

Vertical Farming: The Future of Agriculture?

Can this modern cultivation practice of growing plants in a closed environment meet our food demands in a more sustainable way?

For those of you unaware of the quiet revolution going on in agriculture, vertical farming is shaping the future of food.

World population is expected to reach a colossal [11 billion by 2100](#) (though it varies depending on whose model you use). As a result, many have begun to [ask](#) how are we going to feed even more hungry mouths? The answer, at least in part, comes in the form of vertical farming, a new, revolutionary, and [sustainable way to grow our food](#) that can also help to reduce the carbon footprint of food production.

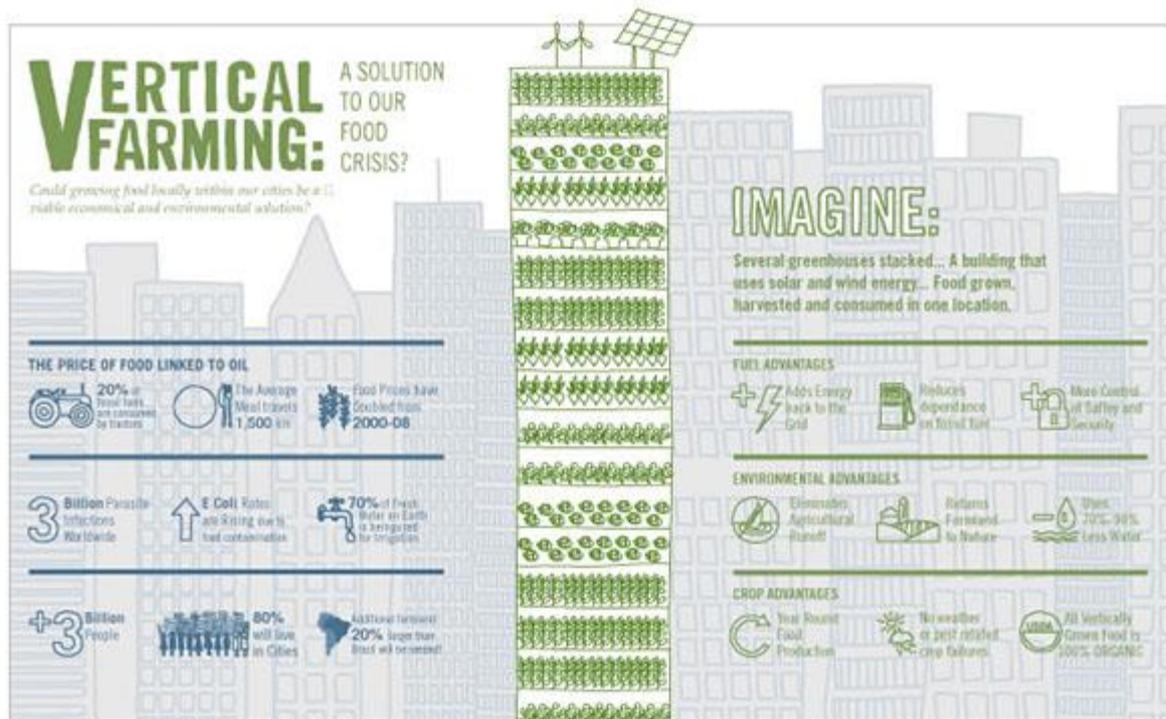
Vertical farming involves growing plants in stacks of hydroponic towers, lit with LED lamps, in a strictly controlled environment. The towers of crops are fed with water laced with nutrients, the strict control of the environment allows for optimum yield from the crops every time. Global Vertical Farming market was [worth 600 million](#) USD in 2014.

Vertical farming has numerous [advantages](#) over the practices of regular farming. As well as producing a consistent and high yield crop 365 days a year, the crop can be grown in a compact and protected environment — one that is not affected by weather patterns or climate change. All with the added bonus of zero waste (through water recycling) and zero net energy use. All the water used in the hydroponic stacks is [recycled](#) and reused — [urban waste water](#) can even be recycled for use in vertical farms.

[Green Sense Farms](#) in Portage, Indiana, is in the process of building a network of indoor vertical farms across the globe. Their goal is to not only reduce the carbon footprint and environmental consequences associated with traditional farming, but to [provide](#) consumers with locally produced, fresh, leafy greens, to try to foster healthier and more environmentally friendly communities. Green Sense Farms is using LEDs built by Dutch tech giants Philips to cut power costs through cheaper LED light, as well as tweaking light wavelengths to try to grow the perfect crop. *The Economist* [praised](#) their farms for the innovative work that they are doing to provide new ways to better feed the planet:

“The crops grow faster, too. Philips reckons that using LED lights in this sort of controlled, indoor environment could cut growing cycles by up to half compared with traditional farming. That could help meet demand for what was once impossible: fresh, locally grown produce, all year round.”

