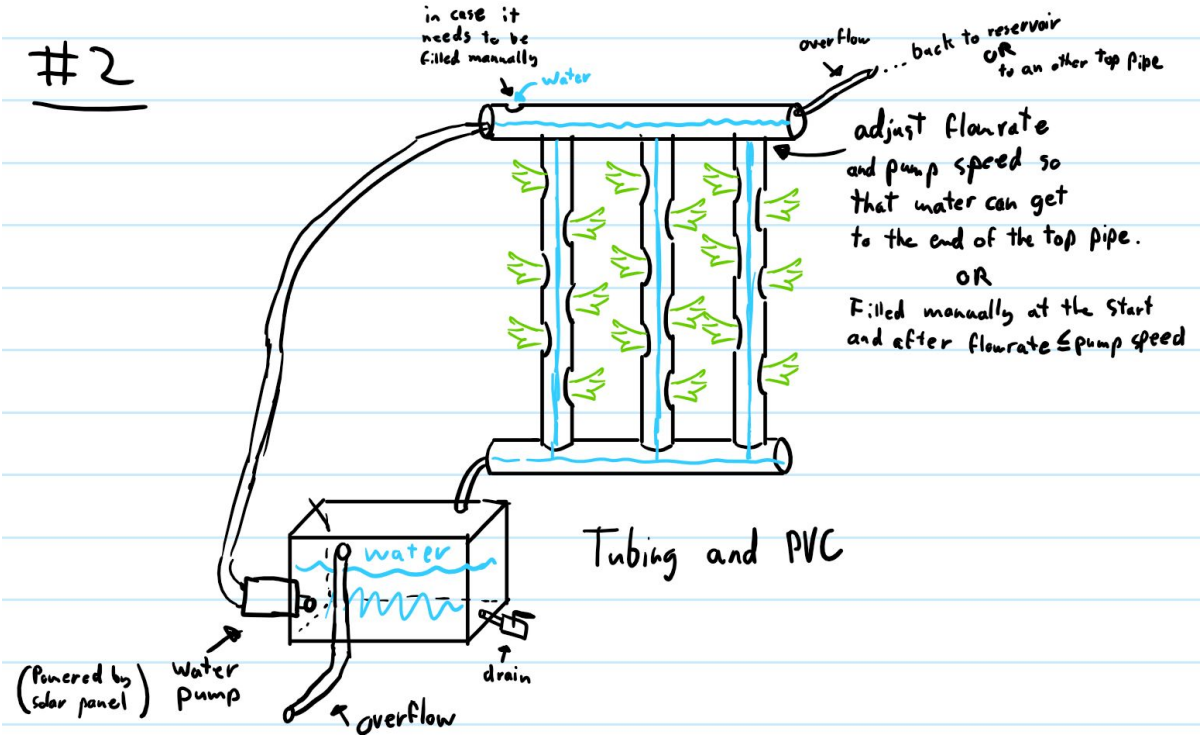
Advantages:

- Considers overflow and draining
- Can set flow rate
- Can store a lot of water

Disadvantages:

- Takes a lot of space
- High need of water

2.



