

## Drafted Project Logbook V1.0

### Hydroponics for Gardening Improvement

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#### **Problem statement consideration**

The **Non-Activeness In Horticulture** is a widespread problem within Singapore that results in the decline of gardening. Such an observation is due to the following reasons:

a. Time extensive

With a kit, it takes about **45 minutes** to set up an entire container garden kit. If you're growing on your own, it takes much more time and research. When it comes to maturation time, every variety moves at its own pace. For example, carrots require 60-80 days to mature while tomatoes require 70-90 days. This shows how long even common edibles, like carrots and tomatoes actually require much time for it to mature. The time of day you pick your bounty is also very important, with the time early in the morning being the best time for harvesting as the plants stay crisp and fresher longer that way.

#### In Housing Estates

b. Spatial concerns

If you live in one of Singapore's many high-rise apartments, your gardening space is probably limited to your balcony (if you have one), or the common corridor area outside your front door. Experience has shown that these environments can still be conducive to cultivating healthy plants – as long as your plants receive the correct intensity and duration of sunlight exposure.

“Rows of leafy plants are crammed pot to pot in the common space in front of the eighth-floor unit at Block 101 Pasir Ris Street 6. The Straits Times saw about 40 tall potted plants lining the walkway on Monday (May 27). A woman in her late 40s, who did not want to be identified, was seen watering the plants and trimming leaves. Neighbours say the large collection of plants is an obstruction and a fire hazard. They also find that they pose a safety hazard, and are difficult to navigate through while carrying large items.” This is an excerpt from an Article by the Straits Times on overcrowding of planting areas along the corridors.

c. Cost Against Outtake Value

Gardening isn't cheap. Before you start a garden, be sure you can afford it. Plants cost money, sometimes a lot of money. And you will also need gardening implements, soil amendments, and fertilizer. If you are unfortunate to get into legal or medical trouble because of your hobby, that will cost you money too.

In the most recent study conducted by NParks in 2016, the revenue generated from the sales of plants by the nursery industry was estimated at S\$265 million.

Conclusion:

Therefore, as claimed in the above article citations, it can be seen that the growing urban agricultural farming practices results, if done in a mass production sequence, in high income revenue per unit derivative. This means that through a wider use of urban farming, we can cut down on our monetary losses. However, farming on a small scale, such as on a household scale, will result in many losses if the yield is small.

Legend	Increasing number of points indicate the severity of the issue	Rating from 1-4
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Considerations for Selection	Problems Faced			
	Dislike for gardening	Non-active in horticulture	Would rather buy from market	Cost against outtake value
Monetary Concerns	1	3	2	4
Spatial Limitations	2	4	3	1
Time Extensive	4	3	2	1
Convenience	3	4	1	2
Total Score	10	14	8	8

## **Extent of the Problem and Parties Affected**

Firstly, to enact this problem with contextualisation of the kind of stage Singapore has been set in toward Agriculture and Horticulture on a domestic basis. In a recent study conducted by NParks, in 2016, the revenue generated from the sales of plants by the nursery industry was estimated at S\$265 million, which however is not directed toward the sustainable development of edible plants or at urban farming, rather the trade of valued plant specimens and species. However, people in Singapore do not seem to see the pending issue of not having proactive urban farming cultivations. This can be seen as Singapore remains one of the most food-secure countries in the world due to a comprehensive import diversification strategy, hence topping the Global Food Security Index by the EIU, Economist Intelligence Unit in both 2018 and 2019. This being said, the Singaporean government has aimed at a goal, which we have previously mentioned in the past presentation, an initiative named 30'30, which aims to obtain 30% internal nutritional needs by 2030. This remains quite a challenging task to be achieved in the coming decade due a lack in horticulture practices in Singapore currently. According to the Agri-Food and Veterinary Authority of Singapore (AVA), Singapore currently imports more than 90 percent of her food supply, and urban farming can also help mitigate our reliance on imports and serve as a buffer during supply disruptions to import sources. Another indication of the severity of Singapore's dependence on overseas imports was seen in 2016, where less than one percent of land in the state was dedicated to agriculture.