The versatility of location is the greatest strength of vertical farming, especially in the fight against [climate change](#). The farms can be [located](#) at, or nearby to, distribution centres, supermarkets, or anywhere that sells or serves large volumes of food, and thus reduce the carbon footprint associated with transporting food from farms to tables — it is the antithesis of globalization.



One of the most globally renowned vertical farming start-ups is [Urban Crops](#), whose headquarters are located in Waregem, Belgium, (though they have recently launched a [US division](#) in Miami that will be responsible for the entire American continent, North and South). They don't see vertical farming as a [radical](#) departure from traditional farming, rather they see it as a more refined and efficient evolution of farming. Urban Crops [grow their produce](#) under a purple light delivered by red and blue LED lamps that create the perfect conditions for growth; the plants are fed via a hydroponic system of water infused with special minerals and nutrients. Their [set-up](#) can turn 50 square meters into 500 square meters of usable farm space and their 30 square meter space produces 220 lettuce plants every day with only five percent of the water that would be needed in traditional farming.

Despite all of these perceived benefits, there have been some who have rejected the idea of vertical farming as a realistic way forward for humanity. [TreeHugger](#) has had trouble digesting the concept of vertical farming for a number of years, supporting the belief held by [Stan Cox of Alternet](#) that:

“Although the concept [of vertical farming] has provided opportunities for architecture students and others to create innovative, sometimes beautiful building designs, it holds little practical potential for providing food.”

Cox's main gripe with vertical farming is with the logic (or lack of it) at the heart of the technology; that using renewable energy to power indoor lighting to grow plants with is nothing but a waste of energy a resources. The transfer of energy from sunlight, to solar arrays, to power lamps that feed plants with light energy, is, in his eyes, nothing but a waste of energy (due to transmission losses) and infrastructure. He [argues](#) that it is much better to:

“Let crop plants do what they do best: capture cost-free, emissions-free sunlight for themselves, directly.”

Although much of the loss in terms of infrastructure cost could be accounted for if the farms were powered by solar panels on-site – for example by Elon Musk's [solar roof](#).

Cox also forwards the idea that traditional farming is still viable, that they are simply ploughing the wrong land as it's become more economically viable to ship produce long distance. The solution is to grow more crops locally, rather than relying on huge sprawling farms and cattle ranches that are not sustainable. Since world hunger is ultimately a result of [poor distribution](#), not a lack of resources, the sensible option seems to be to localize food production as much as possible — whether through vertical farming or more traditional farming techniques.

In contrast to these two polarized opinions Paul Mahon, from [Ontario Farmer Publications](#), doesn't believe that vertical farming in its more extreme form is how farming is going to develop (at least not in the immediate future).

“Horizontal Farming [a self-coined term] is moving towards that sort of idea, farmers are using hydroponics to ensure a constant supply of water to the roots and crops. GPS and modern technology is allowing farmers to be much more precise in their measurements and their use of land. They are moving to smaller and smaller plots of land for the same yield, and are now able to match nutrients with soil types and capability.”

So the future of farming could marry traditional techniques with some of the small space advancements made with vertical farming to produce higher yields from smaller plots of land. This marriage of techniques has been adopted by Green Living Technologies in their [Mobile Edible Wall Unit](#), which allows users to grow produce outside on an A-Frame mounted flowerbeds to allow for more economic use of space. This could be viewed as a validation of Stan Cox's opinion that traditional farming isn't as flawed as many are suggesting.

However, these solutions do not deal with the massive carbon footprint associated with traditional farming, or have the advantages of being immune to [climate change](#) and weather conditions in the way that vertical farming is. Although [Polyculture farming](#) has offered a way to reduce the carbon footprint of horizontal farming, in a way that is easy for everyone to adopt, it still requires large areas to grow substantial quantities of food. This is where vertical farming truly outstrips more traditional techniques —in urban and more highly populated areas where space is a valuable resource.

With plans in Sweden to build a 16 story “[plantscraper](#)” in the works, and MIT [working](#) with Target to produce their own greens in-store using vertical farming techniques, there doesn't seem to be any dispute that vertical farming is going to play a role in the future of agriculture. We will just have to wait to see the extent to which it will dominate agriculture in the future. In the meantime, there are numerous ways that we as individuals can reduce the carbon footprint of agriculture. For example, instead of planting lawns you could grow your own produce, or try to incorporate polyculture farming into your garden. We all need to be responsible for the future of our food, rather than consider it to be someone else's job.

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