

Design and development of portable/collapsible structure for indoor hydroponic farming

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Introduction:

Hydroponics is a method of growing plants in nutrient solutions without the use of an inert medium to offer mechanical support. Hydroponics is derived from the Greek words hydros, which means water, and ponos, which means labour, and literally translates to "water work." Professor William Gericke invented the term hydroponics to describe the cultivation of plants with their roots floating in water containing mineral nutrients in the early 1930s. There is an existence of horizontal and vertical hydroponic structures. We're developing a portable hydroponic farming system which is the combination of both horizontal and vertical hydroponics. As the world's population grows, so does the need for food, and the vegetables sold in urban markets contain high levels of fertilizer and pesticides. As a result, human health may be harmed by a variety of disorders. Garden aficionados may find it difficult to realise their dream of producing crops due to a lack of room or no space. By this structure who wish will be fulfilled to grow their own food in their homes or on the roofs of buildings. The system in which we may cultivate a variety of veggies for domestic consumption that meets our daily vegetable demands. Those still cultivate vegetables in their fields in the traditional method, but people who live in urban areas can't receive fresh veggies due to late transportation of crops from farms in rural areas to market yards in various towns. We feel that old solutions cannot tackle current challenges; instead, innovative solutions are required, and hydroponic farming can be one of them.

Objectives:

- Fabrication of low-cost Portable/collapsible structure for indoor hydroponic farming.
- Reduction of the large space necessary for farming, making it ideal for garden enthusiasts who want to farm without taking up extra space.
- Hydroponic structure is portable and hence it can be placed anywhere like indoor, outdoor or rooftops.

- Conservation of water. The water will be circulated throughout the structure after the structure achieves its water requirements.
- No soil is required for cultivating crops. Plants grow in the water in the nutrient solution. Improve the yield by optimizing the environmental parameters.
- No labour is required for monitoring the structure and it saves time

Methodology:

- Portable/Collapsible hydroponic structure is implemented because of the growth of the plant without soil and less water. Their implementation describes the framing of pipe, maintaining, and auto refilling of the water cycle.
- A standard PVC pipes of 2 inch diameter is constructed in a square shape at the initial set up. Then its easy in sizing of all pipes in the same structure, after assembling all parts gums are applied to join the pipes. Bends are fixed at the end of each pipe. F.T.A - M.T. A threaded pipe is used to rotate the joints which is required for collapsing and make our model portable.
- When the structure is in standing condition the vertical pipes bends to 60 degree connecting to the below pipe. In the 60 degree rotated pipe, water will flow faster which can damage the roots of the plants to avoid that we have used concentric pipe inside the vertically bended pipe to control the flow rate so that no damage to roots and plants can grow easily.
- After determining the model's portability, give assistance for the base. GA CLAMP was used to connect the specified pipe to the bolt, and to create rotating legs for the model that we can open and close. It's employed to support the structure's foundation.
- A 35 watt pump is used to circulate water throughout the model which is placed inside the small bucket which is filled with the water fertilizer and end pipe of the model is connected to the bucket to reuse the fertilized water.

Conclusion:

- Hydroponics has the potential to feed a significant percentage of the global population.
- Even in areas where the soil is poor and water is scarce, the plants or vegetables are cultivated. In regions where space is limited, the technology may potentially be employed as a vital source of food production.
- It is possible to move a portable hydroponic system anyplace. This construction may be used to guard against floods by keeping it within, and it can also be used when there is no land to grow.
- On comparison to plants grown in soil, plants cultivated in nutrient solution develop quicker. People in urban areas will be interested in farming, but owing to a lack of space, they will be unable to meet their needs.
- Our methodology may be utilised to solve the challenges that urban farmers encounter. Its capacity to recycle water also decreases water use and saves water. The notion of making it portable is a fantastic way for garden enthusiasts to participate in their favourite hobby

Scope for future work:

- When space and expense are limited, the Portable/Collapsible is a fantastic option for garden enthusiasts who want to participate in their favourite hobby. It's a simple and portable construction that can be put together. The structure is light enough to be moved by at least two individuals from one area to another without causing damage.
- A portable greenhouse may be used in all seasons, even the summer, to assist maintain a consistent growth environment. Small-scale unit farmers may have factored the whole cost of the system into their calculations. When compared to traditional ways, hydroponics farming produces superior outcomes.