Hence by extrapolating the space usage in Singapore, one can easily make use of pockets of land area for cultivation or farming even.

In conclusion my group would like to cite an article from Channel News Asia, in accordance with the perks of urban farming, "Having food production within the city or heartland brings food closer to the consumers as it cuts transport costs and carbon emissions, and may improve environmental sustainability," a claim made by a spokesperson from the Singapore Food Agency (SFA).

## **Solutions Existing Now**

Existing solutions to increase interest in gardening

NParks has been fostering a love for gardening through their Community in Bloom (CIB) programme of creating community gardens and indoor gardening options. Where natural light is lacking, more energy-efficient LED grow lights can be used to provide the right spectra of light for indoor plants. In addition, low-maintenance plants that are less pest-prone can be planted to minimise the usage of pesticides. Another existing solution was National Parks Board (NParks) 'Gardening with Edibles' programme that started in 2005, which has distributed 400,000 free seed packets to encourage people to grow leafy and fruit vegetables at home. NParks gave each family vegetable seeds to grow at home, to attempt to interest families in gardening. NParks aims to increase the number of community gardens island-wide to 3,000 and the number of allotment plots in parks to 3,000 under its flagship gardening programme, Community in Bloom.

This includes a new Green Friends Forum to engage young Singaporeans who are interested in greenery and horticulture.

Another point of concern is the development of other ideas which are in line with the kind of project we have decided to undertake. An example, quite varied on the online market, is a prototype designed by students from the National Junior College and Nanyang Girls High where they chose to tackle the problem of dangerous planting in housing estates. That's where residents plant illegally on spaces like window ledges, their design is a compact and stackable planter that is designed to fit in small corners.

## Our Project Proposal

Our proposed invention is to create a potting device which can prevent the growth of weeds by eliminating external light sources from reaching the cornerstone parts of the device which supports hydroponics plantation. There will be three layers to the device, supported by detachable stilts and hence allowing shifting of layers should the growth space of certain plant species require more area, and three compartments per row, which allows for small-scale plantation of the user's needs. Pin-sized holes will be installed on the floor of each row which allows filtration from the upper segments to reach the bottom. A moldable latch is fixed on for attachment to cylindrical handle rails, commonly found in Housing Estates, HDBs, for the convenience of the user.

By installing this portable planting device which can be made use of on ledges or railings along the corridor, we have solved the need for competition of space due to Singapore being an island state and having limited spatial resources. The use of shifting handle bars of the stilts supporting the layers of the device also means that the user can adjust planting areas to suit the needs of each potted plant species and allow for flexibility in changes as the plant grows.

The purpose of the invention is to further encourage household agriculture, at least to promote a beginning to start an active movement amongst residents in Singapore. A main goal of this potting device is to create a partial sterile environment for the most efficient cultivation of plants even with spatial limitations and with external negative influences such as noise or pollution which can cut down the need for time and effort spent into household agriculture. This will in turn encourage more people to actively participate in horticulture.

In view of comparison with previous projects that have aimed to support this idea of household agriculture, we have come up with certain comparisons with other previous projects done. This involves the study of our broader based problem statement, 'how to encourage more active participation in household agriculture and cultivation of consumer plants at home', and the project based idea against previous inventions. With regards to the overlying topic of discussion, we have made comparison with some movements NParks have started over the course of the past decades. Here we see the initiative of Community in Bloom (CIB) as proposed by NParks. However effective this campaign is really dependent on the participation of community members, with correlation to the kinds of activities given. Should there be a lack of activity, there will naturally be less participating parties. This, with overall consideration, does not have a solid base to incrementally expose citizens to agriculture activities. We then turn our view toward the existing inventions that are in line with our proposed one. This meant scouring through a range of potting structures and devices. In conclusion we will contrast two existing solutions, one hydroponics based and another of the same concept. This is a link of a similar project that was done by Nanyang Girls in a creation prototype competition, which is a prototype made to accommodate physical potting, which differs from our proposed prototype due to it not being able to accommodate hydroponic systems. By allowing for the usage of hydroponics in the device, users can more easily control the growth of the plant in a near sterile environment. Why we have opted for this system of plantation is also mainly due to the fact that the planting can be controlled.

