White paper on Vertical Horticulture

International overview of Vertical Horticultural Projects

White paper in the MeetingMoreMinds Series on Feeding MegaCities

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July 2018

Smart Cities and Vertical Farming:

a Rational Combination based on Needs to Feed Citizens in Megacities with Healthy Food and Fresh Produce




Prof. dr. Annemieke Roobeek

Professor for Strategy and Transformation Management at Nyenrode Business University, The Netherlands
And CEO/Founder of MeetingMoreMinds, based in Amsterdam, The Netherlands
Contact: a.roobeek@nyenrode.nl, annemieke.roobeek@meetingmoreminds.com

Introduction: Re-thinking the dominant production paradigm in greenhouse horticulture

If the Dutch want to stay world-class they have to re-think the current way of producing vegetables, plants and fresh produce in greenhouses. Notwithstanding the fact that the Dutch are the world most advanced producers and traders in horticulture, floriculture and highly innovative in green technology installations that support this clusters, the world is changing. But are the Dutch? And are they in time?

In this research paper on Smart Cities and Vertical Farming we challenge the dominant paradigm in horticulture and in the slipstream the ornamental plants and floriculture cluster. From thinking in endless hectares of horizontal greenhouses we would like to open the conversation on re-thinking the mainstream way of production towards vertical farming in the perspective of the steep rise of megacities in the world. The future world consumption of fresh produce and plants is increasing. Most of the world population will live in cities. Feeding the world means more and more securing access to fresh food in megacities where 5 billion people will live in 2030. The governing bodies of these cities will look for other solutions to feed their citizens than the traditional Dutch solution of building horizontal greenhouses at a large distance from cities where land is cheap. From a sustainability perspective the loss of often 30% or more of the harvested production due to inefficient transportation and inadequate infrastructure is untenable, unsustainable and not defendable in the light of Sustainable Development Goals (SDG's) as proclaimed by the United Nations in 2015.

While the dominant production paradigm in horticulture of horizontal greenhouses still leads to well filled international order books for greenhouse builders and green tech installers and while the Dutch growers in horticulture and floriculture are exporting to all parts of the world at all times records high, now is the time to re-think the mainstream with a future perspective. If the Dutch want to keep their world-class position in the decades to come it is necessary to take a closer look to what is happening internationally in the field of urban farming, vertical and indoor farming.

The outsider view challenges the mainstream

As a professor for Strategy and Transformation Management at Nyenrode Business University, Annemieke Roobeek lectures about innovation, ecosystems and clusters like the Dutch horticulture and floriculture clusters. These two clusters in the Netherlands are great examples of clusters with the typical characteristics of geographical proximity, mutual cooperation and dependence, of innovation and competitiveness, of efficiency and international excellence. When teaching a renowned Harvard flower case for the MBA students, she discovered that it sketched a terribly outdated picture of the cluster and the suppliers. She found that it lacked dynamics and important changes over time. Although horticulture and floriculture clusters in the Netherlands are almost totally export-oriented with world class enterprises operating internationally, there is also a kind of stubbornness in keeping a short-term view and getting stuck in the traditional way of doing business while ignoring what innovators, start-ups and potential competitors from outside the industry are doing.

Together with her team at MeetingMoreMinds she decided to do research into the driving forces behind the changes in the horticulture and floriculture clusters. While doing interviews, numerous working visits, technology reviews, and analytical data research Annemieke Roobeek came up with an new international growth perspective for the Dutch export based on creating the collaborative advantage in ecosystems. Having many specializing companies is great, but creating collaboration between these super specialists in an emerging paradigm is even better.

