

Optimising the world's first underground farm

Thirty-three metres beneath the busy streets of Clapham in London lies a farm that is producing subterranean salad greens. In a repurposed WW2 air raid shelter, the Growing Underground project uses soilless hydroponic technology and LED lighting to grow crops year-round, producing 12 times as many crops per unit area as conventional UK greenhouses.

The farm offers a vision for how food production might be increased for a growing global population without using up valuable land resources. However, farming crops without sunlight is an energy-intensive process, so researchers at the Turing and the University of Cambridge have developed a **digital twin** of the farm, to find ways of maximising crop growth while minimising energy use.

The model is fed with variables including water use, relative humidity, temperature, and CO2 and light levels, from both manual observations and automatic sensors. The researchers can then use the model to identify the combination of variables that most improves crop growth. The digital twin can also make forecasts, helping growers to make decisions about the day ahead. If the model predicts that the farm is likely to be too cold, for instance, the grower might add a temporary heater or tweak the lighting. In turn, the model provides data on how effective the measures were.

Thanks to this work, the farm has reduced the time it takes to grow crops by as much as 50%, and increased yields by almost 25%. It is a brilliant example of how data-driven models can help green, innovative projects such as Growing Underground to blossom.



Related programmes and teams
Data-centric engineering
Research Engineering
AI for science and government (ASG)

“The underground farm provided the perfect opportunity to test our digital twin technology in a unique environment. Bespoke, data-rich computer models such as this will be crucial for optimising the farms of the future, to maximise their output in a changing climate.”

Ruchi Choudhary

Project leader and Data-Centric Engineering Group Leader
The Alan Turing Institute