Research Report Environmental Commission

Forum:	Environmental Commission
Issue:	Discussing the implementation of vertical farming
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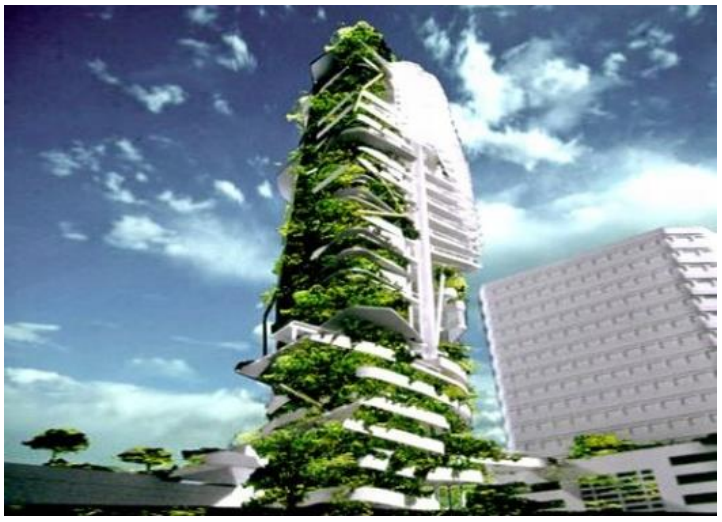
Position:	President of the Environmental Commission

Introduction

Vertical farming is a term of future technology; it is a special type of urban agriculture. The idea of building skyscrapers which are used for agricultural purposes could be a sustainable way of farming for the future.
When there is not enough land in a crowded city, the solution is normally pretty easy, you have to build upwards. Now Mankind has to solve a similar problem.
Because of a controlled environment a year-round farming of different types of food, such as but not limited to: vegetables, fruits and algae is possible.
The skyscraper would consist of many levels. On every level something different would grow, so the whole space would be used to farm. In 1999 Dickson Despommier studied for the first time the thought of vertical farming. He developed the basic idea for houses which could be able to provide for a whole city. Those researches were continued by many other scientists. Those skyscrapers, also called "farmscrapers", could solve the problem of growing cities and their widely transported food.
Due to the fact that with every year the major cities expand and that the world´s population grows every day, the most efficient way of using space is needed to enable urban life.
An extreme amount of nourishment is needed. Since the urbanization increases rapidly, a new possibility to farm is needed. The production of locally growing food could be a new way to stop long transport ways for food to large cities.



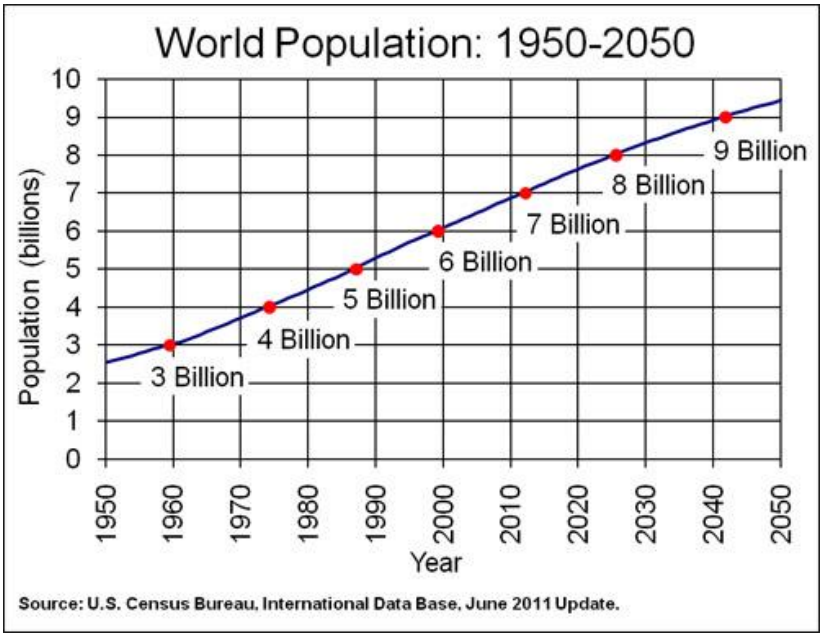
A so-called "farmscraper"

Urbanization

By the year 2050 about 70% of the world´s population will live in urban centers.
Every year many people move closer to or into a city.
This causes an extreme urbanization which needs more space for people to live in.
Many people move to the city to use the advantages of a modern society.
The chances to get a job are much higher, the condition of the infrastructure is much better and cinemas, theaters, schools and other educational institutions are available.
Infrastructural the urbanization is an enormous challenge, eventually there has to be adequately provided housing for a wide variety of people in a small space, which also of course have an enormous demand for energy and other resources.
Consequently all things needed in daily life have to be brought to the cities where they are then available for the consumer.
Because of this extreme growth of the population in cities, space is one of the most valuable things. Every part could be used efficiently to enable an expansion of the city.