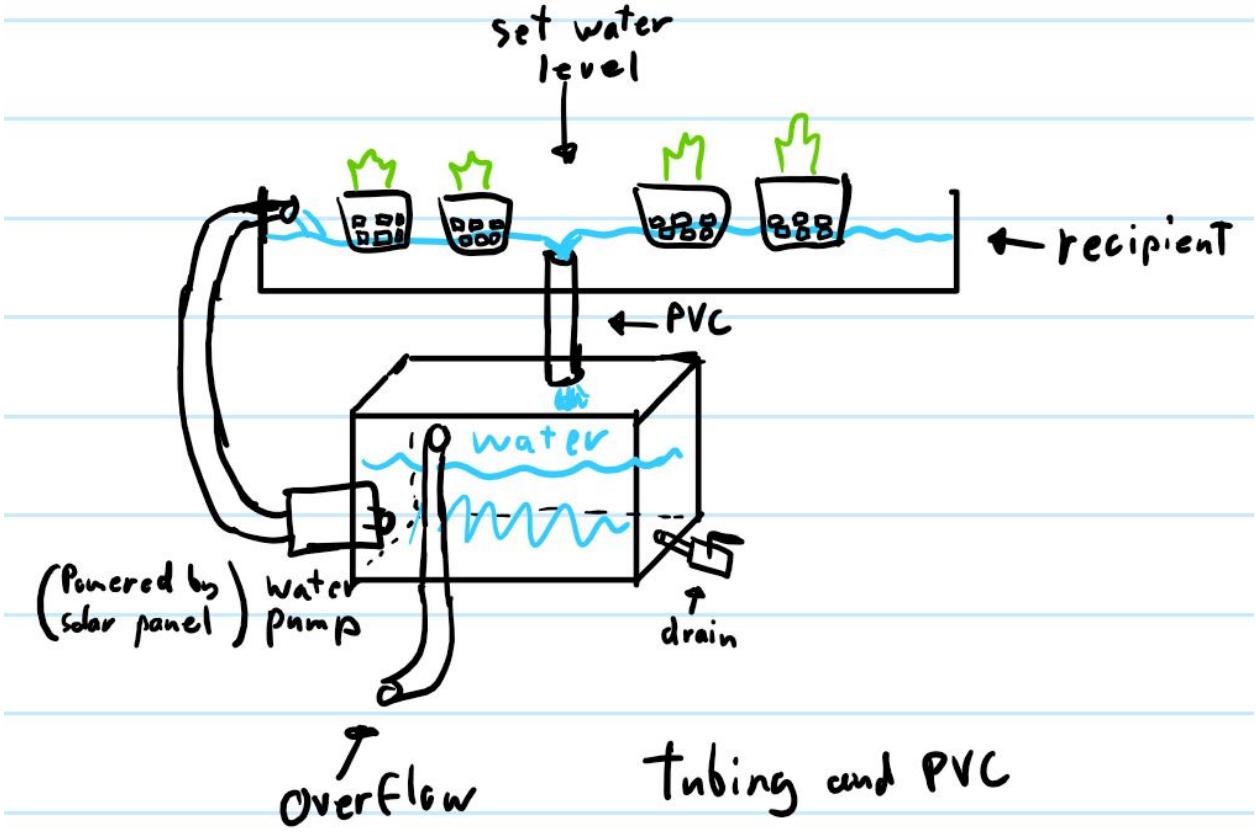
Advantages:

- Considers overflow and draining
- Space efficient (space vs number of sites)

Disadvantages:

- Might require manual labor

3.



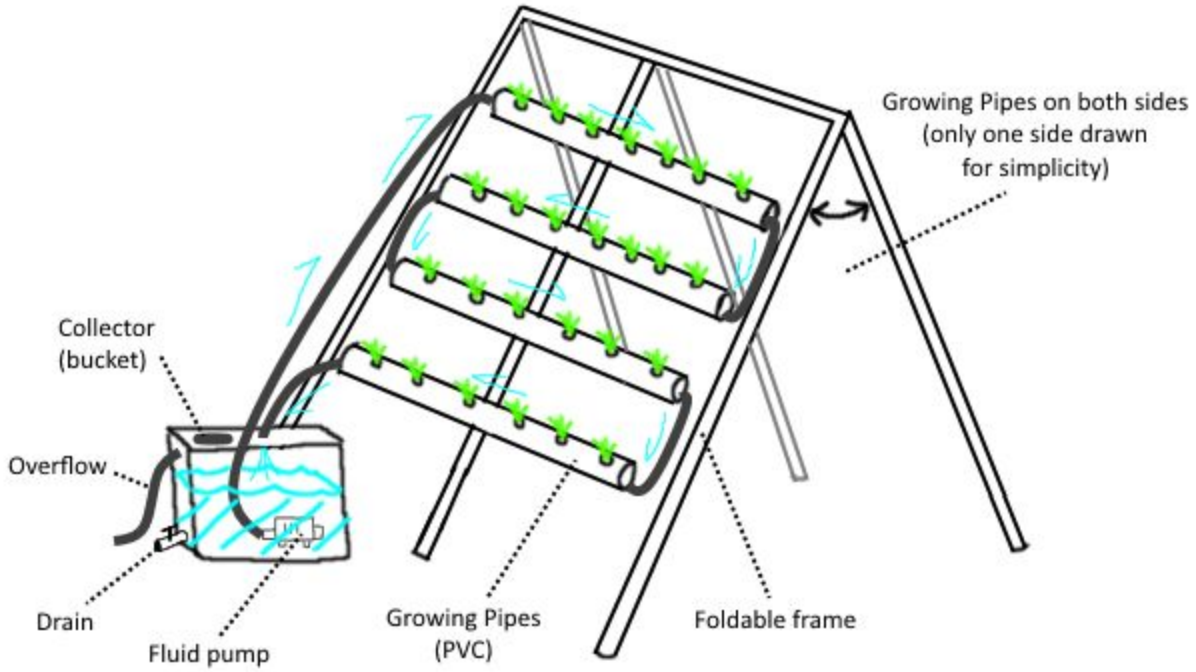
Advantages:

- Considers overflow and draining

Disadvantages:

- Takes a lot of space
- High need of water

4.



