URBAN FARMING IN MUMBAI

A Capstone Project Submitted in Partial Fulfillment of the Requirements of the Renée Crown University Honors Program at Syracuse University

Ankur Patel

Candidate for B.Arch. Degree
and Renée Crown University Honors

May.2010

Honors Capstone Project in _______ Architecture _________

Capstone Project Advisor: __________ Robert Svetz __________

Honors Reader: __________ Lena Vassilev __________

Honors Director: __________ Samuel Gorovitz __________

Date: __________ 05.10.10 __________
The vertical farm concept has been proposed over the last decade by designers and ecologists as the radical solution to the global food crises in advanced urban areas such as New York, Chicago and other highly populated and economic cities around the world. However these sites lack the urgency and necessity that is required to cultivate the idea of vertical farming into reality. I am advocating vertical farming as a dense urban solution, tested in a climatological & socioeconomic situation that is more responsive to the archetype’s needs than anywhere it has yet been proposed – Mumbai.

The city can act as the place for a new form of urban farming which responds to both Mumbai’s problems and strengths. Mumbai has a large slum population living on land that is being increasingly encroached onto by new urban development. As a result this city’s productive, educated, and family orientated labor force is denied clean water & infrastructural amenities. Despite these unreasonable shortcomings, this disenfranchised population is willing to live in crowded spaces and take on the jobs which are crucial to the growth of the city, including the infrastructural services on which the middle class, who are responsible for the city’s development, relies on.

My urban farming proposal not only provides the city with an infrastructural icon but also supplies basic needs to the slum inhabitants which reside around and within the urban farm, serving as the backbone of the new infrastructural archetype of the urban farm. In increasing the standard of living within the slums and creating employment opportunities the city can see a positive movement of it lower class which follows the upward progress of the rest of Mumbai. In this way the city receives an agricultural symbol in an infrastructural architecture which provides food, water, education and employment to develop a new form of growth within Mumbai.

1 Despommier, Dickson. *The Vertical Farm*. p1
2 Despommier, Dickson. “A farm on every floor”. p19
By the year of 2050, nearly 80% of the earth’s population will reside in urban centers. The world population is estimated to increase by 3 billion, a 50% increase in less than 50 years. To provide enough food based on traditional farming practices the world would need an amount of land comparable to the continent of South America solely for the purpose of agriculture.¹ With the scarcity of land for crop growing an alternative strategy must be developed before this urgent need for food sources becomes a large and present crisis. Obtainment of food supplies without encroachment on land and ecosystems is necessary; as an evolution of the traditional method of farming, which involves the construction of urban food production centers, vertical farming proposes a more efficient and productive method to supplying the food needs of metropolitan areas. Continuously growing crops within tall high rise buildings inside a controlled and monitored environment one would be able to begin producing yields larger than horizontal farming with a much smaller footprint.

Due to the removal of soil and the capability of stacking crops, vertical farms can be produce with great efficiency and use of space, one indoor acre can produce on average at least 4-6 outdoor acres worth of harvest, a larger ratio can be true depending on the specific food being grown.² The high yields of food on small more efficient sites allow the construction of vertical farms in urban areas, creating an urban farm which feeds the city around it rather than having to store, ship and transport from suburban areas to the cities thousands of miles away. This direct connection between the farm and the consumer eliminates shipping fees, storage costs and packaging prices; Weather would no longer dictate harvests because vertical farms would be able to produce yields all year long, with no need to submit to issues of temperature, rainfall, pests and other inconsistencies related to changes in season.

¹ Despommier, Dickson. The Vertical Farm. p1
² Despommier, Dickson. “A farm on every floor”. p19
Countries with substantial population growth, especially in cities would possess the urgency and need for new food sources that vertical farming could provide. Expanding cities with major population influxes would present large new groups in need of greater food sources and employment within the city infrastructure. Emergent nations in which land in the city is being developed at a rapid and an unconstrained manner would create economical feasibility for vertical farming. The most populous countries in the world are China and India, which both reach well over one billion inhabitants, accounting for 19% and 17% of the world’s population respectively; the next closest country is the United States at 300 million, which only has 4% of the world’s population. India and China both have numerous cities ranking high in population, but only India includes four that are ranked highly in both population and density; furthermore India offers a better climate in which vertical farming can thrive, is in larger need for energy, and in terms of population and city development is showing more rapid growth. India also boasts the most populous and dense city in the world: Mumbai.