The need for inter-industrial collaboration to get to the next level

In this international overview of Smart Cities and Vertical Farming is becomes clear and visible that the traditional way of building greenhouses for horticulture is not the way forward in cities with millions of inhabitants. The overview shows that in dozens of cities in the world all kind of experimental initiatives are taken to explore new ways of producing fresh produce within cities. These initiatives in urban farming, rooftop farming, indoor farming and vertical farming can be seen as an innovative search for new ways to a healthy style of living in cities. Fresh produce forms a crucial part of the complex puzzle to sustain and create an increasing population in cities with millions of inhabitants. Access to fresh food is as necessary as access to electricity, internet, water, education and work. Smart Cities are often identified by technology and in particularly in putting digitalization strategies into action. A closer look at the more advanced forms of vertical and indoor farming makes clear the blending of Smart Cities with Vertical Farming. It takes a lot of high tech to create a successful indoor or vertical farm. Many green technologies, such as climate systems, LED-lighting systems, water systems and growth protocols are all based on data and digitalization.

What will the integrated concept of advanced urban farming look like?

It is a data-driven, at distance monitored growth system where recipes for fresh produce secure stable production through the year in climate controlled production settings. Selling an integrated concept including advanced knowledge, combined information, construction and installation processes and data surrounding horticulture is different from growing tomatoes and exporting the products. The focus on systems does not mean giving knowledge away, but selling tailor made knowledge for a specific location in the world together with sustainable production recipes for high quality products. This results in a competitive advantage of the Dutch horticulture with higher

margins for all parties involved. In fact, in the concept we developed we combine clusters and networks into larger ecosystems where collaboration is key. The Dutch world class position in floriculture, horticulture and its specialized suppliers around the green house sector gives the entire ecosystem an enormous competitive advantage. The focus for the new growth strategies is on the world's megacities. Growing fresh produce in the first place and later also flowers and plants in advanced, climate-controlled greenhouses close to a city, wherever in the world this may be. Because of the unique knowledge position of The Netherlands, knowledge can be aggregated and put into data systems and the Dutch can fulfil a directing role in sustainable growth processes. You can even see it as an advanced form of horticulture tailored to the demand of specific locations in the world. It will result in creating trade on high tech production systems with a higher value and more impact than just growing and transporting tomatoes or cucumbers all over.

Thinking big: high tech growth systems

Thinking big is difficult for many entrepreneurs. Most companies only look at their own part of chain. There certainly are traditional growers and greenhouse builders who think this is a bridge too far. Creating an international and sustainable ecosystem indeed is an enormous challenge that all stakeholders in the horticulture sector need to commit to. However, not committing to this challenge of taking urban farming as a serious gamechanger is a missed opportunity in the medium and long term. With such an ecosystem around high tech growth systems in development, a real contribution towards the World Goals (SDG's) can be made.

A new generation is combining knowledge and technology

At any rate, the new generation looks differently at growing flowers and plants than the old generation. It is not by chance that many sons and daughters of horticulturists now study informatics and big data. They already see the potential of an international sustainable ecosystem and are ready to anticipate on it. Amongst other things, they can do so with the experiential knowledge and know-how of their parents and grandparents, which they can translate in bits and bytes into advanced growing programmes. This inter-generational knowledge and know-how is key in the transformation process and it will be applied with artificial intelligence and machine-learning. It will be used in another way together with the dynamic innovations in installation technologies, robotics and drones. Not so much the production of fresh produce, flowers and plants will be the head of the game, as the knowledge for the systems to produce in stable, high tech climate controlled environments.

About this overview of vertical farms

The overview we show you in this White Paper is a snapshot of what can be found in public sources until. We selected those vertical farms with a stable production track record. However, since this industry is in flux, and many new vertical farms are set up, as are many going bankrupt as well, the list does not pretend to be complete. It is much more a visual impression of how many serious vertical farming projects set up in the past few years, particularly in smart cities with conscious consumers and high tech savvy entrepreneurs at hand.

