

AUTOMATED HYDROPONIC VERTICAL FARM

DESIGN OVERVIEW AND INTRODUCTION

This is an opportunity to provide a high-level description of the project you are considering. The scope of the Challenge is to design new appliances or improve existing off-grid appliances that directly connect to a solar home system or a mini-grid (no inverter). The focus is on energy consumption (how appliances use electricity), not the energy generation of the system. The appliance's primary source of energy should be solar generated DC electricity.

Project Title:	Automated hydroponic vertical farm
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Theme(s): i.e. Agriculture	Agriculture
Problem Statement: As stated in the Challenge Brief, your design should address a real world problem. Succinctly state the problem you hope to address here.	As from the national monthly drought updates from the national drought management authority , currently, nine arid and semi-arid counties are in alert drought phase. This is quite a great challenge as food is progressively lacking to supply to the market. The traditional farming system is facing a great challenge from the unforgiving weather.

The automated hydroponic vertical farm is a simple yet far reaching idea that aims to better cope with the earth's changing environment. This project has the following canonical advantages:-

- Better water utilisation
- Minimal space occupation
- Pesticide-free produce
- Minimal labour requirement

If such a system were to be made in an affordable manner, there would be good adoption of the system and its adoption can lead to further good outcomes better than what we have in mind. This is what we intend to do, make such an affordable system.

The automated hydroponic vertical farm design involves a long pvc pipe with a good base that accepts plants in pods. A smaller pvc pipe will be inside the main pvc pipe and will be connected to a small 30W dc pump which will pump water upwards to the top of the system and allow the water to fall through to the bottom while passing through the plants' roots.

This system will be powered by a solar system made of solar panels and a battery to power the pump during the night hours.

Such a design will be ideal for the following people:-

- People who want to farm their own produce but lack available arable land.
- Farmers who don't grow tubers and use traditional farming methods.
- Subsistence farmers in urban populated settings.

INNOVATION Your design needs to improve on solutions that are currently available to your target end-user

What is the potential of your design to improve energy efficiency compared to existing alternatives?

Available hydroponic solutions to the target end user do not fully reuse water. Our design will enable reuse of available excess water and prolong its effectiveness by aerating the water. Aerating the water will prevent fungal activity from occurring in the water . This will improve plant growth and reduce cleaning requirements.

What is the potential of your design to reduce production costs compared to existing alternatives?

The vertical farm design will utilise space, thus providing equivalent or more produce for less space relative to existing alternatives. This will reduce the amount of material used to achieve the same amount of produce. The design will also make use of readily available materials which will greatly reduce production cost compared to existing alternatives.

What is the potential of your design to improve usability compared to existing alternatives?

There will be minimal involvement by the end user and thus this will be ideal for use by people who also have other commitments. Provided a relatively very low cost, simple installation and use of the system, this will really allow people to adopt the design for use in their homes.

SUSTAINABILITY Your design must contribute to a positive impact on the environment

How will your design reduce the environmental impact throughout its lifecycle compared to existing alternatives?

The design will make better use of water used for farming.

How will your design contribute towards greenhouse gas emissions reduction compared to other technologies that exist in the market?

The design will be fully dependent on solar energy and considering its minimal energy requirement energy stored will be able to last the product a long while. Continual adaptation of this product will lessen the demand stress for market produce and thus reduce greenhouse gas emissions involved in traditional farming practices as well as in transportation of produce to consumers.

How will your design contribute to and draw connections between the Sustainable Development Goals (SDGs), in particular SDG7 – Affordable and clean energy?

In the view of food as energy, access to clean food free from pesticides and preservatives by the consumer will contribute to clean energy part of SDG7.

SOCIAL IMPACT Your design will need to make a difference to people's lives

How will you consider who will be using the design? How well have you understood their needs?

The target end user of the design can be:-

- Any person who desires to farm enough food for subsistence and lacks available farming land.
- Any farmer who is using traditional farming methods and aims to obtain more produce with minimal labour involvement and water requirements.
- Urban setting individuals with limited or no farming ground

What is the likely potential of the design to improve the quality of people's lives?

- People with no access to farmland will be able to utilise available space for farming produce to sustain them.
- Farmers can obtain more produce and supply to the market at better prices.
- Save money that would otherwise be used to buy the grown crop ie subsistence cropping.
- Help in achieving Food security.

How will your design consider the SDGs' commitment to 'Leave no one behind'?

The affordability of the design will enable people with low and moderate income to obtain the product for use.

SCALABILITY You need to justify that your design has the potential to get to market at scale

How will you consider the potential market for your product?

The product will be targeted to people from low to high income to enable them grow fresh produce from small spaces available in their homesteads with minimal effort involved.

How will you consider the accessibility and affordability of your product?

The product will be made accessible to anyone with a smart-phone and made in different categories that fit the economical situation of the end user.

How will your business model consider affordability, payment models, existing supply chains, manufacturing, distribution channels, local partners and services associated?

Considering the modular nature of our design, upon purchase of a basic system, additional improvement components will be offered at cheaper prices. Our business model can cooperate with existing hardware pvc pipe suppliers to provide the major part of the product material. Our model can also well cooperate with available delivery services to deliver to far areas. An installation manual together with videos on the installation, use and response to challenges encountered with use of the product will be made available.