

Urban Agriculture

A photograph of a modern, multi-story building with a glass facade. The building is situated in an urban environment. In the foreground, there is a rooftop garden with green plants and a metal railing. The sky is clear and blue. The title 'Urban Agriculture' is overlaid on the top of the image in a large, yellow, 3D-style font.

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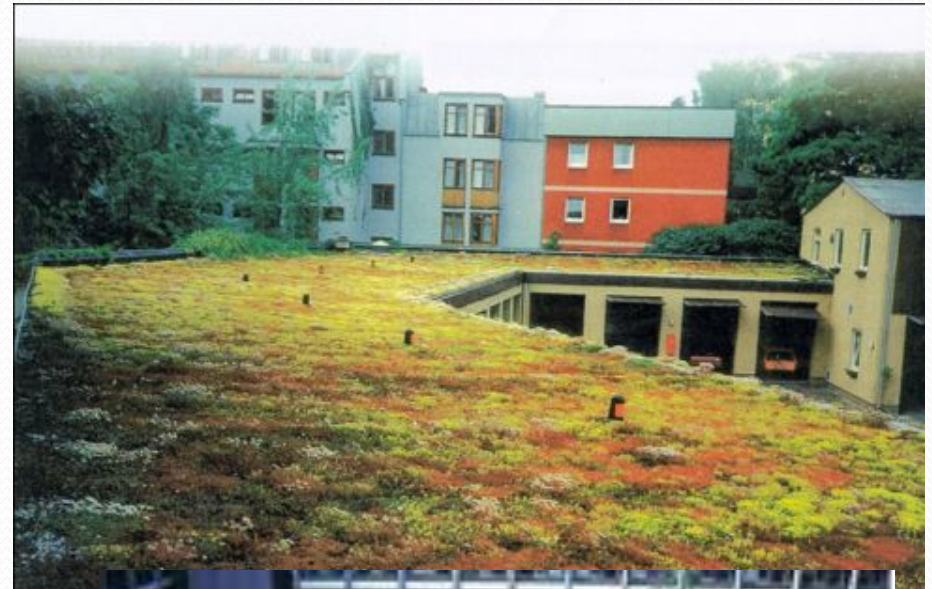


Here's the Future

- By the year 2050, nearly 80% of the earth's population will reside in urban centers.
- An estimated 10^9 hectares of new land (about 20% more land than is represented by the country of Brazil) will be needed to grow enough food to feed population increase.
- 80% of the land that is suitable for raising crops is in use.
- Historically, some 15% of that has been laid waste by poor management practices.

What is a Green Roof

- Green roofs supplement traditional vegetation without disrupting urban infrastructure -- they take a neglected space and make it useful.



Pro's and Cons of Green Roofs

- They decrease "heat island" effect
- The building with a green roof creates its micro-climate, so building is cooler in summer and warmer in winter. This means less energy is needed for air conditioning
- It absorbs pollution and particles from air
- It absorbs rainfall and reduces the load of water on sewage system
- Protects Roof insulation material. Thus potentially doubling the roofs lifespan
- They provide natural environment for birds, insects and small animals
- Initial investment is significantly higher.
- Weight of the green roof increases the load on the building and should be carefully considered
- Green roofs should be regularly maintained, depending on type of green roof.

Types of Green Roofs: Extensive

- Overall Depth:
3 - 5 inches
- Weight max:
15- 25 lbs/ft²
- Irrigation: no, not recommended
- Plants: Mosses, Sedums, Succulents, Herbs and few Grasses
- Costs: low
- Proctor Hall



Types of Green Roofs: Semi-Intensive

- Overall Depth: 5- 7 inches
- Weight max: 25- 40 lbs/ft²
- Irrigation: partially, as-needed
- Plants: Mosses, Sedums, Succulents, Herbs and few Grasse Selected Perennials, Sedums, ornamental Grasses, Herbs and little Shrubs
- Costs: medium