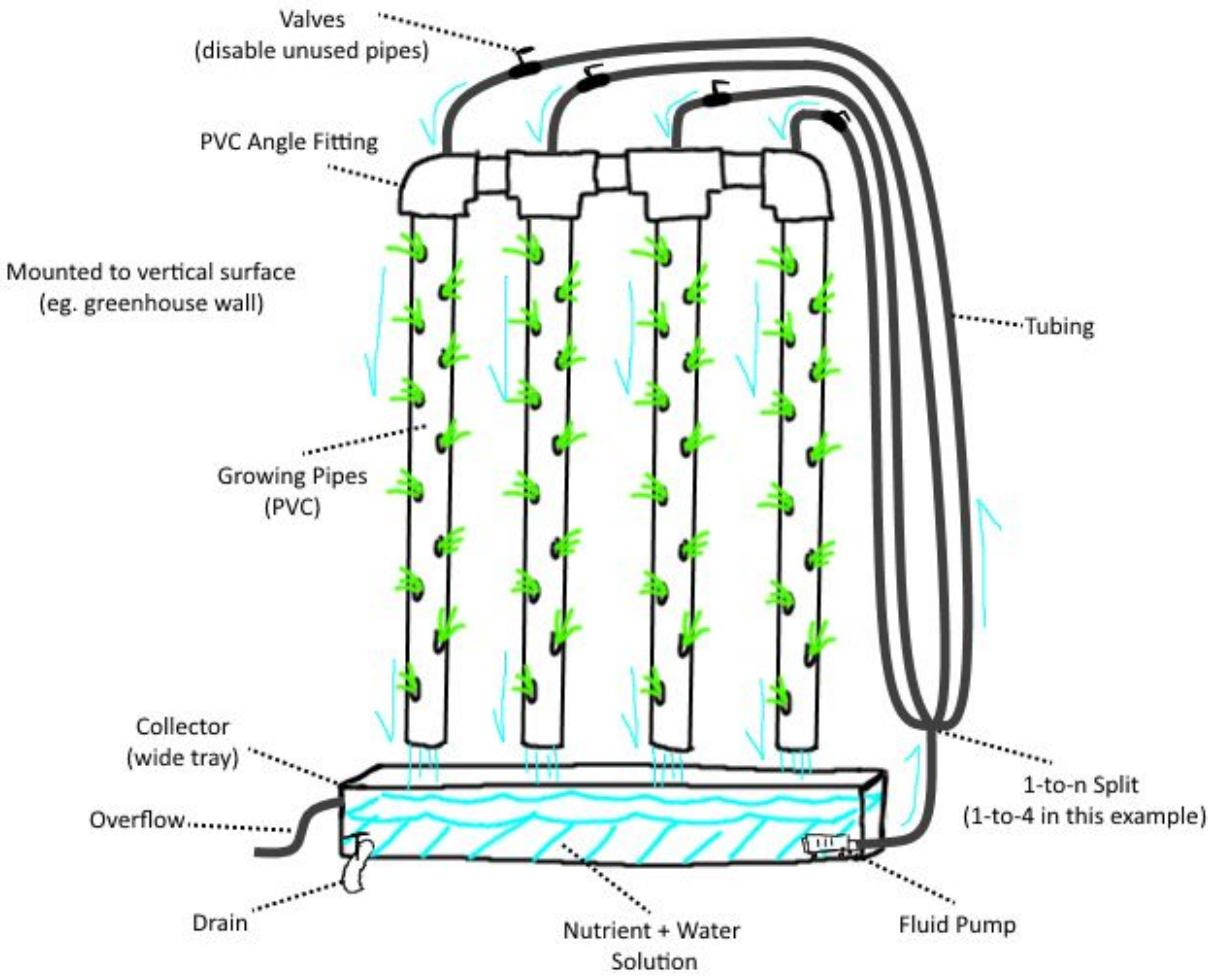
Advantages:

- Functions without need for existing structure
- Foldable frame allows for quick assembly/disassembly
- Series-style water flow ensures no flooded or void-of-flow locations
- Simplistic tube/piping; no complex fitting required
- All plants are accessible from behind/under the structure

Disadvantages:

- Low space efficiency
- Not stackable/modular; design only accommodates fixed number of growing pipes
- Requires pump to be on, otherwise plants dry up
- Bulky frame; additional materials and construction efforts required

5.



