

Growing Underground

sustainable systems for the future

Growing Underground, part of the Zero Carbon Farms family, is a brand working to reshape farming by accelerating the transition to carbon negative approaches. Design Council spoke to Richard Ballard, co-founder of Growing Underground, about the work that he and the team has been doing.



RB: Our work is based on circular economy concepts. We use recycled substrates, recirculated water, and we reduce resource use wherever we can. We grow our products close to their point of consumption to minimise food miles. We use renewable energy. By combining all those approaches, the company has become carbon negative.

How does the design and creation process differ from traditional approaches?

RB: Most systems out there – in farming, yes, but across all industries – were designed years or decades ago. They’ve been continually improved, but they’re based on traditional principles even though the systems, demand, and supply chains around them might have changed.

A well-designed system is symbiotic, with consumers, distributors and agriculture all in the same place. We don’t just look at the work we are doing but also how it relates to every part of the supply chain. That means we understand the whole system right from the start of the process and design each element to fit.



“It’s great to bring our technology to communities. We’ve really lost touch with how food is grown. Having that ability to bring it into cities can start to reconnect us to the things we consume.”

So, a project like this must mean redesigning a whole system. Where do you begin?

RB: We had certain constraints to work with. We grow in tunnels, which are a controlled environment, but naturally controlled so they're not perfect. We started with the assets that the tunnels offered and design each element for maximum efficiency and productivity.

We spoke to experts so that we could fully understand the system that we wanted to build. We measure everything we do, collect data, and iterate. With coriander, for example, it typically takes 20 to 22 days to grow, and our yield would increase by 20 to 30 per cent. We have tested various growing conditions and found the ideal temperatures, airflow and humidity. Now our yield has increased to over 40 per cent, sometimes double what we used to get.

We've been collating data on temperature, humidity airflows, CO₂, microbiology, pathogens in the water, temperature of the water, the pH of the water, etcetera. With that data, we can continually improve.

Why is that important? Why not just jump straight into automation?

RB: The two biggest costs to any business are labour and power. If you design and iterate, rather than jumping straight in, you can find the most efficient way of using each of those things. Most organisations will jump at new technology, but once they've retrofitted their system, that tech isn't working in the context it was designed for. The systems around it might not be cutting edge, for example, so it's not as efficient as it was designed to be.

We design each element to work with what we have. As a result, we've boosted our productivity. Power is only 4 percent of our operational costs where conventional power for this sort of industry is about 15 percent. Clever design can make a huge difference.

“Our society currently is a very inefficient and unproductive system. That is changing, but slowly.”



“The basis of our business is data now. We can measure each element and design data-driven improvements. We can minimise waste because we don’t have to trial everything. A lot of the process is on paper.”



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