The economic boom in Mumbai’s service sector has drawn in millions of people; the middle class population has grown in Mumbai, but so has every other class with it. While this flood of educated middle class people gaining employment in newly erected offices and businesses has brought production and revenue to the city, it also demanded something else. With a large influx of people, a service infrastructure is necessary. Millions more came to the city in search of opportunity of a different kind. In Mumbai it is estimated that 54% of the population are slum dwellers; compared to 25% in Chennai, 19% in Delhi and 12% in Kolkata, the three closest percentages of slum dwellers in Indian cities. This 54% of the population serves as the backbone of the city which saw the rapid growth of middle class over the past few decades and a growth of

1 Despommier, Dickson. *The Vertical Farm.* p1
2 Despommier, Dickson. “A farm on every floor”. p19
the slum people to support them. This underrepresented group, which accounts for half of the population of Mumbai, has claim to only 5-8% of the land area. This staggering disconnect between amount of land and amount of people causes unbearably dense areas of overcrowded and unhealthy living amidst a city supposedly booming with economical and financial opportunity. In this way, Mumbai can be read as two separate cities: one of service, of the slum people who live in conditions without proper amenities and work laboriously to create a better future for their children; and one of the served, of the middle class who have come to the city in search of an opportunity to reap the benefits of their skills and an economy in which there is a demand for them.

Although the government has made some efforts to help these citizens it has not been enough and the efforts have been so far transparent in that the government’s agenda to reallocate slum land for development has been the primary objective for these projects rather than giving the slum dwellers the opportunity to better their lives and ensure better futures for their children; while social injustices rarely get the funding they deserve and the government is right to put land development as a high priority because of the money it does bring into the city a capitalistic solution can still have social implications. Currently Mumbai is in a crisis of population inflation which has lead to climate disasters, energy concerns, needs for job creation and new more sustained food sources. This crisis can be the catalyst for the development of a new architectural typology in a place that actually needs it. While social justice might not be the most convincing reasoning for the creation of vertical farms from an economic standpoint, the ulterior reasons are capitalistic enough in their endeavors to receive proper funding to make vertical farming more than just reasonable in Mumbai, but ideal.

1 Despommier, Dickson. *The Vertical Farm*. p1
2 Despommier, Dickson. “*A farm on every floor*”. p19
Vertical farming creates a sustainable environment for city centers along with employment opportunities for the slum population; the massive potential of Mumbai’s cheap labor force can again become the backbone for the cities production and output. Along with jobs, urban farming would initiate opportunities for the slum people and their children to eventually alleviate density issues in heavily populated areas which would lessen with more and more families gaining an opportunity to progress. This in turn will give the government the valuable land they have been needing in order to further the development and growth of the city without losing the infrastructure and workforce that these people provide. Sewage systems in slums could connect to the vertical farms to reorganize waste management in down trodden areas. Proper education on farming in an urban environment would lead to personal farms for the slums which would create a food supply and a healthier lifestyle for the dwellers as well as a greater knowledge on how to farm more efficiently. With the influx of middle class continuing to flow into the city, more water, food, power and land in necessary to accommodate them; the farming initiative begins to provide those necessities without destroying green land and millions of lives in the process. Not only will the production of food help the people but the smarter and more efficient use of water, energy and waste will combat affects of climate change and deforestation, the vertical farm will substitute for the green spaces that once protected and provided for the city. Urban farming serves as the cohesive solution for the city of Mumbai.

1 Despommier, Dickson. The Vertical Farm. p1
2 Despommier, Dickson. “A farm on every floor”. p19