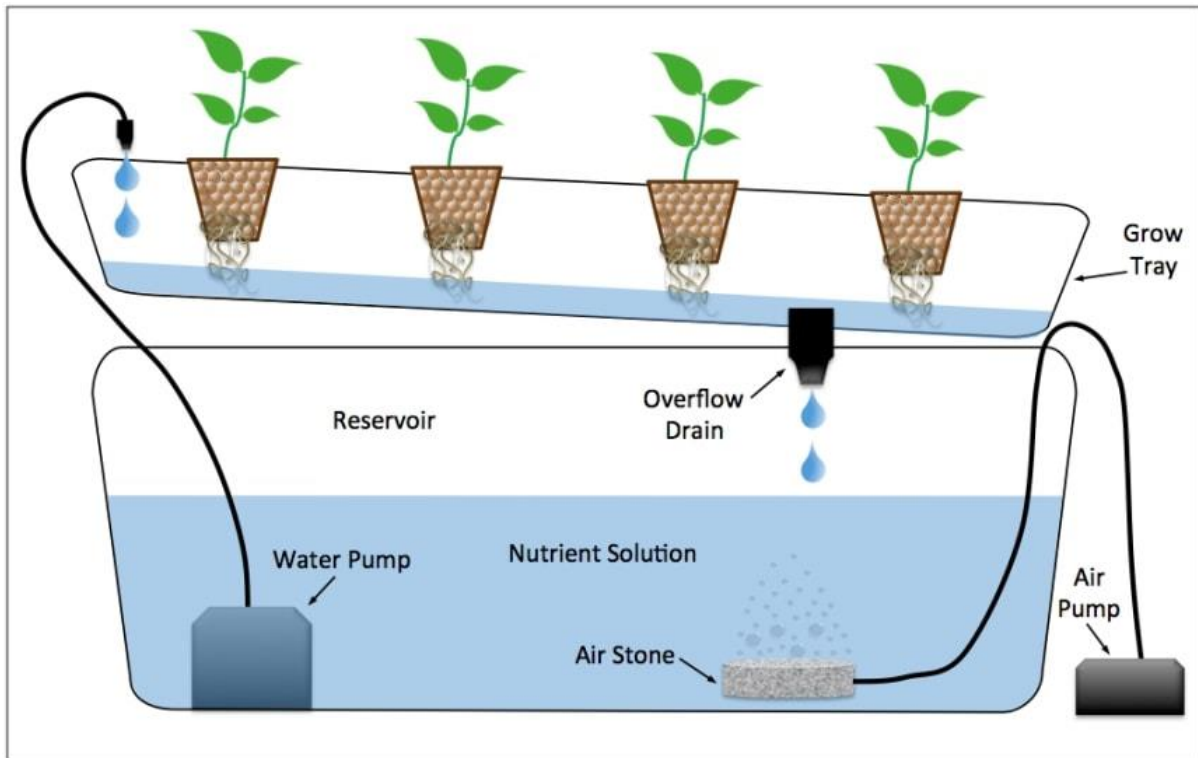


# WHAT IS VERTICAL FARMING

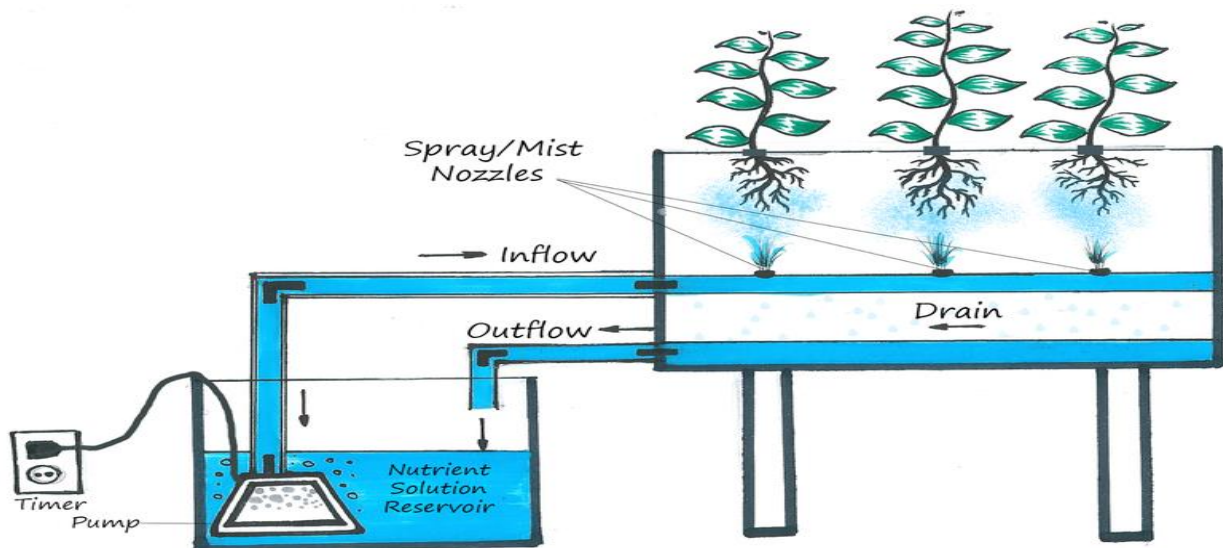
Prime agricultural land can be scarce and expensive. With worldwide population growth, the demand for both more food and more land to grow food is ever increasing. But some entrepreneurs and farmers are beginning to look up, not out, for space to grow more food. One solution to our need for more space might be found in the abandoned warehouses in our cities, new buildings built on environmentally damaged lands, and even in used shipping containers from ocean transports. This solution, called vertical farming, involves growing crops in controlled indoor environments, with precise light, nutrients, and temperatures. In vertical farming, growing plants are stacked in layers that may reach several stories tall. Although small, residential vertical gardening (including window farms) has been around for decades, commercial-scale vertical farms have only been serious for the past few years. Types of Vertical Farms Vertical farms come in different shapes and sizes, from simple two-level or wall-mounted systems to large warehouses several stories tall. But all vertical farms use one of three soil-free systems for providing nutrients to plants—hydroponic, aeroponic, or aquaponic.

*The following information describes these three growing systems:*

**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 National Aeronautical and Space Administration (NASA) is responsible for developing this innovative indoor growing technique. In the 1990s, NASA was interested in finding efficient ways to grow plants in space and coined the term “aeroponics,” defined as “growing plants in an air/mist environment with no soil and very little water.” Aeroponics systems are still an anomaly in the vertical farming world, but they are attracting significant interest. An aeroponic system is by far the most efficient plant-growing system for vertical farms, using up to 90% less water than even the most efficient hydroponic systems. Plants grown in these aeroponic systems have also been shown to uptake more minerals and vitamins, making the plants healthier and potentially more nutritious.



**3. Aquaponics:** An aquaponic system takes the hydroponic system one step further, combining plants and fish in the same ecosystem. Fish are grown in indoor ponds, producing nutrient-rich waste that is used as a feed source for the plants in the vertical farm. The plants, in turn, filter and purify the wastewater, which is recycled to the fish ponds. Although aquaponics is used in smaller-scale vertical farming systems, most commercial vertical farm systems focus on producing only a few fast-growing vegetable crops and don't include an aquaponics component. This simplifies the economics and production issues and maximizes efficiency. However, new standardized aquaponic systems may help make this closed-cycle system more popular.