Technicalities: Due to the complexity of the hydroponics system, I expect that we may face many problems, especially during the test runs. Firstly, we might face hydroponic system leaks during our test runs. Leaks can occur when we build a system with a reservoir which cannot hold all of the nutrient solution in the system. Another problem we may face is the possible inability to monitor and adjust the pH level in the nutrient solution. The pH level in hydroponics can change considerably over days due to temperature, excess evaporation etc. Similarly, this problem becomes hard to solve during our process of inventing. Thirdly, a problem we would likely face is the nutrient deficiency or toxicity in our plants. There are numerous factors that can cause nutrient deficiency or toxicity in the plants. Excess levels of one nutrient can cause problems with absorption of another.

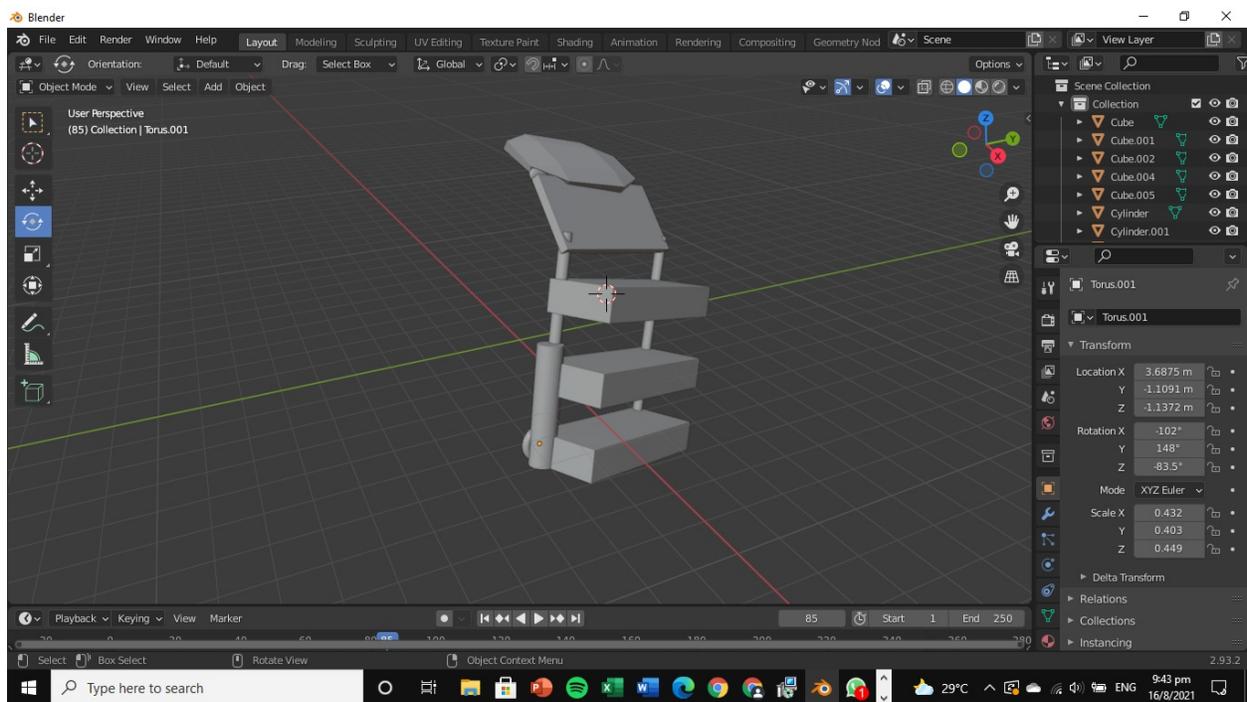
Cooperative basis: We also faced problems on the aspect of cooperation as many of us had variable thoughts on the invention and we constantly got into many conflicts on the decisions for the project, such as inability to meet certain deadlines efficiently and some members not attending regular meeting sessions. However, at the point of drafting this document, we have successfully overcome these setbacks and more or less worked as a team to complete the goal.

