

What You Should Know About Vertical Farming Is It the Future of Agriculture?

By 2050, the world's population is expected to be almost 10 billion, and feeding this massive population will be a huge challenge. Due to industrial development and urbanization, we are losing arable lands every day. [Scientists say](#) that the Earth has lost a third of its arable lands over the last 40 years. We don't know how much more we are going to lose in the next 40 years. Increasing food demand due to growing population along with ever decreasing arable lands poses one of the greatest challenges facing us.

Many believe that vertical farming can be the answer to this challenge. Is vertical farming the future of agriculture? Is it going to play a significant role to face the ever increasing worldwide food demand? Let's find out!

What Is Vertical Farming?

Vertical farming is a new practice of producing food on vertically inclined surfaces. Instead of farming vegetables and other foods on a single level, such as in a field or a greenhouse, this new method produces foods in vertically stacked layers commonly integrated into other structures like a skyscraper, shipping container or repurposed warehouse. Using the Controlled Environment Agriculture (CEA) technology, this modern idea uses indoor farming techniques. The artificial control of temperature, light, humidity, and gases makes producing foods and medicine indoor possible.

In many ways, vertical farming is similar to greenhouses where metal reflectors and artificial lighting augment natural sunlight. The primary goal of vertical farming is maximizing crops output in a limited space.

How Vertical Farming Works

There are four critical areas in understanding how vertical farming works: 1. Physical layout, 2. Lighting, 3. Growing medium, and 4. Sustainability features. Firstly, 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 life structure. Secondly, 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 the lighting efficiency.

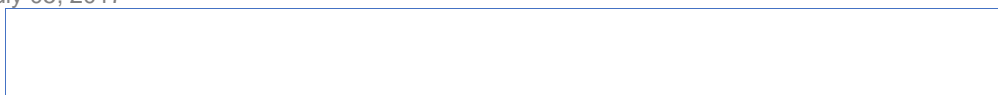
Thirdly, instead of soil, aeroponic, aquaponic or hydroponic growing mediums are used. Peat moss or coconut husks and similar non-soil mediums are very common in vertical farming. Finally, the vertical farming method uses various sustainability features to offset the energy cost of farming. In fact, vertical farming uses 95 percent less water.

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:

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- **Preparation for Future:** By 2050, around 80 percent of world population is expected to live in urban areas, and the growing population will lead to an increasing 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. In fact, 1 acre of an indoor area offers equivalent production to at least 4-6 acres of outdoor capacity. According to an independent estimate, a 30-story building with a basal area of 5 acres can potentially produce an equivalent of 2,400 acres of conventional horizontal farming. Additionally, year-round crop production is possible in a controlled indoor environment which is completely controlled by the vertical farming technologies.
- **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 Unfavorable 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 unfavorable weather, providing a 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 occupational hazards associated with traditional farming. Farmers will not be exposed to hazards related to heavy farming equipment, diseases like malaria, poisonous chemicals and so on. As it does not disturb animals and trees in land areas, it is good for biodiversity as well.

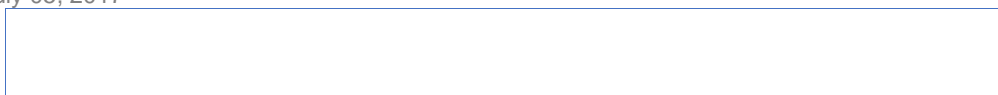
Limitations of Vertical Farming

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:

- **No Established Economics:** The financial feasibility of this new farming method [remains uncertain](#). The cost of building skyscrapers for farming, combined with other costs such as lighting, heating, and labor, can be more than the benefits we can get from the output of vertical farming. For a 60 hectare vertical farm, the building cost can be well over \$100 million. And while vertical farms will be attractive to locate close to cities, the high price of real estate will impede the financial viability of urban locations. The financial situation is changing, however, as the industry matures. One company, [Newbean Capital](#), recently announced equipment financing services aimed at the indoor farming sector.

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- **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:** In vertical farming, the labor cost can be very high due to the need for highly skilled workers. So, the hourly cost of workers may be significantly higher than for agriculture in general. And vertical farming technologies will require significant training, which will add to labor costs.
- **Fewer Jobs:** Automation in vertical farms may lead to the need for fewer workers. Manual pollination may become one of the more labor-intensive functions in vertical farms.
- **Lower Worker Efficiency:** The layout of a vertical farm may pose a challenge for the workers to reach each layer. Climbing to upper layers takes time and energy, decreasing the overall employee efficiency.
- **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.

Vertical Farming in the United States

AeroFarms is one of the major vertical farming companies in the U.S. Its 70,000-square foot facility in Newark, New Jersey is being called the world's largest vertical farm. In addition to this Newark farm, the company has eight other smaller vertical farms. The company has raised more than \$50 million from the likes of Prudential and Goldman Sachs. It has received over \$9 million in local and state grants as well.

The company hopes to produce over 2 million pounds of greens annually, making use of aeroponics technology. Aeroponics is a cultivation approach in which roots are suspended in air and a nutrient solution is applied in the form of a fine mist.

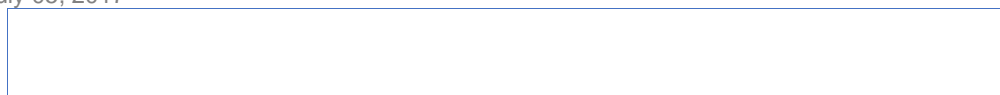
In its New Jersey facility, more than 250 types of greens and herbs are being grown on trays stacked 30 feet high. The AeroFarms products are free of fertilizers and pesticides. Currently, its products are available in grocery stores and supermarkets for \$3.99 a package.

AeroFarms plan on building a larger vertical farm in Camden, Jew Jersey. The 78,000 square feet farm is expected to be operational by 2018. The company got \$11.14 million grant in tax incentive from the Economic Development Authority of New Jersey. Once operational, the new farm will be called the new largest vertical farm in the world.

Conclusion

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Apart from AeroFarms, there are no other major vertical farming companies in the U.S. Japan perhaps has seen the most success of any country. Japan already boasts 200 large scale “farming as manufacturing” [plant factories](#), and China has another 80. And while vertical farming is a very small segment of the mark

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