Population growth

The birth rate and the immigration rate of a country increase the population, while the death rate and the emigration rate lead to a smaller population.
Only if the inflows and outflows balance within a specified time to each other, a constant population density is created.
The population growth is very unevenly distributed, there are large differences between countries.
Currently about 7. 3 billion people live on the earth.
According to the UN, the world population in 2050 is expected to reach about 9.1 billion people.
Due to the growing population and the urbanization more space is needed.
The Earth´s population grows by about 80 million people per year.
That means that although people die, the total number of the whole population increases.



A diagram showing the world's population growth

Advantages

Vertical Farming has many positive aspects. It is estimated that by 2050 about 70 % of the world population (about 7 billion people) will live in urban areas. For the needs of an additional 3 billion people, the traditional land use methods would expand on newly developed land.
To provide resources for feeding the world's population an additional agricultural area of 10 billion hectares is needed, this would roughly correspond to the expansion of Brazil. According to opinions of various scientists, such an increase is not feasible and would lead to massive environmental damage.
Unlike conventional farming methods, vertical farming allows year-round harvests. A non-seasonal crop production increases productivity.
In addition, the infrastructure used for the production is simultaneously used for the consumption. Long transports or cooling transports are not needed anymore. This leads to less spoilage, or losses due to crop failures.
Research showed that up to 30% of the harvested fruit can no longer be used because of spoilage. There is a working and a really efficient water cycle, the water created, used and collected by the planted farms will be recycled. The water is reused again and again within the building.
Vertical farming reduces the need for expansion of farmland and conserves natural resources, which are already threatened by deforestation, desertification, salinization, overuse and pollution.
Controlled environmental conditions reduce the biocide and fertilizer use significantly. It is hardly possible for bugs to enter the closed farming system, so the use of pesticides and chemicals could be reduced.
A retreat of human activity could stop the global extinction of species.
Agriculture in natural areas has often led to a sharp decline in wildlife populations. Also in cultural landscapes, the intensive nature of agriculture leads to a loss of biodiversity. The perfect conditions for plants to grow can be guaranteed, the whole environment of the plant can be controlled. This ensures a stable yearlong harvest.

An example of vertical farming

Disadvantages

The initial phase will be very expensive. This would often lead to a very cost-intensive time.
Many poor countries do not have the financial possibilities to build up and finance those buildings and facilities. Since the maintenance has not been explored yet, many problems can occur. The theoretical plans can seem to be perfect, but can contain many problems.
Due to the inexperience concerning this topic in a global dimension the implementation of vertical farming could end in chaos and result in disaster.
Furthermore it is not possible to plant every kind of plant or crop in those skyscrapers. This means that there still has to be an area where those plants can still grow, so the ordinary way of farming is not completely dispensable.
The plants need a special kind of light, the light-emitting diode (LED). This light is comparable to natural sunlight for the plants. They grow in the same way as they would do if they were growing in the sun. Most of the plants depend on these special lamps, so they would have to be produced in an extreme number. This would cause extra costs as well. There would be thousands of lamps needed to light a whole building, this would lead to an extreme need of power. This power has to be produced in an ecologically beneficial way to avoid a generation of electricity which causes greenhouse gases.

Vertical farming in reality

One of the first vertical farms is located in Chicago, United States of America. Here an unused area was replaced by a big farm, which now produces nourishment.
Because of using specially invented lights, vertical farming is really efficient. It is possible to harvest the crops about 26 times a year while being very environmentally beneficial. They need 85 percent less energy, 10% of the normally needed amount of water, nothing like pesticides or even herbicides and reducing the facility's CO_2 output by two tons a month. They already manage to produce an average of 46 pounds of oxygen daily.
Because of farming vertically, they can earn more harvest per hectare. The area which is now used to farm vertically can produce more nourishment than conventionally growing farms.

Questions, which could help you to prepare for the debate:

Could your country benefit from vertical farming?

Is your country affected by extreme urbanization?

How could vertical farming improve the situation in large cities?

Could your country finance the building of farmscrapers?

Is your country an agricultural state?

Is there anything like vertical farming already existing in your country?

Helpful links:

http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf

http://data.worldbank.org/indicator/SP.POP.GROW

https://www.cia.gov/library/publications/the-world-factbook/rankorder/2002rank.html

Sources:

http://www.geography.learnontheinternet.co.uk/topics/urbanisation.html#cause

http://www.un.org/en/development/desa/population/publications/pdf/trends/Concise%20Report%20on%20the%20World%20Population%20Situation%202014/en.pdf

http://www.brighthub.com/environment/science-environmental/articles/39036.aspx

http://www.cornellcea.com/resourcesPublications/otherResources/Albright-vertical-farming-2014.pdf

Pictures in order of appearance:

http://bluelabyrinths.com/2015/03/15/is-vertical-farming-the-future/

http://www.kivu.com/wp-content/uploads/2012/04/worldpop.jpg

https://www.cyclicx.com/wp-content/uploads/2014/05/vertical-farming.jpg