FOOD PRODUCTION BECOMES PART OF DAILY URBAN LIFE.
“We stand for food production within urban spaces, independent from fossil fuels. With vertical farms we see the possibility not only to reduce the consumption of resources but also to close energy loops. Regional, organic products have to be produced next to the consumer. Food production within cities will become of daily urban life.”

vertical farm institute
„Whether we want it or not, urbanisation is continuing to happen. By the middle of this century, nearly two thirds of human kind will live in cities.

The city of the future demands both food security and food of the best quality. Yield increase is currently only provided by increasing efficiency. But the world population is growing faster than the increase in productivity.

World agriculture will be confronted by big challenges, in the medium and long term. In the future, traditional production methods will have to be supported by new agricultural technologies.

Vertical Farming offers a promising new approach to guaranteeing food security for cities. Food is produced directly next to the consumer - in the middle of the city.

Vertical Farming drastically reduces the required agricultural area and resources such as water, fertilisers and pesticides. Thus, it offers completely new opportunities for urban organic food production.

The Vertical Farm, conceived as a multifunctional building, offers new possibilities to combine food production with other functions such as living and working. It aims to bring the environment into the living room.

I am very pleased to hear about the activity of the vertical farm institute as well as about the open and broad discussion of this issue in Austria. I hope that this technology will be of great significance for the city of the future and that Austria will play a role in this."

DI Dr. Franz Fischler, President European Forum Alpbach
THE NEXT AGRICULTURAL REVOLUTION

The city of the future is already being built.

Food production in greenhouses has a long tradition. New technologies give the opportunity to develop this kind building type. The development of alternative cultivation methods, comparable to the invention of the elevator for skyscrapers, lead to a new building typology – the vertical farm.

Efficient building services in combination with intelligent building forms use sunlight and sunenergy at its optimum. Wind- and solar power cover the biggest percentage of the energy demand. The vertical farm aspires to entail circular economy, from closed energy- and material loops.

Intensive food production in the middle of the city creates potentials for the economy, for trade and the public life. Healthy organic produce will be sold on newly created market areas – next or in the vertical farm. Regional products are available all over the year. The vertical farm therefore can be seen as a magnet to relocate market- and trade spaces which directly or indirectly are connected to food production and food distribution within the city. The vertical farm – in the visual field of the urban population – embodies a closed production chain from cultivation to distribution. Food production will become part of urban daily life.

Vertical farms already have been realized in numerous countries all around the globe. Technologies therefore are already in use, economic track records are speaking for themselves.
VERTICAL FARM - ARABLE LAND OF THE 21\textsuperscript{st} CENTURY

Vertical farms lead to

- resilient cities
- new services
- activation of public spaces for market, trade, gastronomy and leisure
- transparency in food production
- transparency in the food production chain
- healthy organic local produced food products
- support for an energy optimized urban planning and urban energy design. It further secures
- technology- and innovation leadership and
- strengthens the international competitiveness

Compared to conventional agriculture vertical farms reduce

- the overall energy consumption of the food sector
- the cultivation area to more than fifty fold
- water consumption up to 95%
- pesticide use up to 99%
- fertilizer use up to 90%
- the dependency from food imports and its social, ecological and economic costs
- the CO2 footprint
- economic, social and health costs of the food miles and
- the dependency on fossil fuels
Designing and developing the city of the future needs a multidisciplinary collaboration. By now this challenge no longer can be applied only to architects or urban planners. The growing world population implies to rethink cities from scratch. The agricultural area which supplies the city with food actually expands ten-fold compared to the newly built up area.

Food supply therefore shifts in the center focus of the city of the future. This, though, can only be accomplished if we keep a holistic and integral view on the city of the future. Next to ecological, economic and social components the spatial integration of vertical farms is influenced by plant physiological and infrastructural requirements. Different expertises therefore have to be considered.

But what all experts have in common is finding answers to the following questions:

**How to we want to live in the future? How do we guarantee attractive public spaces? How do we transpose the modernistic city into a resilient city?**

All research activities of the vfi circle around food- and energy production as well as questions on sustainability of urban life. For the vfi the vertical farm is a building typology to be developed which can cope with the huge challenges the global city is heading in the 21st century.

Our collaboration with individuals and associations ensure early contacts and exchanges with stakeholders in different planning- and implementation stages. We practise an intense interchange with all who have a future-directed view to a rich ecological food production. In all processes though the human being stays in the center point.
WE PRODUCE THERE WHERE FOOD GETS CONSUMED.

