

CREATING URBAN AND BUILDING SPACE FOR AGRICULTURAL SPACE TOWARDS SUSTAINABLE JAKARTA

Albertus Prawata

Architecture Department, Faculty of Engineering, Binus University
Jl. K.H. Syahdan No. 9, Palmerah, Jakarta Barat 11480
albertus_prawata@binus.ac.id

ABSTRACT

Agricultural sector will be one of the many sectors affected by the rapid growing population in the cities. The agricultural crisis would lead to more dependence on imports for food. Another problem caused by the rapid growing population is the relocation of agriculture industries to the countryside. This will result in higher price for food, air pollution, and traffic jam. Indoor controlled environment agriculture is one of the strategies that can help the city, so it can produce its own food and create sustainable lifestyle. This paper focuses on how to create Jakarta, one of the big cities in South East Asia, into a city based on agricultural system that can ensure food safety and make a sustainable urban lifestyle without damaging the environment. Also, it discusses the possibilities of converting the urban or building space into agricultural space, which can support the food production for the people of Jakarta.

Keywords: *agricultural crisis, indoor environment agriculture, urban lifestyle, agricultural space*

ABSTRAK

Sektor pertanian akan menjadi salah satu dari banyak sektor yang terkena dampak pertumbuhan penduduk yang cepat di kota-kota besar. Krisis pertanian akan menyebabkan lebih banyak ketergantungan pada impor makanan. Masalah lain yang disebabkan oleh pertumbuhan populasi yang cepat adalah relokasi industri pertanian ke pedesaan. Hal ini akan mengakibatkan peningkatan pada harga makanan, polusi udara, dan kemacetan lalu lintas. Indoor controlled environment agriculture atau pertanian di dalam rumah adalah salah satu strategi yang dapat membantu kota, sehingga dapat menghasilkan makanan sendiri dan menciptakan gaya hidup yang berkelanjutan. Makalah ini berfokus pada bagaimana menciptakan Jakarta, salah satu kota besar di Asia Tenggara, menjadi kota dengan sistem pertanian yang dapat menjamin keamanan pangan dan membuat gaya hidup perkotaan yang berkelanjutan tanpa merusak lingkungan. Selain itu, makalah ini membahas kemungkinan mengubah ruang kota atau bangunan ke ruang pertanian yang dapat mendukung produksi pangan untuk masyarakat Jakarta.

Kata kunci: *krisis pertanian, pertanian indoor, gaya hidup urban, ruang pertanian*

INTRODUCTION

The world's population continues to grow at an alarming rate. At the same time, urbanization will also increase. Forecasts from the UN suggest that by the year 2050, it is estimated that there will be 9.3 billion people on earth, and almost 7 billion will live in the cities (UN, 2011).

Jakarta covers a land area of 662,33 km². It has a population of 9.7 million people, making it one of the densest cities in the world. The conversion of land in Jakarta will further reduce the amount of food production, creating higher imported and produced food outside Jakarta. In order to ensure food safety, immediate actions and strategies need to be taken. To name an example, urban farming can be a response to overcome the skyrocketing food prices in Indonesia. As urban farming has received a lot of support by the government as well as the private sectors, it may develop sufficiently to offer viable alternative livelihood options for a lot of impoverished and disadvantaged communities in the coming years. With the increase of urbanization and rural-to-urban migration, urban farming may provide an opportunity for rural farmers who migrate to cities to continue using their skills to generate income. This, in fact, is a more preferable approach rather than asking them to work as unskilled laborers. In this case, there is a scope for an intervention in the dissemination of information, setting up basic structures, providing education on the newest technology, encouraging research on innovative use of technology and development of supply chain management.

METHOD

This paper contains a study of the possibilities to use building space as a farm. The research is based by the literate study of papers and books of building farming in Jakarta and other parts of the world.

RESULTS AND DISCUSSION

Urban Farming and Jakarta's Urban Problems

The development of urban farming in Jakarta is rapidly increasing. The private sectors and a number of local communities are actively transmitting this positive virus to Jakarta residents. An example is Indonesia Gardening Community (*Komunitas Indonesia Berkebun*), which started its activities by making use of a vacant land in the city by planting food crops which can be harvested later for personal purposes. Many residential areas have begun to realize the importance of urban farming in Jakarta. An example is *Kampung Rawajati*, which is located in the area of Pancoran, South Jakarta. The local government now refers this place as an Agro tourism village. There you can see hundreds of plants, ranging from medicinal plants, productive plants to ornamental plants grown independently by people who are committed to create a green environment. Furthermore, *Kampung Rawajati* (Figure 1) residents have also implemented a waste recycling system to its marketing waste, which makes this region as a pilot area for other regions in Jakarta.