The Netherlands: Overview of vertical farming activities

Netherlands						
Cities	**Name**	**Description**	**Image**	**Type / Size**	**Status**	**Production capacity**
Dronten	Fresh Care Convenience, Staay Food Group	The first real vertical farm in Europe, which produces for retail.		Vertical farm	Opening in 2018	300 tonnes vegetables per year (2017)
Amsterdam	GrowX	Small-scale vertical farm in Amsterdam, where vegetables are produced for restaurants. The company has a focus on sustainable logistics.		Vertical farm	Active since 2016	180 tonnes of salads and herbs per year (2016)
Den Haag	The New Farm	The New Farm is the international hub for food production within the city. It is a place for start ups to experiment with new ideas. There already exist a vertical farm and a research field lab.		Vertical farm, research	Active since 2017	
Zwaagdijk	Proeftuin Zwaagdijk	Proeftuin Zwaagdijk is a research institution to optimize the impact of LED light on the growing process. Furthermore it teaches trainees the different facets of growing vegetables. At this moment they work with a 3-level grow system.		Vertical farm, research	Active since 2012	
Venlo	Brightbox	Brightbox is an expert centre on growing vegetables without daylight. Different parties such as, Botany, Philips, de HAS and the province of Limburg work together to innovate the process.		Vertical farming, 192 square meters	Active since 2015	

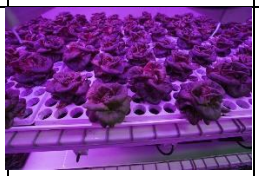
	Innoveins	Innoveins combines plants and technique to develop innovative ecosystems for the market.		Indoor farming	Active since 2017	
Eindhoven	Philips Grow Wise Center	The research lab of Philips test the impact of LED lights on greens and other vegetables. They have designed a special room where they test precisely, which light works for which vegetable.		Vertical farming, 234 square meters	Active since 2015	
Beesel	Deliscious	Deliscious uses a 8 meter tall climate room, where it tests together with Philips, which different plants they can grow.		Vertical farming	Active since 2016	
Poeldijk	Certhon Innovation Center	Certhon designs and implements innovative and reliable technologies that enable the cultivation of horticultural products worldwide. Certhon wants to improve its own daylight-free cultivation techniques in Poeldijk in 8 different growth cells of a total of 240 square meters.		Indoor farming, service, 240 square meters	Under construction	
Den Bosch	PlantLab	The head office of PlantLab is located in the heart of Den Bosch. The company focuses on the various possibilities of indoor farming. More than 5.000m2 includes high-tech breeding rooms in which cultivation recipes are developed, under the brand name Plant Paradise.		Indoor, vertical farming 5,000 m2	Active since 2008	

Utrecht	Wonderwoods	The Wonderwoods plan includes two towers of 90 and 70 meters high with room for living, working, relaxation and entertainment. The highest tower looks like a vertical forest, where the planting is designed along the balconies and on the façade.		Vertical gardens	Concept, construction starts 2019	
Vlaardingen	Hoogendoorn Growth Management	Hoogendoorn, together with worldwide partners, provides sustainable automation solutions that seamlessly harmonize all processes and systems in your horticulture organization. The modular software ensures that the available raw materials such as natural gas, fertilizers and water are used as efficiently as possible.		Indoor farming, service	Active since 1974	
Burgh-Haamstede	Vitro Plus	Vitro Plus has extensively industrialized the cultivation process of greens with specially designed growth chambers. Currently, VitroPlus focusses on plants, but it is investigating possibilities for greens such as lettuce.		Vertical Farming	Commercial, Active since 1990	Over 3 million ferns a year (2018)