For 11,000 years now we produce food exactly there where it gets consumed. With a short break of this practise. On a big scale this happened around 60 years ago – with the green revolution. This led to huge impacts in energy consumption and in land use. The consequences of the global food production network can be highlighted with its co-responsibility for the climate change, air pollution and remarcable geopolitical tensions.

1 m² of a growing city asks for additional 10 m² of agricultural land to supply city dwellers with food.
PRESERVING THE HOLISTIC VIEW

We understand the vertical farm as a structural element of the city. This new building typology carries the potential to rearrange linear material- and energy flows into circulatory ones. This intrinsically leads to an increase of the resilience of urban centres.

The potential in energy production and in increasing the energy efficiency therefore must be detected on multiple levels, they can’t be restricted on the building unit alone.

The key to unlock this potential is to link the vertical farm with the urban environment. For the energy production renewable energy resources are used such as solar- and wind energy, geothermal energy and ground water. Technologies to use excess heat can be adapted. Energetic synergy potentials of different building programmes can be activated. The typological concept of the vertical farm therefore offers ideal energetic potentials for a synergetic interrelationship between building entities within a city which faces to achieve a circular economy.
The vertical farm is an important structural element of the city to close material- and energy flows.

"Circular economy has become the mantra of the EU."
José Ruiz-Espi, European Commission, Directorate-General 'Agriculture and Rural Development'
VERTICAL FARMS IN HIGH-DENSITY AREAS

Urban sprawl and the sealing of fertile ground not only set agriculture under pressure, but also cities and countries. The growing dependency from food imports reduce local political influence in cultivation methods and cultivated produce.

The trend seems obvious: Consciousness and awareness in food production rapidly is growing from the consumer’s side.

Local organic and sustainable production are desired.
POST OIL CITY AND ENERGY CONSUMPTION

Since the industrial revolution agriculture has changed from the bottom. World population has increased five-fold within the last 100 years, arable land, though, has only been doubled. Only this ratio has been able to establish because energy subsidies in agricultural production have been augmented by more than 8,500%, mostly retained from fossil fuels.

A third of the world energy consumption is directly related to the food sector. The vertical farm not only reduces the energy use for food production, but it also can be independent from hydrocarbon energy. Additional energy to run the vertical farm can be covered by renewable energy.
RETHINKING THE GROUND FROM THE BOTTOM

The arable land for urban food supply is the currency of the 21st century. The ongoing losses of fertile arable land caused by conventional agriculture increases the pressure on remaining soils and lead by fact to an additional increase in energy subsidies.

This loss also increases the pressure on rain forests which are exploited for agricultural production by slash-and-burn methods. Not only in Europe we increasingly are dependent on food production overseas which in addition makes freight transport increase which has a devastating impact on the environment.

This diagram represents the land use per capita to get supplied with food all over the year.
The vii is a widely varied multidisciplinary team with specific expertises. It is embedded in an international research network all around vertical farming. Architects, engineers, plant physiologists and artists cover a wide spectrum of knowledge – essential to develop and implement new building typologies for vertical farms.

Our partners support the vii with unique expertises regarding building- and control systems, architecture and energy, biology and plant physiology, also energy production and plant factory operators. Only the combination of a customized architecture, urban planning, resource-conserving technologies and applied plant physiology disclose the potential of vertical farms to be important elements for a sustainable food production with a promising future.

FOUNDING MEMBERS Helmut Holleis, Patrick Jaritz, Lucas Kulnig, Stefan Parnreiter Mathys, Daniel Podmirseg, Sebastian Sautter, Bernhard Sommer, Doris Steinacher

Daniel Podmirseg, Head and Founder
Vera Enzi, Board member
Sebastian Sautter, Board member
In conclusion, this exhaustive body of work presents the best view so far published on what the world would be like if alternative agricultural strategies were employed to feed some 9.6 billion people. In the opinion of this reviewer, it is a tour de force blueprint for how to proceed into the next millennium, enabling humans to finally achieve a peaceful co-existence with the rest of nature.

Dickson Despommier, Prof.a.D. Columbia University, New York about the dissertation „up! Contribution of Vertical Farms to increase the overall Energy Efficiency of cities“ von Daniel Podmirseg, head of the vfi.

For us it is an important matter to increase our multidisciplinary network. We look for engaged persons and partnerships. If these information sheets spark your interest, feel free to contact us. If you want to increase your action field regarding your CSR, then we are delighted to have a fruitful collaboration.

More information regarding all our activities can be found on www.verticalfarminstitute.org