At the basis of the timeline, there are the deadlines which we have to adhere to. The first challenge, at time of proposal submission, has been completed, the term proposal evaluation, conducted in the first semester. Upon receiving feedback we aimed to positively change certain areas lacking in originality, and novelty; which I believe we accomplished in this final project proposal. Next we had to meet up, which in the later dates due to the impacts and social distancing measures the government implemented from May this year, were cancelled.

The crafting of the proposal is not possible due to limited time and resources as well as the restrictions due to Covid-19. This has also posed a problem due to the inability for the members to meet up due to safety management measures which have been implemented to prevent visitation to one's house for the actual crafting of the prototype. In various months of the year we entered the Tightened Measures of Phase 2 and 3, which meant that hopes of meeting up to physically make the project are dashed, and hence having the need for us to result in crafting an online prototype.

Attached below are the earlier stages of our prototype construction.

4b)



We apologise that an animated version could not be uploaded due to connectivity issues and loading data usage.

## References

<https://www.nparks.gov.sg/nparksbuzz/issue-05-vol-2-2010/gardening/let-there-be-light>

<https://blog.gardenuity.com/how-long-does-it-take-to-garden/>

<https://blog.gardeningknowhow.com/gardening-pros-cons/pros-and-cons-of-gardening/>

[https://cنالuxury.channelnewsasia.com/experiences/urban-garde\(https://www.nparks.gov.sg/nparksbuzz/issue-06-vol-3-2010/gardening/make-a-tic-tac-toe-vertical-garden\)](https://cنالuxury.channelnewsasia.com/experiences/urban-garde(https://www.nparks.gov.sg/nparksbuzz/issue-06-vol-3-2010/gardening/make-a-tic-tac-toe-vertical-garden))

<https://www.nparks.gov.sg/nparksbuzz/mar-issue-2021/gardening/potful-of-green-edibles>

<https://www.nparks.gov.sg/nparksbuzz/sept-issue-2020/gardening/know-five-common-diseases-of-edible-plants>

<https://blog.gardeningknowhow.com/gardening-pros-cons/pros-and-cons-of-gardening/>

<https://www.gardeningknowhow.com/special/urban/urban-garden-problems.htmning-singapore-sustainability-12479822>

<https://www.straitstimes.com/singapore/environment/10m-donation-and-slew-of-programmes-to-help-young-singaporeans-hone-green>

<https://www.todayonline.com/singapore/where-jobs-are-love-nature-youths-join-sunrise-landscape-sector-amid-singapores-green-push>

[https://www.nparks.gov.sg/-/media/nparks-real-content/gardening/gardening-resources/horticultural\\_best\\_practices\\_for\\_edible\\_gardening.pdf?la=en&hash=C9C328270D5F45229A39623EE558FA0F2C4EAACC](https://www.nparks.gov.sg/-/media/nparks-real-content/gardening/gardening-resources/horticultural_best_practices_for_edible_gardening.pdf?la=en&hash=C9C328270D5F45229A39623EE558FA0F2C4EAACC)

<https://www.straitstimes.com/singapore/welcome-to-the-jungle-hdb-residents-say-plant-loving-neighbour-is-beyond-be-leaf>

<https://cنالuxury.channelnewsasia.com/experiences/urban-farming-singapore-177456>

<https://www.ura.gov.sg/Corporate/Media-Room/Media-Releases/pr17-77>

<https://cنالuxury.channelnewsasia.com/obsessions/singapore-plant-collectors-splurging-five-figure-sums-on-hobby-187637>

<https://blog.gardenuity.com/how-long-does-it-take-to-garden/>

<https://www.schoolbag.edu.sg/story/student-inventions-to-solve-environmental-problems>

<https://smartgardenguide.com/problems-with-hydroponics/>