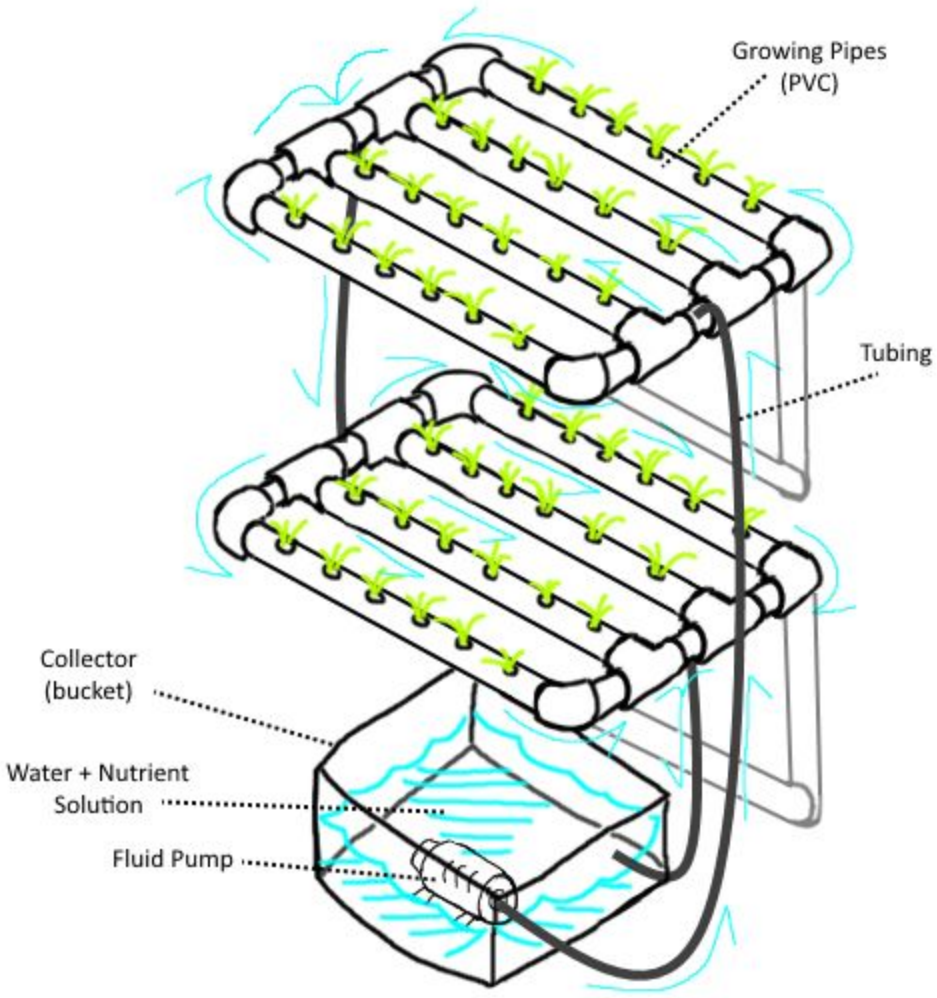
Advantages:

- Modular; additional growing pipes can be added with another T-junction fitting
- Stackable; several duplicate setups can be put side-by-side to maximize space efficiency
- Tuneable; valves can be used to moderate pressure/disable unused pipes
- Vertical pipes ensure no stagnant water collects near plants

Disadvantages:

- Even distribution of water flow is not guaranteed with a parallel design
- 1-to-n splitter could pose reliability issues. Tubing length/amount also a consideration
- Vertical plant growing is challenging; gravity is not your friend
- Pumps always need to be on, otherwise plants dry out
- Plant accessibility is poor; they are crammed together and with stacked designs, inner plants may be inaccessible

6.



