

Short Review on Indoor Farming a Future of the Country

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Abstract

We are currently confronted with unstoppable tendencies in population growth, water scarcity, urbanization, and ongoing and persistent climatic change. All of these factors lead to dwindling arable land stocks per person. Land resources for agriculture are dwindling, and officials in the country are grappling with issues of sustainability and feeding the country's fast rising population. Exemplified urban vertical farming is the ideal approach for increasing food production in the future. Its technique aims to greatly boost the production of fresh fruit and vegetable harvests with minimising the environmental impact of gardening. A modern farming method provides a safe and healthy environment. food source, as well as protection from insects and floods. Biosecurity issues, lower transportation costs, and less fossil fuel depletion are all issues that need to be addressed. Biosecurity issues, lower transportation costs, and less fossil fuel depletion are all issues that need to be addressed. Agriculture has advanced significantly during the last century, producing more food than ever before. However, as the country's population approaches 100 crores, existing food production systems must undergo a fundamental shift to keep up with demand. Fortunately, we now have a variety of innovative technologies that enable us to do so. Hydroponics is one such new farming technology, and with the help of an indoor hydroponic garden kit, it is possible to produce sustainable variety of crops in half the time and for half the price.

Keywords: Vertical farming, Biosecurity issues, Agriculture, LED Grow Lights

INTRODUCTION

Inside organic farmers, also known as indoor farms, vertical farms, v farms, or plant factories, are another technique of cultivating fresh vegetables and other plants. While vertical farms for growing leafy greens are relatively new, mushrooms have been farmed in this manner for over a century. Another popular term is "urban farming." Small farms or gardens that are placed in urban areas are known as urban farms. They may be as simple as a communal vegetable garden. They could also incorporate sophisticated PVC towers that can be placed on the ground, in homes, warehouses, or on rooftops to grow fresh lettuce or kale. LED lights are used to grow the plants totally indoors. Farmers may now save money while supplying plants with just the appropriate wavelengths of light to promote growth thanks to the introduction of economical LED lighting solutions. Automation are examples of other advancements shown in Figure 1. We will delve into these tech improvements in deeper level in some other post [1–10].

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AGRICULTURE IN A CONTROLLED ENVIRONMENT

Indoor test farms, academic programmes, and fields of research focusing on indoor farming are all referred to as "indoor farming" by universities. University of Arizona and Cornell University are two institutions that offer CEA programs. Environmentally Controlled Agriculture is a type of agriculture that is

sophisticated and intensive. Plants are grown in a controlled environment in order to improve horticultural methods. Both greenhouse operations and indoor farms that employ artificial light are referred known as CEA shows in Figure 2.



Figure 1. Urban farming [10].



Figure 2. Indoor farming [1].

TYPES OF GROW LIGHTS GROW LIGHTS COME IN A VARIETY OF SHAPES AND SIZES, AND THEY CAN BE USED IN A VARIETY OF WAYS

Fluorescent Tubes: Fluorescent Tubes – Since they are inexpensive, easy to use, and readily available in a variety of sizes and shapes, fluorescent grow lights are the first choice for many home gardeners. Fluorescent lights, that fluoresce mostly in the blue range, are cool to the touch, making them acceptable for using over sensitive saplings. Micro lighting systems are ideal for gardening in tiny spaces. You can also use newer, full-spectrum fluorescent grow lights which, because they provide light on the both ends of the spectrum, are very close to natural daylight.

LED Grow Lights: They are compact, low-heat, lightweight, and easy to mount, LED grow lights offer several advantages to indoor growers and greenhouse owners. Although LED lights appear dim to human eyes due to the lack of yellow-green light, they deliver enough of red and blue light, which promotes plant development. Most dwellings' interior lighting is insufficient to enable photosynthesis. Traditional incandescent bulbs lack the spectrum and intensity of light required to replace the sun.

Household fluorescent bulbs can be used as grow lights if positioned within a few inches of the plant and left on for 16 hours every day shows in Figure 3.



Figure 3. LED Grow Lights.

Incandescent Lights: Old-fashioned incandescent lights are hot and should not be placed too close to delicate plants. However, some gardeners augment typical fluorescent tubes, which produce predominantly blue light, with incandescent lamps, which only provide light on the red end of the spectrum. Most indoor growers, on the other hand, are choosing for newer technology LED or fluorescent lights, which are easy to use and save energy shows in Figure 4.



Figure 4. Grow lights for indoor plants and indoor gardening.

Greenhouse: A greenhouse, located outside the home but still within, can be a fantastic way to raise food all year. It will take up room, but it will allow you to control the environment without having to

bring the garden inside. For the home gardener, growing plants in a greenhouse may be rewarding– not only can you propagate new plants from your existing landscape favourites, but you can also get a head start on your vegetable garden or grow it entirely indoors with the help of a greenhouse. Although the plants that will thrive in your greenhouse are highly dependent on your setup, there are species appropriate for greenhouse gardening for every type of greenhouse and environment.

Vertical Farming: The method of growing food on vertically inclined surfaces is known as vertical farming. Instead of growing vegetables and other things on a single level, such as in a field or a greenhouse, this approach grows them in vertically stacked layers, which are typically integrated into other structures like as skyscrapers, shipping containers, or converted warehouses. This current concept incorporates indoor farming techniques and Controlled Environment Agriculture (CEA) technology. Indoor food and pharmaceutical production is possible thanks to artificial temperature, light, humidity, and gas management. Vertical farming resembles greenhouses in many respects, where metal reflectors and artificial lighting supplement natural sunlight. Vertical farming's main purpose is to maximise crop output in a small space shows in Figure 5.



Figure 5. Vertical farming.