Types of Green Roofs: Intensive

- Overall Depth:
7 - 24+ inches
- Weight max:
35 - 80+ lbs/ft²
- Irrigation: yes, automatic/flood
- Plants: Mosses, Sedums, Succulents, Herbs and few Grasse Selected Perennials, Sedums, ornamental Grasses, Herbs and little Shrubs Perennials, Lawn, Putting green, Shrubs and Trees, rooftop farming
- Costs: high
- Zimmer Auditorium



New York City Department of Parks and Recreation

- In the spring of 2010, a 4,000 sf vegetable garden designed by Senior Project Manager Rick Gordon
- vegetables including tomatoes, peppers, zucchini, yellow squash, string beans, broccoli, corn, lettuce, cucumbers, eggplant and mixed herbs.



Hydroponic Green Roofs - Egypt

- Two Egyptian brothers have received enough donations to set up three rooftop farms in Maadi – a once wealthy suburb of Cairo.
- Designed to become a secondary source of income for poor families
- Closed loop, vertical hydroponic systems that use recycled water and mineral nutrient solutions to grow cheaper, healthier produce.



Urban Agriculture Potential

- The average American meal travels 1500 miles from field to table
- The sustainability of urban systems can be significantly bolstered by fostering a more urban agriculture
- It is possible to produce a variety of fruit, grain, and vegetable crops on rooftops in a variety of ways.
- If roof gardens are built into the original building plan, structural allowance can be made for several feet of soil, accommodating not only vegetable crops but also trees and shrubs.
- Relatively new practice. Research and new ideas need to be tested. There is a lack of scientific proof to show how well reliable these gardens are as a food source.