Jakarta's problems are increasingly complex, starting from population density; land use change to traffic congestion throughout the city. They will become a serious impact for Jakarta residents. According to Albamar (2012), currently the length of road in Jakarta has reached 7,208 kilometers, while the need for the road in Jakarta until 2012 is accounted for 12 thousand kilometres which only fulfils 60 percent the need of Jakarta residents. Furthermore, Ali (2012), an expert in environmental

stated that traffic congestion has reached a loss of 28.1 trillion, with the greatest amount of losses comes from the fuel sector that reaches up to 10, 7 billion per year. In 2011, the Transportation Minister Freddy Numberi in announced that truck operating hours to pass the freeway in the city are restricted from 5 to 10 pm. In the absence of a decent transportation system and goods distribution, this will become a problem for logistics distribution all over the city.



Figure 1 Kampung Rawajati (Ruang Hergiawan, 2011)

Can a City Produce its Own Food?

Rapid climate change is one of the most important issues that we are facing today. It will continue to grab our attention in the near future. It will continually affect every living thing on earth. Rapid climate change will affect the ability to farm. Problems caused by severe droughts, floods, and disease transmitted through animals (e.g. birds and insects) will be the major problems that we are facing in the future. As climate change starts affecting our lives, it is obvious that in the near future, agriculture will become increasingly weak and vulnerable. The failure of farming caused by severe and uncertain weather problems will lead to the decreasing numbers of farmers. At the same time, urbanization will continue to create problems in rural and urban areas. The reason for people to move to the city may come from the problem of failure in farming. The food safety also becomes the major reason.

Urbanization, rapid climate change, deforestation, land conversion, traffic congestion, and food safety are some of the problems faced by large cities around the world, such as in Jakarta. In the future, it is certainly going to be serious problems for the citizen's food supply. Therefore, Jakarta needs a new strategy for food supply and production. Controlled indoor farming is a solution that to make food productions remain well preserved. A city should start to think about producing its own food for its people, so it does not have to be dependent on food supply and productions, which is miles-away. In the future, a city should be sustainable, which can produce its own food and recycle all of its own wastes. There are many new modalities for growing of all kinds indoors to make any urban food production scheme possible called controlled indoor environment agriculture. Hydroponics, aeroponics and drip-irrigation methods have improved vastly over the last ten years, to the point of revolutionizing the ways in which we can produce indoor crops at will (Despommier, 2011).

Vertical Farm

Controlled indoor environment agriculture is one of the strategies to to ensure the food production and supply for the city. The high technology greenhouse farming is already being deployed around the world, such as New Zealand, the Netherlands, Germany, England, Australia and United

States. To address the problem of limited spaces in urban area, the horizontal footprint of the greenhouses can be replaced by stacking the spaces on top of each other. It will create vertical farms that will be suitable for urban spaces. Vertical farms (Figure 2) of varying heights can be constructed to meet the needs of restaurants, school cafeterias, offices, hospitals and apartment complexes. Some stand-alone vertical farms will also surely be built for mass production of essential crops such as rice, wheat, corn, and other grains, even crops for the production of biodiesel. Urban farming in specially constructed building specifically designed to grow whatever crops we need without the application of soil-based technologies is the founding principal upon which tomorrow's agriculture will be based (Despommier. 2011).



Figure 2 Vertical farm (source: Romses Architects,)

According to Despommier (2011: 145-146), there are 11 advantages of vertical farm. They are: (1) year-round crop production; (2) no weather-related crop failures; (3) no agricultural runoff; (4) allowance for ecosystem restoration; (5) no use of pesticides, herbicides or fertilizers; (6) use of 70-95 percent less water; (7) greatly reduced food miles; (8) more control of food safety and security; (9) new employment opportunities; (10) purification of grey water to drinking water; (11) animal feed from postharvest plant material.