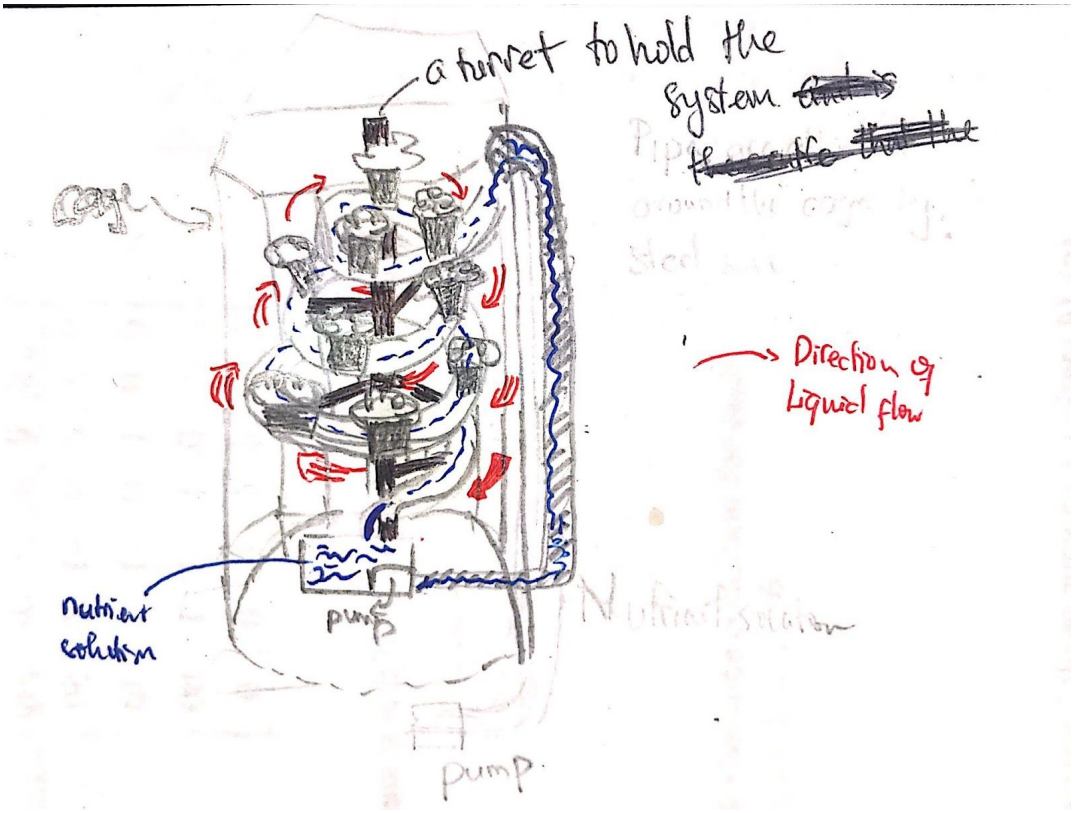
Advantages:

- Plants are easily accessible from the front
- Pump can be turned off occasionally; the water lingers in the pipes as they are not aggressively angled downwards
- Stackable; add another stack for more space efficiency.

Disadvantages:

- Parallel water flow does not guarantee even water flow distribution
- Complex construction; requires frame and many pipe fittings
- Framing required for support

7.



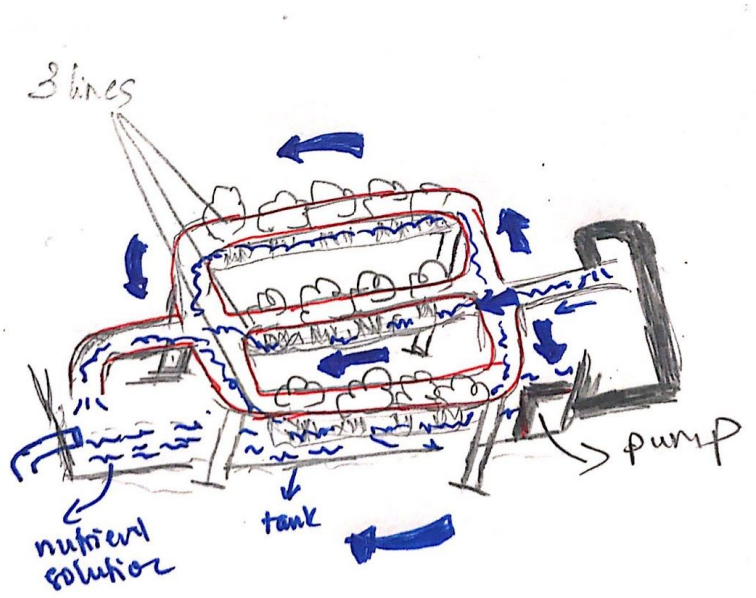
Advantages:

- Strong and stable support structures
- It's huge in general, but indeed has the space efficient since it is put vertically and in the centre of the cage
- Having control over the capacity of the tree's amount
- Able to store a lot of water

Disadvantages:

- Poor overflow consideration
- High need of water
- Since it's big, a big amount of materials is required

8.



