

# Indoor Vertical Farming: The New Era of Agriculture

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## Introduction

As the world's population grows exponentially, our total supply of fruits and vegetables is falling. Traditional farming methods are having difficulties meeting this demand as it faces increasing problems such as water shortage, land scarcity, and an aging farming population with decreased interest from newer generations. In recent years, controlled environment agriculture has experienced a surge of popularity as it presents a compelling solution to all these problems and more. Indoor vertical farming can increase crop yields, overcome limited land area, and even reduce farming's impact on the environment by cutting down distance travelled in the supply chain.

## What is Indoor Vertical Farming?

Indoor vertical farming can be defined as the practice of growing produce stacked one above another in a closed and controlled environment. By using growing shelves mounted vertically, it significantly reduces the amount of land space needed to grow plants compared to traditional farming methods. This type of growing is often associated with city and urban farming because of its ability to thrive in limited space. Vertical farms are unique in that some setups don't require soil for plants to grow. Most are either hydroponic, where vegetables are grown in a nutrient-dense bowl of water, or aeroponic, where the plant roots are systematically sprayed with water and nutrients.

Vertical Farming is the practice of producing food in vertically stacked layers, such as in a skyscraper, used warehouse, or shipping container. The modern ideas of vertical farming use indoor farming techniques and controlled-environment agriculture (CEA) technology, where all environmental factors can be controlled. These facilities utilize artificial control of light, environmental control (humidity, temperature, gases...) and fertigation. Some vertical farms

use techniques similar to greenhouses, where natural sunlight can be augmented with artificial lighting and metal reflections

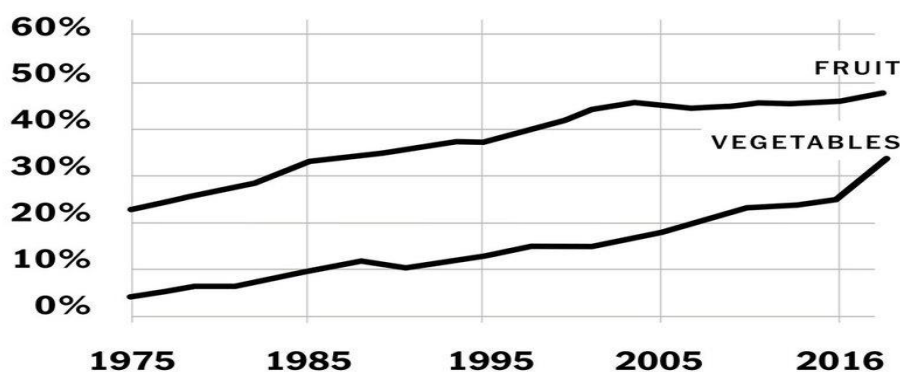
### How Vertical Farming Works:

There are four critical areas in understanding how vertical farming works:

1. Physical layout
2. Lighting
3. Growing medium
4. Sustainability features.
  - The primary goal of vertical farming is producing more foods per square meter. To accomplish this goal, crops are cultivated in stacked layers in a tower like structure.
  - A perfect combination of natural and artificial lights is used to maintain the perfect light level in the room. Technologies such as rotating beds are used to improve lighting efficiency.
  - Instead of soil, aeroponic, aquaponic or hydroponic growing mediums are used.
  - The vertical farming method uses various sustainability features to offset the energy cost of farming.

### A steady rise in imports, over four decades

Percentage of total U.S. sales of fresh fruit and vegetables



(Source: New York Times)

### Advantages and Disadvantages of Vertical Farming:

[www.justagriculture.in](http://www.justagriculture.in)

### **Advantages of Vertical Farming**

Having greater output from a small cultivation area is not the only advantage of vertical farming. Following are some of the major benefits of vertical farming:

- **Preparation for Future:** the world population is expected to rise in urban areas, and the growing population will lead to an increased demand for food. The efficient use of vertical farming may perhaps play a significant role in preparing for such a challenge.
- **Increased and Year-Round Crop Production:** Vertical farming allows us to produce more crops from the same square footage of growing area.
- **Less Use of Water in Cultivation:** Vertical farming allows us to produce crops with 70-95 percent less water than required for normal cultivation.
- **Not Affected by Un- favourable Weather Conditions:** Crops in a field can be adversely affected by natural calamities such as torrential rains, cyclones, flooding or severe droughts—events which are becoming increasingly common as a result of global warming. Indoor vertical farms are less likely to feel the brunt of the unfavourable weather, providing greater certainty of harvest output throughout the year.
- **Increased Production of Organic Crops:** As crops are produced in a well-controlled indoor environment without the use of chemical pesticides, vertical farming allows us to grow pesticide-free and organic crops.
- **Human and Environmentally Friendly:** Indoor vertical farming can significantly lessen the hazards associated with traditional farming. Farmers are not exposed to hazards related to heavy farming equipment, diseases like malaria, poisonous chemicals and so on.

### **Limitations of Vertical Farming**

Vertical farming has both pros and cons. Sometimes the pros of vertical farming are highlighted and not the cons. Following are the major limitations of vertical farming:

- **Difficulties with Pollination:** Vertical farming takes place in a controlled environment without the presence of insects. As such, the pollination process needs to be done manually, which will be labor intensive and costly.
- **Labor Costs:** As high as energy costs are in vertical farming, labor costs can be even higher due to their concentration in urban centers where wages are higher, as well as

the need for more skilled labor. Automation in vertical farms, however, may lead to the need for fewer workers. Manual pollination may become one of the more labor-intensive functions in vertical farms.

- **Too Much Dependency on Technology:** The development of better technologies can always increase efficiency and lessen costs. But the entire vertical farming is extremely dependent on various technologies for lighting, maintaining temperature, and humidity. Losing power for just a single day can prove very costly for a vertical farm. Many believe the technologies in use today are not ready for mass adoption.

### **Conclusion:**

Vertical farming technologies are still relatively new. Companies are yet to successfully produce crops at scale and make it economically feasible to meet the growing food demand. The performance of farms like Aero - Farms will determine how important a role vertical farming will play in the future to face the challenge of growing food demand.