International overview of smart cities with urban & vertical farming activities

North America						
Cities	**Name / Company**	**Description**	**Image**	**Type / Size**	**Status**	**Production capacity**
United States of America						
New York	Gotham Greens	The company has built and operates 4 facilities of technological advanced (hydroponics) Greenhouse Farms in New York City and Chicago.		Greenhouse RTF, 170.000 square feet	commercial, active since 2011	15 million heads of grean leafs and 300.000 pounds of vegetables per year (over 4 facilities) (2018)
	Bowery Manhattan	Located in the centre of Manhattan they produce food for local restauratns and grocery stores. Unlike other vertical farm they experiment also with other crops than only leafy greens.		Indoor farming	Commercial, Active since 2017	
	Bowery New Jersey, Kearny	The company will build a new vertical indoor farm in Kearny, New Jersey, which will grow 30 times more produce than its current indoor farm in NY. The company has developed especially a proprietary software systems, which they claim makes the new indoor farm the most technologically sophisticated in the world.		Indoor farming	To be build in 2018	New York City-based startup raised a $20 million from investors including General Catalyst, GGV, and GV (2018)

New York	Sky Vegetables	Sky Vegetables develops and operates an 8000 square meters urban hydroponic rooftop farms as part of its mission to grow fresh and local produce sustainably.		Rooftop Farming, Hydroponic 8000 square meters	Commercial, Active since 2008	
	Brooklyn Grange	World's largest rooftop soil-farm, located on two roofs of NYC. Provides also urban farming and green roof consulting		Open-Air RTF, 2 Farms in total ca. 100.000 square feet	commercial, active since 2010	50,000 pounds of organically-cultivated produce per year. (2018)
	AeroFarms	Based in New York, it has its ninths and biggest vertical farm in Newark (New Jersey) to serve demand of locally grown fresh vegetables.		Vertical / Sky farming, Over 100,000 square feet over several locations	Research / commercial, active since 2004	2 million pounds of fresh, leafy greens a year (2016)
	EdenWorks	Brooklyn based vertical farm that uses aqua and hydroponics. The plants will be grown in trays with LED lighting stacked 20 feet high		Vertical / Indoor Farming, 10,000 square feet	commercial, active since 2013	50,000 pounds of tilapia and 130,000 pounds of leafy greens (2016)
Boston	Freight Farms	An original kickstarter initative that sells selfs-sustaining containers to would-be-farmers in order to grow their own fresh products		RFT / Indoor Farming	commercial, active since 2010	2-4 tons produce per year per container (2018)
	Green City Growers	Green City Growers converts unused commercial, municipal, education and residential spaces into vibrant urban farms anywhere the sun shines.		Roof Top Farming	benefit corporation active since 2008	More than 5,900 pounds of fresh produce are harvested each growing season (2018)

	Higher Ground Farm	Higher Ground Farm manages two rooftop farms in Boston. One is a commercial rooftop farm located on the Boston Design Center in the Seaport District of Boston, growing vegetables for sale to Boston restaurants. The other is on Boston Medical Center, growing fresh produce for the hospital's patients, staff, and visitors and for their on-site food bank.		Greenhouse RTF 55,000 square feet	commercial active since 2013	Higher Ground Farm plans to grow 50,000 or so pounds of fruits and vegetables each year (2013)
Chicago	Farmed Here	Once the nation's largest vertical farm. It was also the first to be certified organic by USDA. Closed in January 2017 due financial issues.		Vertical / Sky farming, 90.000 square feet	commercial, in-active: closed 2017	
	Metropolitan Farms	Metropolitan Farms' mission is to grow fresh food in the city where it is eaten. They believe this will result in a healthier, more secure and environmentally sustainable food system.		Urban Farming, Aquaponic Farming	Commercial, Active since 2015	
Chicago Area	Green Sense Farms Chicago	The first indoor farm from Green Sense Farms. Their partners are Philips, Hortimax and Rijkzwaan. This farm has 7 grow towers of 12 metres high.		Vertical / Indoor Farming, the Chicago farm has 30,000 square ft	Commercial, active since 2014	1,500 cases of greens a week (2016)
Philadelphia	Metropolis Farms	Starting the first solar powered indoor farm, making both the process of farming and creating sustainable energy.		Vertical/ Indoor Farm, 100,000 square ft	Commercial, active since 2016	Metropolis grow the equivalent of 660 outdoor acres worth of crops in less than 100,000 sq feet (2017)

