Vertical Farming: A Boon for Indian Agriculture

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Abstract

Vertical farming presents a transformative approach to agriculture by using stacked or high-rise systems to grow crops in urban environments, offering a solution to rising global food demands and addressing the limitations of traditional farming. Conventional agriculture is increasingly challenged by resource depletion, climate variability, and social changes such as urbanization and labour shortages, leading to inefficiencies and rising food prices. Vertical farming reduces land use, minimizes water consumption, and decreases food transportation distances, though it relies on electricity for climate control and lighting. While it is not a replacement for traditional farming, vertical farming can complement it by providing fresh, locally grown produce, helping to close food security gaps. Educating consumers and modernizing the perception of farming as a technologically advanced, sustainable, and data-driven industry will be key to its adoption and future success.

Introduction

Vertical farming is a highly promising agricultural practise that aims to increase food production to satisfy the needs of the planet's growing population. Growing in vertical frames or even high-rise farms, conserving valuable ground space while transferring farms into cities, and growing nutrition crops without topsoil are some of the techniques used. Rising food costs reflect underlying trends leading to failures with traditional agriculture. Vertical farming, a technology-driven model of agriculture that offer a means to address farm output and food security in the future, even if it may not impact food prices in the many months ahead.

According to world bank research paper (2008), Over the past 20 years, the average yearly increase in food costs over the world has been 2.6 percent. If that pattern persists, it poses a threat to our entire food security in addition to endangering a baseline standard of living as more disposable income is directed toward food. Malnutrition and hunger are still problems, particularly in poor nations. Political upheaval and violence have also been related to issues of food scarcity. Vertical farming enables the construction of food production facilities close to urban areas instead of rural places. Food production can move upward rather than outward by placing vegetables and fruit in planters in underground facilities, on top of buildings, or even in high-rise facilities. The crops raised can be grown fresh in urban settings and travel less kilometres to customers, lowering the number of food miles per serving.

Why are we disappointed by conventional farming?

In order to raise crops sustainably, field farming requires labour, favourable weather, sufficient sunlight for photosynthesis, irrigation, and often pesticides. That hasn't changed, but by utilizing a framework researchers designed, we can identify the causes of why conventional farming isn't performing as effectively as it once did. We can predict how the future might play out by looking at demographic and social changes, depletion of resources, disparities and variability, scale and complexity. When evaluated collectively, these major

trends should provide causes for the changes in conventional agriculture.

1. Demographic and social changes

The rising world population is surpassing the world's food supply. According to the Food and Agriculture Organization (2017) of the United Nations, in order to meet the world's food demands, food production must rise by 70% before the year 2050. Rapid urbanisation is replacing agricultural land while also leading people away from farming as a career.

2. Depletion of resources

70% of the water we use worldwide is spent for agriculture, which raises the total cost. The methods used in agriculture to produce food are not sustainable, as it is predicted that water scarcity will affect half of the world's population by 2030. Ineffective supply chains increase the scarcity effect. During the processes of harvesting, packing, processing, and distribution, perishable crops blotch and spoil. According to a Natural Resources Defence Council analysis (2017) on food from field to fork to landfill, up to 40% of all crops are ultimately lost.

3. Disparities and variability

In addition to long-standing issues with hunger and persistent poverty in poor countries, differences related to food prices have also developed in developed nations. As global food requirements and the costs of agriculture continue to rise, the prospects of improving health and nutrition circumstances remain grim for low-income families in both developed as well as developing countries.

Vertical Farming arose out of challenges

By providing a different method of producing food that does not share the same volatility and danger as conventional agriculture, vertical farms can help in meeting the needs of our increasing population. Vertical farms are not carbon neutral, while using less water and agricultural area than conventional farming. Their electricity supply, which powers lighting and regulates the indoor climate, has a significant impact on their carbon footprint. The carbon cost of vertical farming will keep declining as more people switch to renewable energy sources. Although it may not lower prices from a market standpoint, vertical farming is expected to help humanity load up gaps in overall food need where conventional agriculture fails miserably.

1. Change the way people think about farming

It has been said that traditional farming is labour-intensive and removed from a modern, urban lifestyle. Farm work is sometimes linked with poverty and loneliness, but with the vertical farm, in addition to managing to the crops, farmers also need to be data analysts, bio scientists, and strategic manager. Urban farms could displace current low-skilled workers if they expand at their current rate. An adjustment like this is characteristic of any significant sectoral change; economists refer to it as the rebound effect. Understanding this transformation in farming provides professionals who are either entering or already in the vertical farming industry with leverage when communicating the need to embrace vertical farming with different stakeholders.

2. Educate consumers

Vertical farming is not monstrous food but might as well be without any efforts to educate the public. Companies can use promotional initiatives to explain the value of non-field farming crops and educate consumers on the nutritional and environmental benefits of vertical farming. Consumers may have chance to try hydroponic and aeroponic produce and judge the taste for themselves.

3. Modernising agriculture's future

While it is silly to expect vertical farms to completely replace conventional farms, it is more likely that they will need to work in parallel if we are to satisfy future food demands. It is technologically advanced, environmentally friendly, economically smart, and above all, health-conscious. Vertical farming is a reality; it is not a fairy tale.

In conclusion, vertical farming represents a transformative solution to many of the challenges facing traditional agriculture. As global populations grow, resource depletion, urbanization, and rising food prices threaten food security. Vertical farming addresses these issues by utilizing innovative techniques to grow crops in controlled environments, closer to urban centers, with less reliance on land and water. While it is not a replacement for traditional farming, it offers a sustainable, efficient, and technologically advanced complement, capable of reducing food waste, cutting down on food miles, and ensuring fresh, nutritious produce. As renewable energy adoption increases, the carbon footprint of vertical farming will decline, further solidifying its role in modern agriculture.

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