

Urbanization and food production: vertical farming

[Business](#), [Industries](#)



Over the centuries, there has been an undeniable symbiosis between urbanization and food production. Before the start of agricultural cultivation, it could be argued that there was no such thing as a city. The history of human settlement starts with the hunter gatherer bands setting up temporary camps in areas where fruit, nuts, fish and grain were plentiful. The emergence of settled living was only possible through the deliberate concentration of food production on clearly defined areas of land.

Contemporary cities have changed profoundly. Now, we are hardly aware of the origin of the food we are eating, the environmental impacts of its production and the energy used in processing and transporting it to our homes. The food we eat consumes more energy than the calories it contains.

The thesis starts by looking at different megacities of the world across time, and forming a timeline starting from Jericho which was the first city originating in 7000bc till Tokyo in 2016 – the present megacity. The study shows how these megacities used the immediate resources like rivers, forests and water bodies to cater to their inhabitants.

The study concluded that the cities now, are becoming net importers rather than net producers of food, which leads to a decrease in the quality of vegetables, and increase in food wastage, carbon emissions and plastic waste from food packaging.

With the rapid growth of megacities, converting hinterlands to towns and eating away green areas, there is a pressing need to grow vertically, in the city itself, to reduce food miles.

The thesis proposes farming in dense cities by going vertical, using new farming techniques combined with traditional techniques to achieve food security and reduce food miles, thereby making the city self-sufficient in terms of food. The resulting design is a proposal of a community farm, serving as a prototype for the entire city. Each module can cater to an area of 1km sq. or more, according to the requirements and site conditions. It can serve as a system where people invest their money/labour to get locally grown food for themselves or earn profits by selling it in the retail shops. The proposal is a mixed use typology combining farming, housing retail, institutional and commercial spaces.

To achieve maximum yield in the minimum cultivable area, hydroponic farming system which is a soil-less farming technique is used for most crops. Traditional soil based farming technique is used on the ground plane for specific crops, which cannot be grown hydroponically. The placement of each crop is determined based on their light requirement. There's also a provision for indoor farming for non- seasonal crops which can be grown by creating controlled environment.

The form, orientation, height and spacing of the towers are generated through various studies to achieve energy efficiency. The conical form of the structures is derived such that the crops get maximum sunlight on all floors. The farming component runs in a stepped spiral for continuous water circulation, collection and recycling. The façade, canopy, and the accessible roof consist of hollow steel members, which support the hydroponic system

and services for the crops to grow. A central void makes the space more open and interactive.

Living units are placed on the northern side, while the farming component sits on the southern side of the structure. The area between housing and farming acts as a buffer space for community and post production activities like processing, arranging and cleaning vegetables. Labs, being placed at different levels, allow for consistent quality checks and provision of required nutrients for the crops.

The accessible cultivable roof of the podium provides direct access to the people of the surrounding area, making it a community hub. Voids in the podium function as courtyards or approaches for the lower levels, housing retail, institution and commercial spaces, thereby making the prototype a self-sustaining unit.