Los Angeles	Local Roots	Local Roots uses vertical hydroponic farming. Instead of soil, the seeds lie on trays with nutrient-rich water, stacked from the floor to the ceilings inside the shipping containers.		Indoor vertical farm	Commercial, active since 2013	65,000 pounds of lettuce a year (2016)
Seattle	Farmbox Greens	Seattle's first indoor vertical farm to grow produce micro herbs.		Indoor Farming / Vertical	commercial, active since 2011	Thousands of pounds of greens annually (2018)
San Francisco	Plenty	Plenty, an indoor agriculture company based in San Francisco, claims it has found a way to make vertical farming scalable and profitable. Plenty operates a growing warehouse in San Francisco and plants to build one outside Seattle next year.		Vertical Farming	commercial, active since 2014	4.5 million pounds of greens per year (2017)
Canada						
Montreal	Lufa Farms	Lufa Farms is a rooftop farm company. They run 2 rooftop farms in Montreal, each commercially active.		Rooftop farm, 2 Farms in total ca. 75.000 square feet	commercial, active since 2011	700 pounds of produce a day (2012)
Vancouver	VertiCrop	VertiCrop is a highy density fully automated closed loop conveyer hydroponic vertical farming system designed to achieve max output.		Vertical / Sky farming	Research Technology, commercial, active since 2009	
	Alterrus	On a parkade vertical farm was built with the Verticrop technology. The farm failed to adapt to the market demands and closed down in 2014.		Indoor / Vertical Farm, Greenhouse	commercial, in-active: closed 2014	

Mexico						
Mexico City	Greening Rooftops across Mexico City	The City promotes rooftop hydroponic gardens and installed beds of succulents on public buildings to tackle air pollution		Open-air RTF, Edible walls & balconies, ca. 12.300 sq m in the city	Ecological City, Private	

Europe						
Cities	**Name / Company**	**Description**	**Image**	**Type / Size**	**Status**	**Production capacity**
France						
Paris	Vertical Farm Romainville	French architecture firm Ilimelgo have designed a vertical farming complex in the Parisian suburb of Romainville. The project integrates production of produce into the city through a greenhouse that maximizes sunlight and natural ventilation.		Vertical Farm / Greenhouse 1000 square meters	Funds are being raised, concept	
United Kingdom						
London	Grow Up Urban farms	The farm combines two well-established farming practices – aquaculture (farming fish) and hydroponics in a recirculating system.		Indoor / Vertical Farm, 6000 square feet	commercial, active since 2013	Projected annual production of 20 tonnes of greens and 4 tonnes of tilapia (2016)
	Growing Underground	The WWII shelter in Clapham consists of two large tunnels that were set to link the London Underground. Instead, Steven Dring and Richard Ballard grow an array of vegetables using hydroponic growing methods		Indoor Farming / Vertical	commercial active since 2012	Currently the subterranean farm can produce up to 60kg of herbs a day (2016)

North Lincolnshire	Jones Food Company & GE	Current, powered by GE (NYSE: GE) and Jones Food Company Ltd. (JFC), today announced that construction is underway toward building one of the world's largest indoor farms.		Vertical Farming	Production starts autumn 2018	Producing up to 420 tonnes of leafy greens per year across a growing area of 5120m2, arranged in racks rising to the height of 11m. (2018)
Germany						
Berlin	InFarm	A company that tries to eliminate the distance between farm and fork. Has a vision to build an indoor farm in every grocery store.		Indoor, vertical Farming (in every grocery store)	commercial active since 2012	
Sweden						
Stockholm	Plantagon	Plantagon develops, implements and operates innovative Agritechture solutions, creating green spaces in urban environments while adding value to surrounding real estate.		Indoor, research farming	Research, Concept	