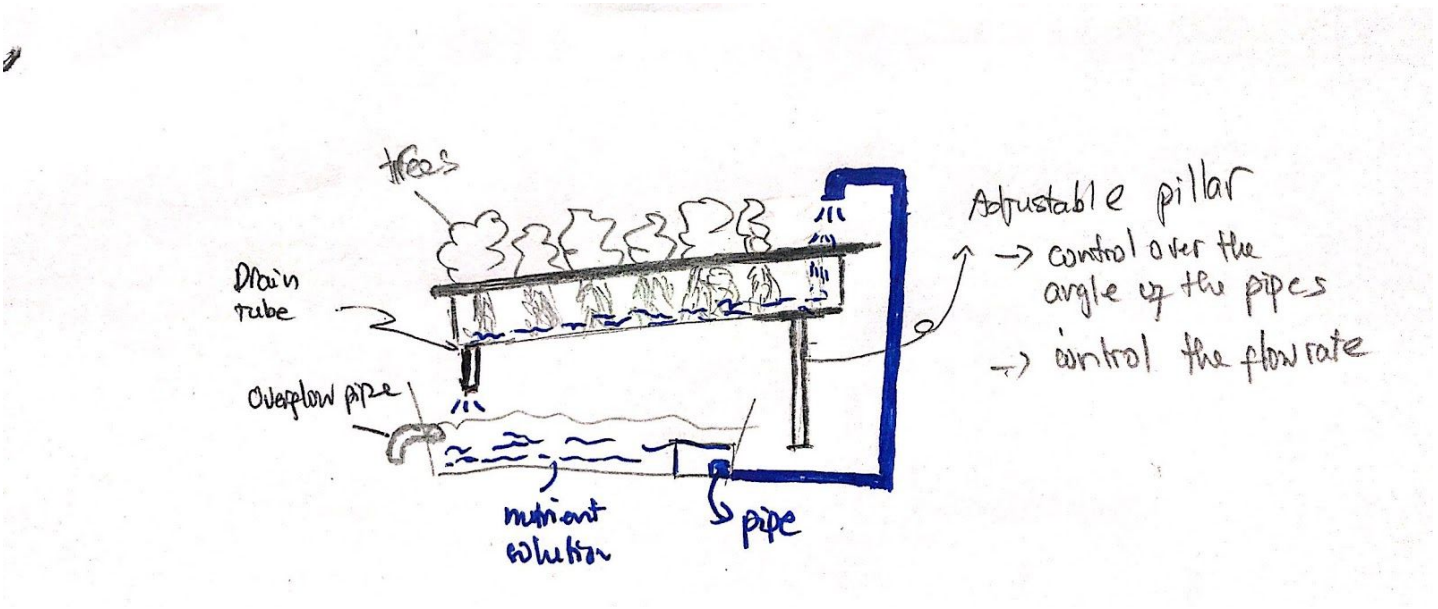
Advantages:

- Strong and stable support structures
- Having control over the capacity of the tree's amount
- Able to store a lot of water
- Able to adjust the flow rate

Disadvantages:

- Poor overflow consideration
- High need of water
- Huge materials consumption
- Need big room for it

9.



Advantages:

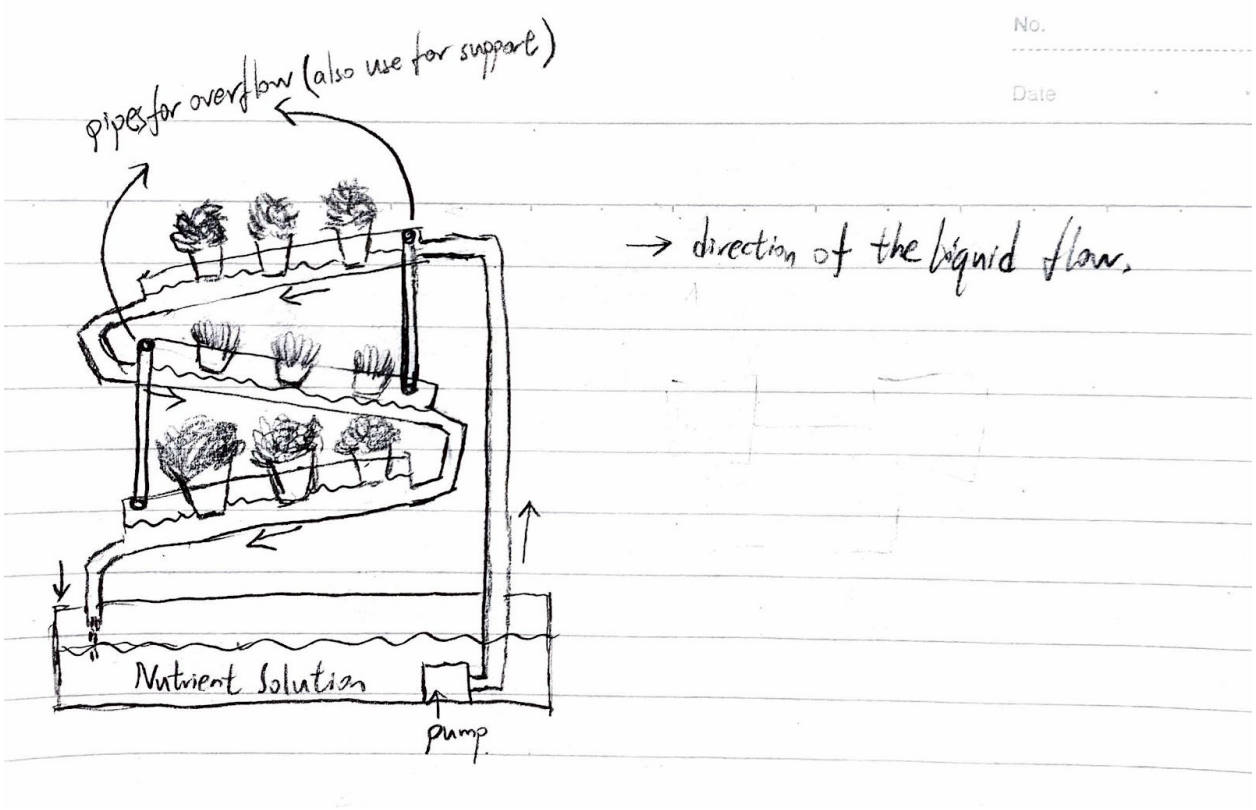
- Strong and stable support structures
- Able to adjust the flow rate
- Simple, easy to build
- Overflow considered
- Space efficiency

