

Vertical Farming

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SUMMARY

The continuous increasing population, urbanization, diminishing water supply, and continuing climate change have contributed to declining stocks of arable land per person. As land resources for agriculture decrease, policy makers are faced with the challenge of sustainability and feeding the rapidly growing world population which is projected to reach approximately 9.7 billion in 2050. Solutions for improving future food production are demonstrated by urban vertical farming which involves much greater use of technology and automation for land-use optimization. Vertical Farming has the potential way for sustainable progress to produce food or related services in urban areas and reduce the environmental footprint within a framework of urban, indoor, climate-controlled high-rise buildings.

INTRODUCTION

Agriculture has been the most common way of food resources for centuries, and it is also closely linked to food security, rural development, and poverty reduction. Vertical Farming has the potential way for sustainable progress to produce food or related services in urban areas. The goals and future vision have been planned with the purpose of generating sustainable cities around the world. Vertical farming is the practice of producing food and medicine in vertically stacked layers, vertically inclined surfaces and/or integrated in other structures (such as in a skyscraper, used warehouse or shipping container). The practice can use soil, hydroponic or aeroponic growing methods. Vertical farms attempt to produce food in challenging environments, like where arable land is rare or unavailable. It often incorporates controlled-environment agriculture, which aims to optimize plant growth, and soilless farming techniques such as hydroponics, aquaponics, and aeroponics.



Techniques of Vertical Farming

Hydroponics

Hydroponics is the method of growing plants without the involvement of soil. Here, plant roots are submerged in magnesium, nitrogen, potassium calcium etc. These solutions support roots, improving chances of higher yield and reducing dependence on water. Studies have shown that there have been 11 times yield compared to conventional farms at a cost of 13 times less water. Thus hydroponics is the most widely used method in Vertical Farming.



Aquaponics

A slightly advanced method that Hydroponics, Aquaponics is soilless farming that combining plants and fish in the same ecosystem. Fish are grown in indoor ponds, producing nutrient-rich waste that is used as a feed source for the plants in the vertical farm. An aquaponic system is incredibly water-efficient, where about 1/6th of the water can produce up to eight times more food per acre when compared to traditional agriculture.



Aeroponics

This technique is an advanced form of hydroponics, Aeroponics does not use mediums like solid or liquid, instead that uses nutrient-rich mists instead of water to grow plant. Cultivators plant the seed in pieces of foam stuffed into small pots. While the plant canopy remains exposed to light, the roots get nourishment from the periodical spraying of nutrient- rich water or fine, high pressure mist. It is the most suited method as it requires neither water nor soil and requires no growing medium. The National Aeronautical and Space Administration (NASA) is responsible for developing this innovative indoor growing technique. In the 1990s, NASA was interested in finding efficient ways to grow plants in space. Aeroponics also promotes faster plant growth than the above methods and is highly water-efficient.



Advantages of Vertical Farming

- Reliable year-round crop production
- Unaffected by adverse weather conditions
- Better use of space
- Minimise water usage
- Environmentally friendly
- No chemicals or pesticides
- Reduce transport costs
- Highly energy efficient
- Safe for staff
- Low labour costs
- Vertical farming can be fully organic
- Fewer crop imports needed
- Protection from outside conditions

Disadvantages of Vertical farming

- Expert needed to set up a vertical farming project
- High upfront costs
- Significant operational costs
- High energy consumption
- High labour costs
- Significant maintenance efforts
- Carelessness could lead to a spread of pests
- Pollination problems
- May need official permissions
- Technology not mature yet

CONCLUSION

Vertical farming technologies are still relatively new cultivation system it conserved the resources and increase productivity per unit area as well as reduces the cost of transportation. Aeroponics, hydroponic and aquaponics systems reduce water loss and increase water use efficiency compared to the conventional agriculture. In vertical farming there is least pests and diseases incidence due to soilless cultivation.

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