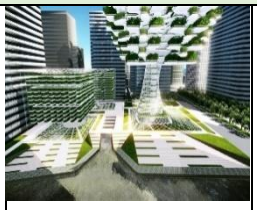
Oceania						
Cities	**Name / Company**	**Description**	**Image**	**Type / Size**	**Status**	**Production capacity**
Australia						
Sydney	Green Camel Farms	An integrated aquaculture-horticulture system that produces both fish and vegetables in a symbiotic manner with zero pesticides. Green Camel uses computer controlled planting and one staff to lay young herb seedlings on conveyer belts. This is intensive food production, whereas on the storey above conveyer belts of herbs move slowly but grow fast, in the regulated warmth and sunlight.		Indoor farming, 5,000 square meters	commercial, active since 2015	Capacity to produce over 130,000 Kg of herbs per year and 15,000 kg Barramundi per year (2015)

Melbourne	FarmWall	Farmwall is a start-up that designs and installs farmwalls in cafes and restaurants to grow fresh herbs and greens		Vertical Farm	commercial (start-up), active sine 2017	

Asia						
Cities	**Name / Company**	**Description**	**Image**	**Type / Size**	**Status**	**Production capacity**
China						
Beijing	IEDA Protected Horticulture	A vertical plant factory on top of the Chinese Academy of Agricultural Sciences in Beijing.		Vertical farming 800 square meters	Commercial, active since 2002	With rows 10 feet high, the indoor patches yield between 40 and 100 times more produce than a typical open field of the same size. (2017)
Shanghai	Sunqiao Urban Agricultural District	The city is planning a 250-acre agricultural district with vertical farming, which will function as a space to work, live, shop, and farm food. It will include 753,000-square-feet of vertical farms.		Vertical Farming / Smart City 753,000 square feet of vertical farms	Smart city, vertical farming Concept	
Nanjing	Vertical Forest Tower	The tower has a plant covered facade that is thought of to help chinese cities to tackle pollution and to absorb up to 25 tons CO2 in a year.		Vertical gardens	vertical garden Concept	
Hong Kong	Rooftop Republic	Rooftop Republic's team has been pioneering the urban farming movement over the last five years. They run several urban (rooftop) farms in Hong Kong		Roof top farming	Community building, active since 2012	Runs 34 farms (2018)

	SCATIL	With the passion in agricultural development, our founders introduced Japanese hydroponic technology and an indoor hydroponic farming in 2014 as the stepping stone.		Indoor Vertical Farm	Commercial, Active since 2014	
Shenzhen	Green Sense Farms Shenzen	This is the second vertical farm from Green Sense Farms. Their partners are, among others, Philips, Hortimax and Rijkzwaan		Indoor Vertical Farm	Commercial, Active since 2016	750,000 to 1 million heads of lettuce and about 1.5 million leafy greens (2016)
Taiwan						
Taipei	Ting-Mao Corp.	TingMao Agricultural Biotechnology was an early pioneer, starting its plant factory in 2007, and today is the leading producer of LED-grown vegetables in Taiwan		Indoor farming, Vertical farm, 3300 square meters	commercial, active since 2007	
	Agora tower	A twisting, smog-eating tower with vertical gardens is nearly finished in Taipei, Taiwan. The skyscraper's facade, roof, and balconies will contain 23,000 trees and shrubs – nearly the same amount found in New York's Central Park. Inside, it will hold 40 luxury condos. The plants are projected to absorb 130 tons of carbon dioxide per year		Vertical Gardens	vertical gardens, in progress	

