



# VERTICAL FARMING BOON OR BANE IN INDIA: A REVIEW

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## ABSTRACT

*The main forces influencing the development of agricultural research include advances in science and technology as well as global urbanisation. Food tastes have evolved as a result of career shifts, rising per capita wealth in developing countries, and worldwide connections. The production of more and better food is made more difficult by these developments and the growing population. Utilizing methods from traditional agriculture from the 20th century to increase productivity of agriculture has its limitations. The dependency on chemical fertilisers and pesticides for productivity enhancement and pest management, respectively, poses a hazard to the environment and is a significant restraint on world food supply. These developments imply that new agricultural innovations are unavoidably required, and that these technologies should be included into mainstream agriculture (the big agriculture as we may call). The research focuses for overcoming these limitations include vertical farming and organic farming. By vertically stacking the farms, more may be produced on a less amount of area thanks to vertical farming. The needs for food supply may be satisfied within cities with this method, which lowers transportation costs and the harm that fuels due to the environment. It is also ideally suited for the continually expanding urban population across the world. On the other hand, organic farming adheres to the principles of minimising the use of chemicals in agriculture and is therefore environmentally beneficial. In order to fulfil the rising demand for food, these approaches may be used to increase output and productivity.*

**KEYWORDS:** Global urbanisation, Agriculture innovation, Vertical stacking, organic farming,

## INTRODUCTION

Vertical farming is the new concept came in the year 1915 when Gilbert Ellis Bailey coined the term “vertical farming” and wrote a book titled “Vertical Farming”. But the modern concept of vertical farming was proposed in 1999 by Professor Dickson Despommier. With the geometric growth of population in the world the need and future of vertical farming is parallelly grow at faster rate. In India the rapid growth of population require food on a large scale. India have only 2.4% of world land surface and constitute 17.4% population which require food for their livelihood. The tremendous growth of population require land to live and this will directly affect the agriculture land as well. Shrinking of agriculture land due to high growth of population result the new way of agriculture practices vertical farming is best option to make sustainable agriculture practices without creating environmental affect and fulfil food demand for growing population. **In the view of Dickson Despommier 2007** vertical farming will save the environment through without harming forest and decrease the CO<sub>2</sub> which is highly toxic to human health as well.

## TYPES OF VERTICAL FARMING

Shape and size of vertical farming depend upon the area available to do such types of farming but it is noted that mainly three types of vertical farming based on soil used in such farming namely Hydroponics, Aeroponics, and Aquaponics.

1. **Hydroponics:** The predominant growing system used in vertical farms; hydroponics involves growing plants in nutrient solutions that are free of soil. The plant roots are submerged in the nutrient solution, which is frequently monitored and circulated to ensure that the correct chemical composition is maintained
2. **Aeroponics:** The most effective method of producing plants for vertical farms is an aeroponic system, which may use up to 90% less water than even the most effective hydroponic ones. These aeroponic systems have also been demonstrated to increase vitamin and mineral absorption, making the plants healthier and maybe more nutrientdense.
3. **Aquaponics:** An aquaponic system expands on the hydroponic system by integrating fish and plants into one environment. Fish are raised in indoor ponds, and the excrement they produce is nutrient-rich, serving as a source of food for the plants in the vertical farm. The effluent is filtered and cleaned by the plants before being recycled into the fish ponds.

Even though aquaponics is utilised in smaller-scale vertical farming systems, the majority of commercial vertical farming systems concentrate on cultivating a select number of quickly expanding vegetable crops and do not have an aquaponics component. **Scenario of Vertical Farming in India:** India is currently home of more than 125 crore of population which is second most densely populated in the



world. This high concentration of population of require food security even though high production of cereals and other crops with the helps of water facility and availability there are severe problem of hunger and food insecurity in India. To meet the demand of food for growing population directly affect the climate change through use of water, pesticides in the fields, fertilizers and other anthropogenic factors as well. To reduce the burden on climate especially soil, and water used vertical farming introduce in India with the objective of better organic production, food security, better job opportunity, and so on so forth. It is noted that Vertical farming is definitely a solution to critical problems in Indian farming like lack of supply or oversupply of farm produce, overuse of pesticides, overuse of fertilizers, deteriorating soils and even the unemployability **M.S Sonawane (2018)**. **In the view of A Chatterjee et al (2020)** Vertical farming helps in proper utilization of land, food security, and poverty alleviation in country.