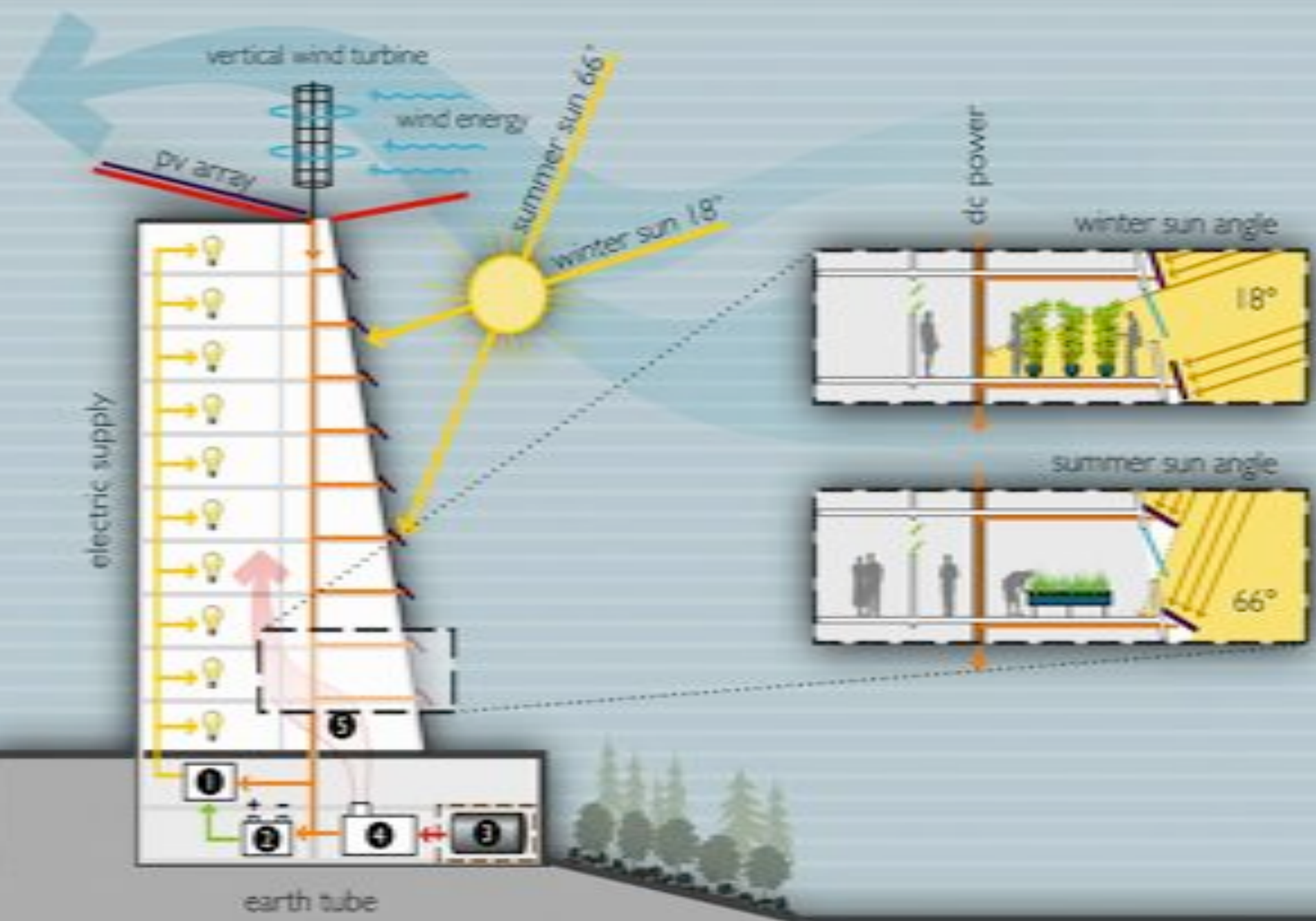
Vertical Farming

Is it applicable for Chinese Cities?

Vertical Farming

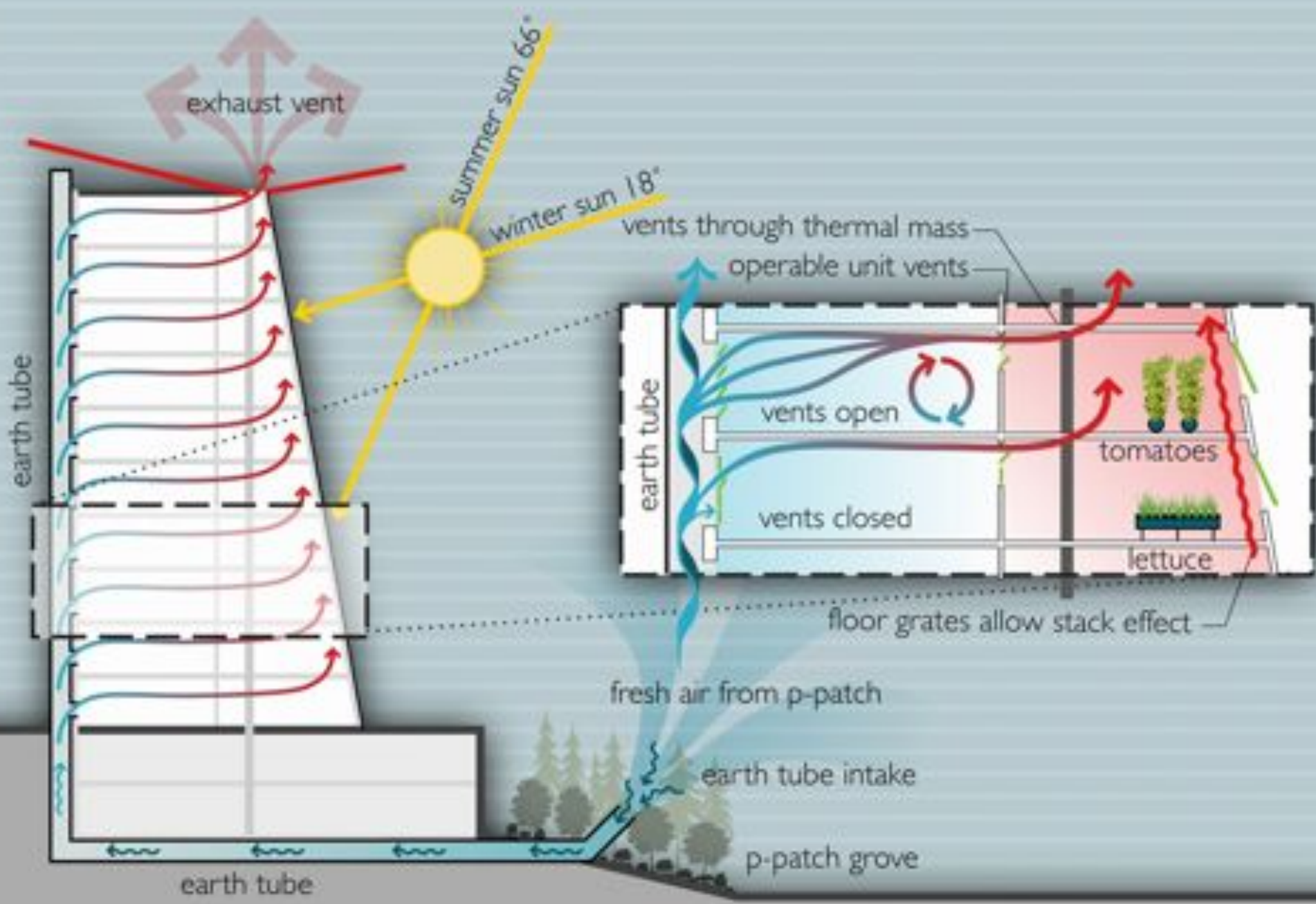
- Recent ideas in past two decades
- Less shipping/accessible to consumers
- Controlled environment
- Protected environment
- Downfall: Sunlight through glass
- Minimal production compared to farm land