	Yes Health iFarm	Yes Health iFarm, in Taoyuan's Luchu Township, is the largest indoor plant producer in Asia, currently employing 130 staff members. it is a technology-driven 14-story vertical farm cover 2,645 square meters.		Indoor farming, Vertical farm, 2645 square meters	Commercial and active	
Japan						
Tokyo	Pasona Head-quarters	The Headquarters of the Pasona Group blooms a garden in the sky that provides Tokyo with a striking display of foliage.		Vertical gardens	vertical gardens, active since 2010	
Kashiwa	GE & Mirai	Claims to be the world's largest indoor farm. The high-tech indoor farm is illuminated by 17.500 LEDs and is nearly half the size of a football field		Indoor farm 25,000 square feet	commercial, active since 2012	10.000 crops lettuce a day (2014)
Aizu Wakamatsu (100km from Fukushima)	Fujitsu	A vertical farm, about 60 miles from the site of the deadly 2011 nuclear disaster in Fukushima prefecture, inside a former silicon chip manufacturing facility owned by the Japanese computer company Fujitsu		Indoor vertical farm, 1850 square meters	commercial, active since 2015	12.000 crops of lettuce a day (2016)
Kyoto	Spread Factory	Spread is Japan's largest vertical farm, a blend of agriculture and industry. Spread grows and ships out four varieties of lettuce.		Vertical / Sky Farming, 4.780 sqm	commercial, active since 2006	More than 20.000 crops of lettuce a day (2017)

South Korea						
Seoul	Urban Skyfarm	The Urban Skyfarm is a vertical farm design proposal for a site located in downtown Seoul, right adjacent to the Cheonggyecheon stream which is a heavily populated dense urban area.		Vertical gardens	vertical garden, Concept	
Indonesia						
Jakarta	2017 green aisle program in 75 areas	Jakarta administration plans to introduce a program to grow vegetables medicinal plants and pot fruit plants aiming to ensure food security. The administration has allocated Rp 5 billion (US$ 375,855) for the program.		Food production, urban farming	In progress	
Singapore						
Singapore	Sky Greens	Sky Greens is a private-public project that endeavours to become the world leading provider for integrated agriculture technology.		Vertical / Sky farming	commercial, active since 2012	1000 kg vegetables a day (2016)
	Packet Greens	Through a multi layered shelf design they are able to produce up to 30kg vegetables daily to meet Singapores self sufficient food target.		Vertical / Sky farming, 1,500 square feet	commercial, active since 2014	30 kg daily yield of vegetables (2016)
India						
Mumbai	Terra Farms	Terra Farms is the first 'Urban Vertical Farm' in Mumbai based at Malad. We aspire to bring the farm as close to the city as possible		Micro Farming / Sky Farming,	Commercial, Research, active since 2012	

Khagaria	Mega food park	The 70-acre food park will create immense opportunities for entrepreneurship and employment in the state bestowed with huge agriculture production potential. It will benefit farmers, growers, food processors and consumers in the state of Bihar		Mega farm	Commercial, in progress	On completion, the park will have facilities of 40,000 tonnes dry warehouse, 10,000 tonnes grain silos, 5,000 tonnes multi-products cold storage, 10 tonnes per hour packing house, two tonnes per hour IQF, 1,500 tonne deep fridge, besides having modern testing labs and reefer vans (2018)
100 cities across India	Smart cities mission	Smart Cities Mission is an urban renewal program by the Government of India with the mission to develop 100 cities across the country making them citizen friendly and sustainable. It is a 5 year program, starting 2017, funded by the government. One criteria is to preserve and develop open spaces in order to create more livable areas.		Smart city	In progress	15 billion dollars has been made available for the project (2015)
United Arab Emirates (UAE)						
Dubai	Badia Farms	Badia Farms is starting the GCC's first indoor vertical farm. We have a growing reputation for supplying the finest micro-greens and herbs to Dubai's top restaurants, caterers, and chefs		Vertical Farming	Commercial, active since December 2017	Since December 2017, Badia has been producing 1,000 heads of lettuce and has over 30 clients across the UAE. (2018)

	Crop one Holding	Crop One Holdings and Emirates Flight Catering (EKFC), one of the world's largest airline catering operators, have announced a $40 million joint venture (J.V.) agreement to build the world's largest vertical farming facility in Dubai, United Arab Emirates.		Vertical Farming	Construction starts in November, 2018	The 130,000 square foot controlled environment facility will produce three US tons (6,000 pounds or 2,700 kg) of leafy greens. (2018)

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