### RESEARCH ON VERTICAL FARMING IN INDIA

Vertical farming is outcome of research innovation in agriculture sector which is need of hour especially in India because geometric growth of population requires food security and environment safety. Indian council of agriculture and Vertical farming association works together technological innovation and its implication on vertical farming in major cities in India which is fruitful in near future. The research and its adaptation are in major cities in India and extend in another minor city as well.

### MAJOR COMPANY OF VERTICAL FARMING IN INDIA

With the growing demand of food especially in city premises the number of companies set and develop vertical farming provide tools and technique to grow and cultivate crops such as UrbanKisaan, UGF Urban green fate, Triton foodwork, 365Dfarms, etc.

1. **UrbanKisaan:** Due to the operation of several vertical farms in the cities of Hyderabad and Bangalore, UrbanKisaan is unquestionably one of India's largest vertical farms. UrbanKisaan takes pleasure in generating 30 times more produce than conventional farming while using 95% less water, The company's website and app allow customers to purchase a range of its items online.
2. **UGF Urban Green Fate:** The following vertical farm, which works locally in Mumbai and internationally in the US, was founded in 2012. UGF farms began its adventure towards vertical farming by creating healthy hydroponic micro-farms out of abandoned locations including vacant lots, gaps between homes and buildings, and restaurants. The firm, which produces leafy greens and microgreens with minimal carbon footprint, is devoted to micro farming. Additionally, UGF educates families, schools, and communities on how to grow their own food and lower their carbon footprints through its educational programmes and seminars.
3. **Triton Food works:** Modern farming techniques like hydroponics and aeroponics are used at this vertical farm

in Delhi to produce fresh veggies. Additionally, the business has created its own aeroponics technology, enabling it to produce practically any crop more quickly and with a lower risk of infections and illnesses. A remarkable 150,000 square feet of vertical farms are owned and run by Triton FoodWorks, a company that was founded in 2014. In addition to more than 20 different crop varieties, they also cultivate oregano, bell peppers, cucumbers, bell pepper plants, microgreens, cherry tomatoes, strawberries, tomatoes, coriander, broccoli, and leafy greens.

4. **365Dfarms:** 365Dfarms, located in Pune is India's first movable hydroponic vertical farm. Built-in a shipping container, this farm produces lettuce all year round, using high-tech. The irrigation system of 365Dfarms cuts water consumption by 90% compared to horizontal farming due to its smart irrigation system.

### MARKET AND GROWTH OF VERTICAL FARMING INDIA

High immigration in the city make pressure on food security resultant vertical farming need and demand to fulfil the requirement of migrated and growing population. **According to market data of Asia pacific vertical farming** in the year 2021 the total value of vertical farming is 0.78 billion US Dollar and estimated that 2.77 billion US dollars in the year 2026 with CAGR of 29%.

**Discussion and Conclusion:** food is basic requirement of growing human population. The country like India which is second most populated in the world have more crisis of food especially in urban centre because shrinking of agriculture land due to puccanization of land by build a mall, office, residential centre, etc. this makes pressure on food growing for residential population live in the city as well. So, reduce the food crisis and availability vertical farming is urgent need in the country which helps to sustainable agriculture practice by using minimum water and land surface of the country. It is necessary to grow such type of agriculture practices in India. Apart from that vertical farming also help in employment generation especially for white colour labour or specialised agriculture labour.

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