Disadvantages:

- Limited number of trees

10.
11.
12.

13.



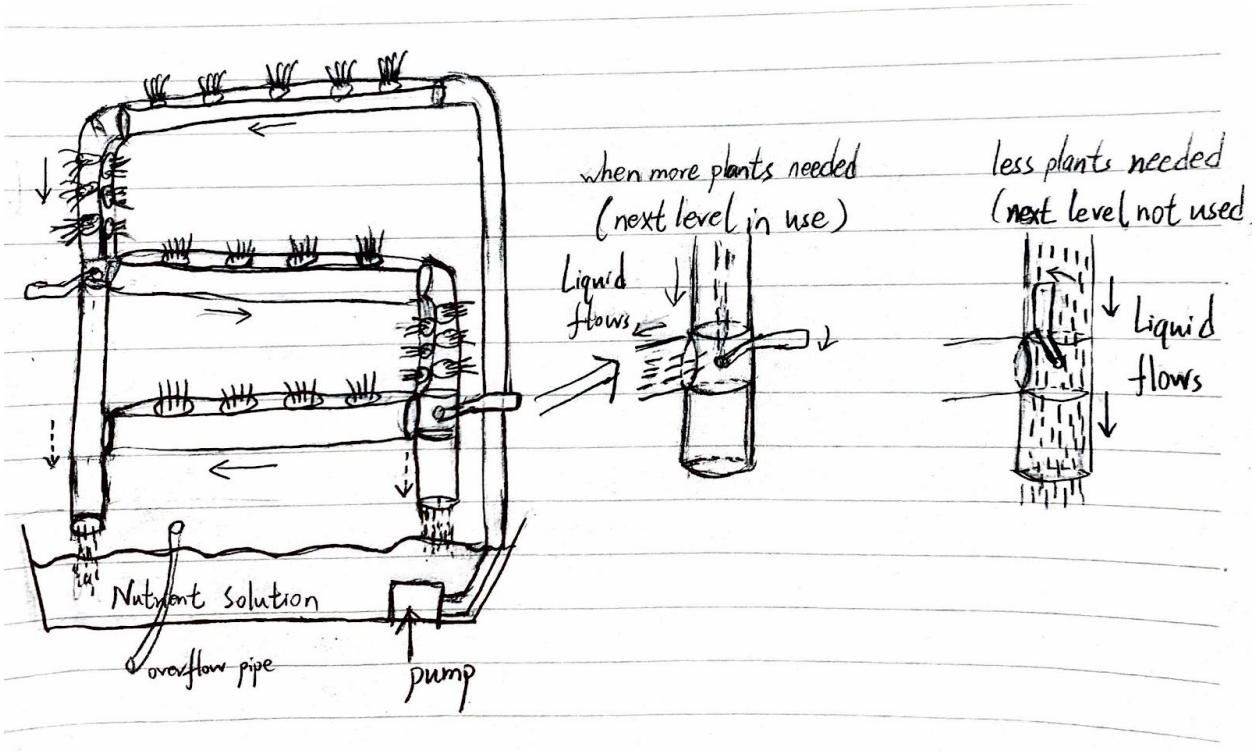
Advantages:

- Considers overflow for each level
- Strong support structure
- Can store a lot of water

Disadvantages:

- High need for water
- Total size is big

14.



