Reimagining the Vertical Farm: Designing a Minimally Structured Modular & Prefabricated Vertical Farm

The Vertical Green Box® Solution

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9 May 2015
Beijing, China
Cities are the Earth's Future
Cities are the Earth’s Future

6.4 billion people living in cities by 2050

People Living in Cities are:

Smarter, Healthier, Wealthier and Happier

-- Edward Glaeser, The Triumph of the City
People Living in Cities are:

Smarter, Healthier, Wealthier and Happier

But They are Fresh-Food-Challenged!

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Vertical Farming 1.0

by Rolf Mohr
Vertical Farming 1.0

Led to a wide array of proposed building designs

by Oliver Foster

by T.R. Hamzah & Yeang

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Dragonfly Tower by Vincent Callebaut
Vertical Farming 1.0

Harvest Green by Romses Architects

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Urban Farm, Urban Epicenter by Jung Min Nam

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by SoA architects

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The Challenge:

**BUT** most Vertical Farm concepts and designs are mainly based on those for conventional buildings, making Vertical Farms:

**PROHIBITIVELY COSTLY!**

by Rolf Mohr
There is NOW a Pressing Need to Usher In Vertical Farming 2.0
Vertical Farming 2.0

To accelerate growth and development of the Vertical Farming industry

Requires Standardization

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Requires Clear Distinction

Growing System apps

Diversity of apps should be encouraged

Vertical Farm Platform / Operating System

Platform should be standardized
Vertical Farming 2.0

Requires Standardization

Standardization of Vertical Farm Platform or Operating System

To accelerate growth and development of the Vertical Farming industry
Vertical Farming 2.0

Standardization of Vertical Farm Platform or Operating System

Growing System apps
INTRODUCING:

The Minimally Structured
Modular &
Prefabricated
Vertical Farm

aka The Vertical Green Box® Solution
(1) Minimally Structured

- Reduced load-bearing requirement
- Reduced services
- Reduced materials
- Reduced total weight
(2) Modular

- Uniformity of growing space, hardware, environmental control
- Consistency of operational procedures
- Interchangeability of units
- Allows use of varied growing systems
- Allows development of turn-key operations
(3) Prefabricated

- Off-site construction and assembly of modules
- Significantly lower cost in construction and labor
The Minimally Structured, Modular & Prefabricated Vertical Farm

The Vertical Green Box® Solution

Modular Unit:

- Transparent sides
- Operator may or may not be intended to step onto modular structure to keep structure light-weight in design
- Operator may use forms of mechanical devices, like conveyor belts, to gain convenient access to crops
Top View

Cylinder Configuration

The Vertical Green Box ® Solution
Linear Configuration

Top View

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Pyramid Configuration

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Platform:

Assembly/Disassembly - Friendly

Non-permanent structure

Movable

Can load diverse
growing system apps

Growing System apps

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Growing System apps

**Business Models:**

- Owned and exclusive operation
- Lease of module spaces
- Lease of furnished/non-furnished modules
- Lease to entrepreneurs, individuals, community groups, schools, etc.

**Vertical Farming 2.0**

*The Vertical Green Box ® Platform / Operating System*

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Analog:

Leadenhall Building

London, United Kingdom
Leadenhall Building
ZipGrow Towers by Bright Agrotech
Analog:

BROAD Sustainable Building

China
A 200-STOREY ENERGY AND MATERIAL EFFICIENT, EARTHQUAKE RESISTANCE BUILDING
A CAR-FREE CITY FOR 100,000 PEOPLE
A MILESTONE OF LIFE-STYLE TRANSFORMING

SKY CITY ONE
Growing System apps

Vertical Farming 2.0

The Vertical Green Box® Platform / Operating System

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Microalgae Constitute a New Crop For Vertical Farms
Accordion Algae Photobioreactor
Microalgae are any of a diverse group of microscopic organisms that are typically: chlorophyll-containing, predominantly aquatic, unicellular/single-celled, and non-vascular plants.
Algae for Nutraceuticals

(Omega 3/6 -- DHA, EPA, AA)
Feed
Cosmetics

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ACCORDION Photobioreactor

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Vertical Farming 2.0

Growing System apps

The Vertical Green Box®
Platform / Operating System

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Deliverables:

1. Safe and Fresh Food
2. Food accessibility for Everyone
3. Agro-Tourism
4. Education
5. Building and Strengthening Communities

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Different Growing System Apps

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The Vertical Green Box ®
Solution