- ~ wind
 - ☀ sun
 - ▽ photovoltaic panels
 - ⚡ ac current
 - dc power
 - ← methane
- 1** dc/ac converter
 2 battery backup
 3 methane from living machine
 4 hydrogen fuel cell
 5 heat

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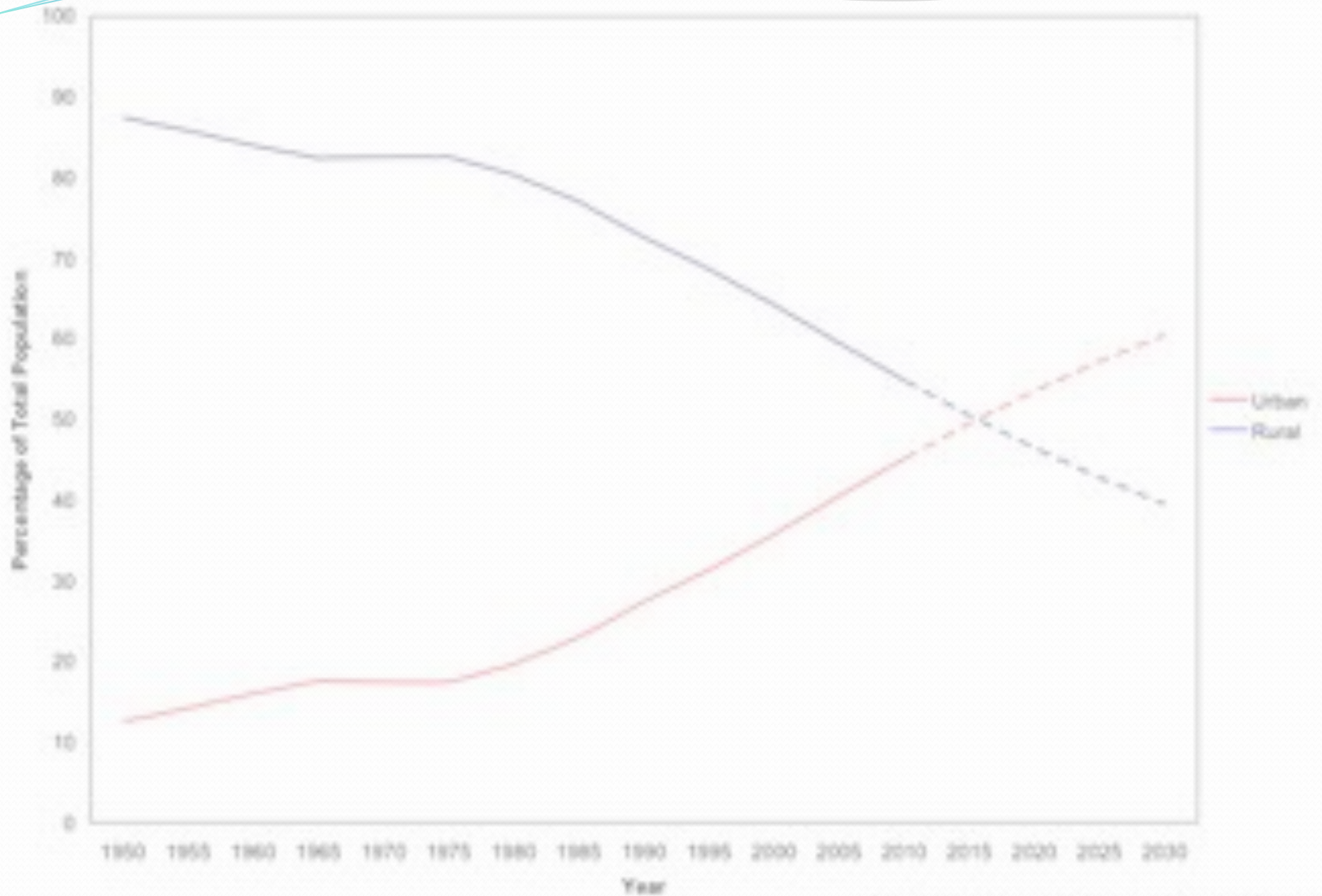
fresh air → warm air exhaust ← fresh air from p-patch █ concrete thermal spine

Case Study

- Sky High Vegetables in Singapore
- Slowly rotating on water-powered, aluminum A-frames
- Supplying one of city's supermarkets with weekly deliveries of its greens. The Sky Greens produce costs around 40% more than an imported Chinese equivalent.
- Singapore only produces around 7% of the vegetables it consumes.



China's Urban and Rural Population, 1950-2030



Source: China Statistical Yearbook, various years



Questions

- Due to rapid urbanization, are these urban agriculture methods applicable in Chinese Cities?
- What does urban agriculture mean for the future of China's food?
- What are the steps the Chinese are taking to ensure access to fresh food?

Lessons Learned

While in China

Mary Wischmeyer

5/23/2013

Sustainable Urbanism

Vertical Farming

Applicable in China?

- After discussing with BLVD architects and BJUT faculty and students, I learned that there are no vertical farms currently in China. There is also very little research being done on the topic.
 - #1 reason: It's too expensive! For example, for the most part the only urban farming taking place in China is growing plants for yourself typically in a pot on your apartment's balcony.



Vertical Farming

Applicable in China?

- BLVD and BJUT both stated that they believe China's cities will need to resort to some form of urban farming in the future. They stated that vertical farming seems pursuable, but it may be many years.
 - #1 reason: Chinese cities are growing so fast now, that currently the issue is where to put all of these people. Many high rise apartments are being constructed. Also many of the buildings being constructed now, do not have a very long planned life span—due to cheap and quick construction.



Vertical Farming

Applicable in China?

- BLVD has done one project with a green roof (no crops). Many clients do not want to spend the money on an expensive green roof.
 - I believe, feeding the growing population will become more of an issue in a couple years. Maybe in 20 years, when today's buildings being built become inhabitable, new high-rise vertical farming will go up. By that time, much more research of how to successful grow plants indoors will have been done, but that is not the Chinese government's focus right now.