Advantages of Vertical Farming

1. It proposes a strategy for meeting future food demands.
2. It permits crops to be grown all year.
3. It consumes a lot less water.
4. Crops are unaffected by the weather.
5. It is possible to raise more organic crops.
6. There is less chemical and illness exposure.

The ability to produce more from a smaller crop area isn't the sole benefit of vertical farming. The following are some of the most significant advantages of vertical farming.

Preparation for Future: Around 68 percent of the world's population is predicted to live in cities by 2050, and the expanding population will boost food demand. Vertical farming might potentially play an important role in preparing for such a scenario.

Increased And Year-Round Crop Production: We can produce more crops with the same amount of growing space by using vertical farming. In fact, 1 acre of indoor space can provide the same amount of output as 4-6 acres of outside space. A 30-story skyscraper with a base area of 5 acres could possibly produce the equivalent of 2,400 acres of conventional horizontal farming, according to an independent calculation. Year-round crop production is also conceivable in a regulated indoor environment managed entirely by vertical agricultural technology.

Vertical farming allows us to grow crops with 70 percent to 95 percent less water than traditional farming.

- **Not Affected by Unfavorable Weather Conditions:** Natural calamities such as torrential rainfall, cyclones, flooding, or severe droughts can harm crops in a field—events that are growing more common as a result of global warming. Indoor vertical farms are less likely to be affected by inclement weather, ensuring consistent harvest output throughout the year.
- **Increased Production of Organic Crops:** So, they are cultivated in a well-controlled indoor environment without any need for agrochemicals, vertical farming allows us to raise pesticide-free and organic vegetables.
- **Human and Environmentally Friendly:** Traditional farming's occupational dangers can be considerably reduced by using indoor vertical farming. Farmers are not at risk from the dangers of heavy agricultural machinery, infections such as malaria, or harmful chemicals, for example. So, it is helpful to ecology as it will not harm inland animals or trees.

LIMITATIONS OF VERTICAL FARMING

Pollination Issues: Vertical farming is done in a controlled environment where insects are not present. As a result, pollination must be done manually, which is both time consuming and expensive.

Labor Costs: Vertical farming has significant energy costs, but labour expenses can be much higher because concentrated in urban regions, and costs are higher and more specialised labour is required. Vertical farms, but at the other hand, would necessitate fewer workers due to automation. Manual pollination may become one of the more labor-intensive procedures in vertical farms.

Too Much Dependency on Technology: The advancement of new technology can always improve efficiency and reduce expenses. However, the entire vertical farming system is very reliant on numerous technologies for lighting, temperature control, and humidity management. For a vertical farm, losing power for even a single day may be highly costly. Many people believe that today's technologies aren't ready for mass acceptance.

CONCLUSION

Farming is a new technology. Corporations have yet to succeed in mass-producing crops in a cost-effective manner to fulfil rising food demand. How crucial a role vertical farming will play in the future to meet the challenge of rising food demand will be determined by the performance of farms like AeroFarms. However, technology created for vertical farms are being adopted by other areas of the indoor farming sector, such as greenhouses, which can utilise natural sunlight but require much more space and lengthy paths to industry. While much of the hype revolves around large, commercial enterprises, average gardeners can learn from it. Food farmed indoors saves resources, allowing for year-round cultivation, and assures that you know where and how your crops are grown. As access to freshwater for growing food is one of the most important concerns of our day," she continues, "this is a transformational invention for agriculture as a whole.

REFERENCES

1. Yang J, Liu M, Lu J, Miao Y, Hossain MA, Alhamid MF. Botanical internet of things: Toward smart indoor farming by connecting people, plant, data and clouds. *Mobile Networks and Applications*. 2018 Apr;23(2):188-202.
2. Gnauer C, Pichler H, Schmittner C, Tauber M, Christl K, Knapitsch J, Parapatits M. A recommendation for suitable technologies for an indoor farming framework. *e & i Elektrotechnik und Informationstechnik*. 2020 Nov;137(7):370-4.
3. Roberts JM, Bruce TJ, Monaghan JM, Pope TW, Leather SR, Beacham AM. Vertical farming systems bring new considerations for pest and disease management. *Annals of Applied Biology*. 2020 May;176(3):226-32.
4. Beacham AM, Vickers LH, Monaghan JM. Vertical farming: a summary of approaches to growing skywards. *The Journal of Horticultural Science and Biotechnology*. 2019 May 4;94(3):277-83.

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5. Bowers H, Curran TP. The Utilisation of Indoor Farming to Reduce Ireland's Over-Reliance On The Cow. *Biosystems and Food Engineering Research Review* 23. 2018 May:128.
 6. Specht K, Zoll F, Schümann H, Bela J, Kachel J, Robischon M. How will we eat and produce in the cities of the future? From edible insects to vertical farming—a study on the perception and acceptability of new approaches. *Sustainability*. 2019 Jan;11(16):4315.
 7. Sabri FN, Hanif NH, Janin Z. Precision crop management for indoor farming. In 2018 IEEE 5th International Conference on Smart Instrumentation, Measurement and Application (ICSIMA) 2018 Nov 28 (pp. 1-4). IEEE.
 8. Eaves J, Eaves S. Comparing the Profitability of a Greenhouse to a Vertical Farm in Quebec. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*. 2018 Mar;66(1):43-54.
 9. Mempel H, Jüttner I, Wittmann S. The potentials of indoor farming for plant production. *at-Automatisierungstechnik*. 2021 Apr 1;69(4):287-96.
 10. Acosta-Coll M, Anaya D, Ojeda-Field L, Zamora-Musa R. Low-Cost Smart Indoor Greenhouse for Urban Farming. In *International Conference on Computational Science and Its Applications 2021* Sep 13 (pp. 120-132). Springer, Cham.