The crop production has been subjected to the seasons and the weather conditions, even in tropical climates. It will also depend on the type of soil that would support the crop. It is clear that vertical farm will eliminate the weather or soil conditions as the main issue of failed farming. The farmer can plan to grow crop anytime in any condition. They also can control everything, including the level of temperature, humidity, and the amount of light inside the vertical farm. Farming is heavily loaded with other chemicals such as, silt, fertilizer, pesticides and herbicides. They usually end up in some river, and at some point they could harm other organism in the water.

The water runoff in the vertical farm will not harm other organisms. The hydroponic (Figure 3), aeroponic and aquaponic technologies have advanced technologies to minimize the use of water without the damaging side effect of agricultural runoff. The water used in the vertical farm also can be recycled by the process of transpiration and dehumidification of the indoor air. The safety of food production is one of the main advantages of vertical farm. The hydroponic, aeroponic and aquaponic technologies will eliminate the use of harmful chemicals which are used during farming.

The secure locks, clean air and the hygiene of the workers will guarantee that a vertical farm is a safe and secure place to grow plants. By having vertical farm in urban areas, it means that the used of fossil fuel will be reduce significantly. It means that the food is grown locally, fresher and faster delivery into our plate. Vertical farm will also help the nature to have a rest and to restore. For example, reforestation would benefit nature, and helping us to fight the climate change. Vertical farm will attract new developments. New jobs and careers also will be available, from managers, indoor controlled-agriculture specialist, waste to energy specialist, farmworkers for the nursery, planting, monitoring, harvesting, sorting and selling.



Figure 3 Hydroponic system (*Guides for Hydroponics Farming*, 2011)

Vertical Farm in Jakarta

The verticultural concept was firstly introduced in Indonesia around 1970. People used to put plants on the pot or grow plants vertically on the walls. At that time, people did that because of the aesthetic aspect, not for the purpose of crop cultivation. According to Sastro (2012), an expert in food technology, since 1998 the farming technology department (*Balai Pengkajian Teknologi Pertanian*) has been developing the vertical farming to create food security for the citizen. However, the public responses have not met the expectation. People still consider buying vegetables and fruits because it was cheaper rather than growing them. The strategies to promote vertical planting and farming need to be made seriously. We could address the healthy and environmental issues as the major concern, therefore vertical farm is the best solution for creating a better future for the citizen of Jakarta.

Jakarta should start to find a new method of creating agricultural space towards sustainable city. The density and the scarce of land making it impossible to provide the agricultural space horizontally. The vertical farming technologies need to be introduced, and it is very likely to fit into Jakarta conditions. The vertical farm can be an integral part of an existing building, by adding up some spaces vertically in low stories building. Jakarta is known to have a lot of shopping markets with the big space of horizontal footprint. The markets are either owned by the local government or private sectors, such as Carrefour. The markets itself, such as Carrefour, mostly have only up to 2 or 3 stories high. It is a good place to create vertical farm on top of the existing market. The food production, marketing and selling can be under one roof. The food distribution will not become a major problem, and the use of fossil fuel is significantly reduced. The safety of the food has never been better. We will not have to worry about the dangerous chemicals used during the farming. The food production and also the recycled waste can be done effectively, again because they all can be done under one roof. The recycled of rainwater technology also can be introduced to help the farming, therefore the building itself will become one complete sustainable “machine” of food production.

Jakarta has relatively high unemployment rate. According to the Jakarta Statistical Bureau (2012), the unemployment rate reaches about 10.72 percent. This problem surely needs to be taken seriously. The vertical farm could help the problem, and it would create many job opportunities, especially for people who used to farm and moved to Jakarta to find a better job and opportunity.

CONCLUSION

Vertical farm is the strategy that Jakarta can adopt to create new urban spaces for agricultural production. It is an efficient thing to do and it may be one of the solutions to make a sustainable city. However, it will still need a lot of work to realize and to create vertical farm, new agricultural urban spaces for the people of Jakarta. The local government and authorities should allow vertical spaces to be added into an existing building. New rules and regulations need to be made to encourage urban planners to build and develop vertical farm into the city planning. Therefore, in the future, Jakarta will have an integrated food production that will allow distribution to certain areas and locations. The vertical farm certainly will be a model to create a better future for food production, and to ensure the food security. It will create a healthy sustainable future and lifestyle for Jakarta.

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