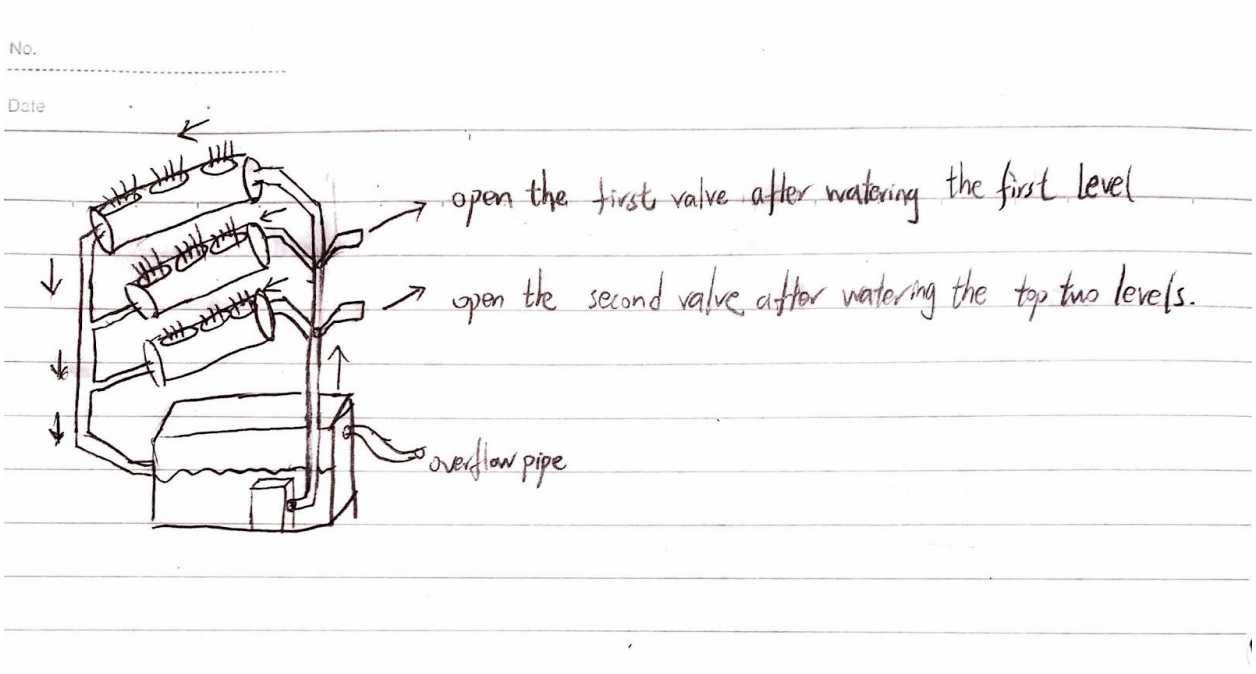
Advantages:

- Considers overflow
- Space efficient
- Time-efficient (adjustable system depending on the numbers of the plant needed)

Disadvantages:

- Large space needed

15.



Advantages:

- Considers overflow
- Tiny space required.
- Adjustable system (depending on the numbers of the plant needed)

Disadvantages:

- Might require manual labor

Concept analysis

design	Electricity production	Water recycling	Assembling time	Cost	Size	Can be disassembled (transportation)	TOTAL
weight	**4**	**4**	**3**	**3**	**4**	**4**	
1	2	3	1	2	1	2	**41**
2	2	3	1	2	3	2	**45**
3	2	3	2	2	2	2	**44**
4	2	3	3	2	2	3	**55**
5	2	3	1	2	3	1	**45**
6	2	3	1	2	3	2	**49**
7	2	3	1	1	2	1	**38**
8	2	3	1	2	1	2	**41**
9	2	3	2	2	2	2	**48**
10							
11							
12							
13	2	3	1	2	1	2	**41**
14	2	3	1	1	1	2	**38**
15	1	2	2	2	2	2	**40**

From this selection matrix, we have selected the conceptual design number 4 to be our first prototype.

Conclusion

To conclude, we have produced various conceptual designs individually and then reconvened as a team to analyse these concepts and adapt them. After comparing these concepts, we have selected one design to be our first prototype. The next step of this project will be project plan and cost estimate.