The secret

A Dutch firm is using new technology to tackle food shortages. Ken Wilkie tastes the fruit and veg of the future

life of plants

Photo: Mark Horn

In the last 100 years, earth's population has tripled. In 2011, according to UN figures, we will reach the seven billion mark. And by 2045, the global population is projected to reach nine billion – twice what it was in 1980.

Meanwhile, the UN Food and Agriculture Organisation (FAO) states that 30 million people a year are dying of hunger (the equivalent of 100,000 folk per day), with another two billion suffering from malnutrition.

Not only is food production totally out of balance with human needs, as Lester Brown, head of the Earth Policy Institute in Washington, points out, but humans are living off natural capital – eroding soil and depleting groundwater – faster than they can be replenished.

In short, we are not making enough food, and much of what we do make is unevenly distributed.

The FAO sees technology as the key to creating food for all that's affordable, safe and preserves natural resources. But what kind of technology?

One revolutionary answer is being developed in The Netherlands, once home to the 17th-century 'Father of Microbiology', Antoni van Leeuwenhoek. It is called PlantLab.

"We have created a plant paradise here," says PlantLab's managing partner Gertjan Meeuws, introducing this new world of cultivation in Den Bosch. Meeuws's 'plant paradise' is no green oasis basking in the sun, but a controlled high-tech environment where fruit, vegetables and flowers are made to measure in a way that has never before been done.

PlantLab is housed in a hangar next to a parking lot at the University of Den Bosch's Centre for Growing Concepts, a study centre for the plant managers of the future.

Sealed off from sunlight, a white corridor leads to a series of computer-controlled cultivation chambers accessed through thick aircraft-like doors. Inside, from floor to ceiling, are rows of vegetables and fruit: courgettes, peppers, cucumbers, strawberries, lettuces, peas, tomatoes – all growing at controlled rates in pots of earth under infrared and blue LED lighting.

The atmosphere is psychedelic. Walls are pink. Plants look greyish-purple. I expect Dr Spock to be beamed up any minute. But when Meeuws takes a plant out of the chamber and into the corridor's white light, it gradually turns green as my eyes adjust. I taste a slice of fresh PlantLab cucumber. I am not a cucumber expert, but this was one of the most succulent and refreshing that I have tasted.

Meeuws explains: "Because of mathematical calculations, the plants here are growing to ultimate efficiency and free of pesticides. They enjoy their ideal requirements of water, light, humidity, CO_2 and room and root temperature. There is no wastage. The latest LED technology makes it possible to create the ideal light combination of blue, red and far-red to suit the plants' individual requirements."

LED lighting is costly, says Meeuws, "but LED performance is increasing spectacularly. We use only the latest sustainable LED lighting and only provide wavelengths that are useful for growth and development of the crop. The LED lighting we use is more energy efficient than the light that is normally used in glasshouses."

Unlike sunlight and traditional electronic lighting, LED only emits one colour of light. So, no energy is wasted with light spectra that are superfluous to the plant's needs.

"We provide exactly the colours that the plant requires for photosynthesis," says Meeuws. "Plants mainly need blue and red light for photosynthesis. But plants also need far-red, a colour not visible to the human eye, but 'visible' to the plant. The relationships between the light colours determine the form of the plant. Our use of LED lighting is economic and, in certain countries, use can be made of solar panels as an energy source. Every plant acquires an ID. They all grow completely independent of sunlight, rhythms of night and day, seasons and weather. And, on top of ▶▶

FAR LEFT
Gertjan Meeuws in the lab
LEFT
A sketch of a possible inner-city farm

> "We humans are not making enough food"

this, our plants require less than 10% of the water that would be needed in a glasshouse."

Meeuws and his colleagues, John van Gemert, Leon van Duijn and Marcel Kers are not just far-sighted engineers realising a vision, they are motivated by a passion for the role that they feel PlantLab can play in the future of our planet. Walking around PlantLab and listening to Meeuws, the significance for the future is clear to see.

Meeuws himself provided the basis for the unique thinking about plant balance, back in 1989. "After 10,000 years of land cultivation, we are now seeing new forms of indoor farming."

He explains: "Dickson Despommier, Professor at Columbia University, developed the first concept of vertical farming in 1999. This went from rooftop gardens to flats with cultivation floors."

Meeuws feels that, energy-wise, greenhouses are outdated. "Light cannot be regulated under glass, a lot of costly moisture and CO_2 escapes when windows are opened and sudden bright sunlight can destroy a carefully created climate. Our Plant Production Units remedy all these limitations."

By cultivating in tiers, the PlantLab solution also saves space. Meeuws explains: "It is possible to cultivate in five, ten or 20 levels in a large hall. In a Plant Production Unit, less evaporation is needed to cool the crop which means we save over 90% of water, compared to traditional cultivation methods. In short, we can provide identical crop performances anywhere in the world, on industrial premises, in the tropics, the far north or in the desert."

PlantLab's partner, Imtech, is responsible for the technical service of the units and claims to be able to place nurseries virtually anywhere.

"PlantLab's first city nursery will soon be in action," says Meeuws.

"Either Amsterdam or Rotterdam will be chosen as the launch city. There are more than 300 cities in the world with over one million inhabitants, all dependent on fresh food that sometimes comes from thousands of kilometres away and is on the road for days," he says.

"All over the world there is a growing need for nutritious food instead of mere filling. Malnutrition is an increasing problem in both developed and developing countries. With our technique, we can grow and distribute our fruit and vegetables on the spot, in the centre of the city and at any time of the year."

Meeuws envisions cruise ships having their own system-grown fresh fruit and vegetables on board. "But, more important, an entire country can adopt the PlantLab concept," he says. "The Plant Production Units are tailor-made for large or small production. For a major city or a small African village."

He agrees that traditional local farming is still a good idea where it can be done, but feels it will never be able to feed nine billion people by 2045.

And so, the PlantLab project shows one possible way to help meet the needs of the future.

Groundbreaking technology used to create a better-fed world. It could be a fresh start for food. ■

Photo: Maarten Laupman. Sketch: PlantLab and Imtech