

# Vertical Farming

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**Abstract-** Present population of earth is 7 billions , by the time of 2050 it will become 9.5 billions or more. As the population increases the natural resources like food, water and land decreases. Ultimately there will be food crises if measures or development of techniques in farming aren't take place. One of the best method to feed growing population on earth is "VERTICAL FARMING". It is the type of farming in which growing crops takes place in vertical manner. It was introduced by Dr. Dickson Despomerre who is considered to be the Father of the Vertical Farm concept . He introduced it as theoretical concept. It was first founded in Germany munich in july 2013. Newark, New jersey they have developed vertical farming without soil and sunlight .The organisation is known as "AERO FARMS".They grow leafy vegetables and small shrubs bearing fruits. The productivity is high when compared to normal farming. The water loss is 95% reduced . instead of sunlight they have substituted LED lights of different frequencies .The major advantage is that they grow crops in less space and time and the yield is high . Disadvantage is that the power consumption of led has become more. In further reviews we come with a structure that is feasible to Indian conditions and parameters.

## I. LITERATURE SURVEY

In a literature "Vertical Farms Urban Restructuring and The Rise of Capitalist Urban Agriculture" a journal by Lindsey Saran Hallock , we found two major things pertaining to our project i.e Food regime analysis and rise of vertical farms.

Food regime analysis is concerned with explaining, and therefore politicising, the strategic role of agriculture in the construction and development of the world capitalist economy.

It will be a good combination if we combine commercial stuff with agriculture.

Introduction of agriculture in commercial building will be great mile stone in our present day scenario. The best way to achieve is to do vertical farming.

In other literature "Vertical Farming Concept In : Important Decision Variables" by KorKamonpatana we found other two aspects namely food security and concept of vertical farming. Food security is a condition related to the supply of food, and individuals' access to it.

In a paper "Filling the Hunger Gaps with Vertical Farming" by Malisia Wilkins & Allison Kelly we came to know the need of vertical farms in present day sevnario.

## II. CONCLUSIONS FROM THE LITERATURE SURVEY

To summarize the published journals we came to know that need of vertical farms plays an major role in both urban area and rural areas as well.it cost economic , less chances of attacking pests, water conservation , minor losses during natural disasters , pollution control in urban areas.

## III. PROBLEM DEFINITION

Lack of land for agriculture in present day and in the future the population will explode to meet food supply to such huge population we need to develop our farming techniques.

## IV. METHODOLOGY

We divided our into 4 parts followed by each part

- Identify the main variables that are relevant to vertical farming development by conducting a literature review
- Investigate the possibilities for the vertical farming concept and verify the key variables
- Propose a model of decision variables and the linkage model for vertical farming development
- Conclude the design concept of vertical farming

## V. DESIGN STANDARDS & REALISTIC CONSTRAINTS

On the basis above literature we have a structure that is feasible and can be easily constructed.



**VI. WORK DONE**

The concept of vertical farming is very new that very few papers were published we have driven out max information. There are many alternate solutions pertaining to vertical farming. In Newark, New Jersey they have developed vertical farming without soil and sunlight. The organisation is known as “AERO FARMS”. We have listed out some of the alternate solutions to vertical farming. We have developed a structure based on Indian standards and climatic conditions.

**Basic vertical farming:**

Verti Crop:

Verti Crop was the first big company to kick off the vertical urban farming trend, stacking shelves upon shelves of delicious greens that could produce up to 20 times the crop yield with only about 8% of the water of a comparable horizontal garden setup. Time magazine even named it as one of the world's greatest inventions in 2009.

Though the company had some financial trouble, they definitely set a high bar for the power of this kind of sustainable farming.



**Figure:2.1-Verti crop**

**Growing Power Aquaponic System:**

This aquaponic system takes advantage of the existing symbiotic relationship between plants and animals. The pump pulls water from a five-foot-deep pool to feed multiple layers of plants in this case, watercress and tomatoes then drips back down into the pool again, where the fresh oxygen helps to feed the tilapia in the tank below. It's like a little self-contained and portable ecosystem. (Also, the fish poo works as fertilizer.)



**Figure:2.2-Aquaponic System**

**Hydroponic Vertical Farm:**

This is believed to be the world's first educational vertical farm, where curious students can study, train, and experiment in farming progress.

At Wigan, a British university, the setup boasts a rotating soilless conveyor belt system, temperature and lighting controls, and even a state-of-the-art kitchen where students can actually start to develop recipes for the future(which may or may not include the delicious aquaponic fish they're raising as well, space salmon).

**Window farms:**

These vertical windowfarms are catching on in major cities where everything is already stacked up tall and tight .There are plenty of online communities offering tips, tricks, and instructions, but the basic idea is that you can set up rows of recyclable drip-water systems in the comfort of your own home. All you need is a window, some old plastic bottles, and string.



**Figure:2.3-Window farms**

**Aero farms:**

It is built inside a former laser tag arena just outside New York City, AeroFarms is known as the planet's largest indoor vertical farm to date, with the ability to grow 75 times more crops per square foot while using 95% less water. Their system relies on an aeroponic mist instead of standard soil and uses concentrated LED lights, and it's also being used to provide affordable food to underserved communities.



**Figure:2.5-Aero Farms**

**The Land at Epcot Center:**

Even the mouse himself is getting in on the vertical farming action, sometimes they make hydroponic mouse-shaped pumpkins.



**Figure:2.4-Epcot Centre**

**Bright Agro Tech Zip Farm:**

These innovators found a cool new way to make their vertical farming even more vertical. They're not just stacking horizontal flowerbeds upright: They use zip ties to create vertical planes that grow

**VII. WORK TO BE DONE**

In upcoming reviews we analyze the proposed structure. Other feasible structure that can be made easily and is economic. We make Proto type of both the structures in which we can explain the concept vertical farming ,it will be easily understandable to leman

**VIII. TIME LINE**

Give a Gantt chart indicating all the activities to be carried out till the Thesis submission.

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