

# A battery with leaves

**Is it possible – plants that produce electricity, recharge your mobile phone and keep your fridge running?**

**Wageningen pioneers think it is.** TEXT RESOURCE ILLUSTRATION KAY COENEN

Getting electricity from plants sounds like science fiction, but David Strik, an Environmental Technology researcher at Wageningen University, part of Wageningen UR, begs to differ. 'It's not a fantasy. Soon people will be able to use a few square metres of vegetation to power LED lamps, charge their mobile phones or run a super-efficient laptop. About 20 per cent of the global population has no access to electricity. Many people live in wetlands, and these are precisely the people we can supply with electricity.'

## CLEAN ENERGY

It is already possible to charge a mobile phone using plants. The principle was conceived by Bert Hamelers, who heads the Renewable Energy group within Environmental Technology. This group is using EU funding to investigate new technologies for generating clean energy, using

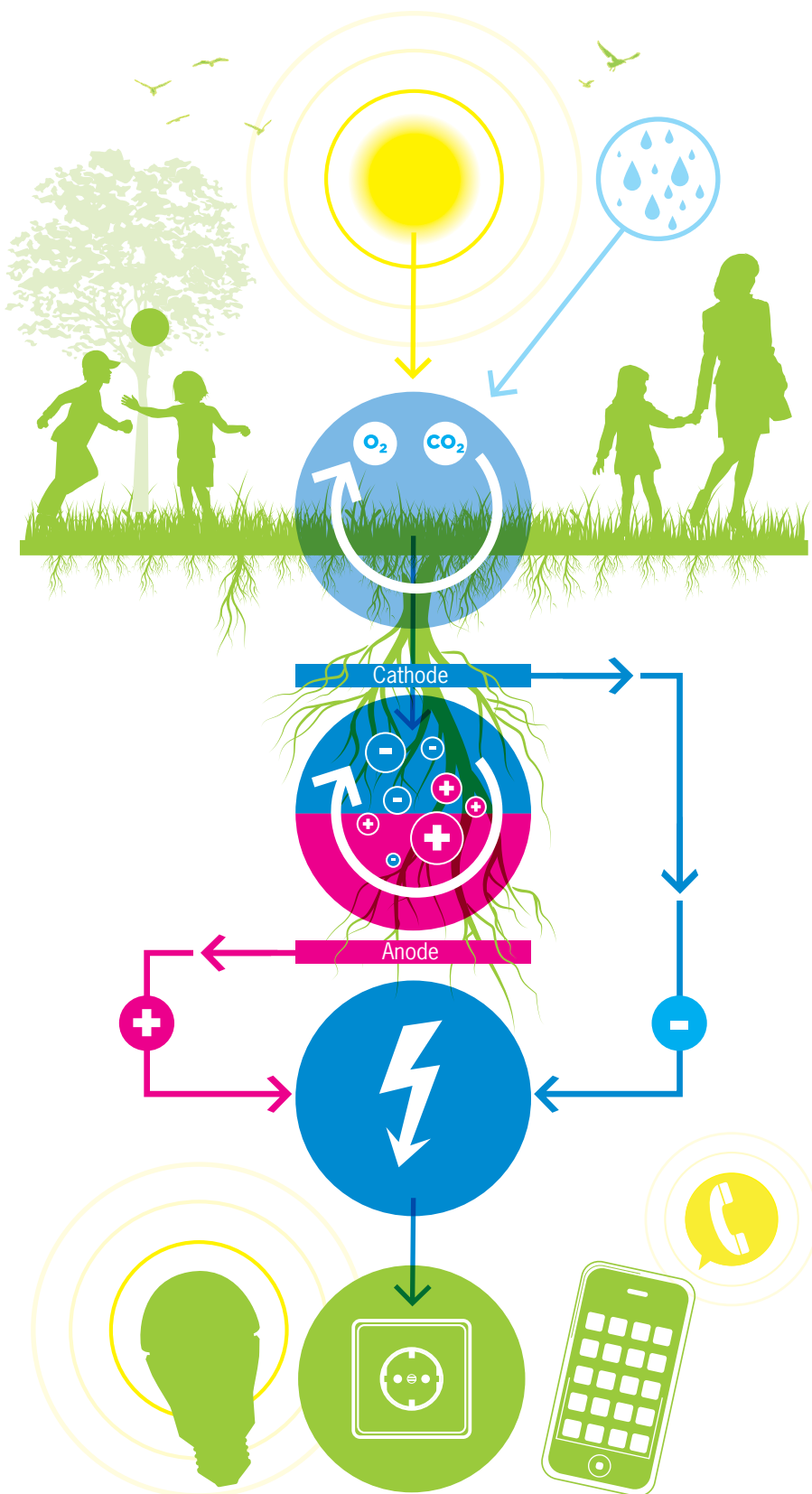
something called a plant-microbial fuel cell, for example. The plant provides the fuel and bacteria convert it into electricity. In this context 'fuel' means the organic compounds, known as exudates, discharged by the plant's roots into the soil. Sugars and organic acids make excellent fuel, for example, as do hydrocarbon polymers, enzymes and dead cell material. Electrochemical bacteria in the soil break this material down by oxidation into CO<sub>2</sub>, H<sup>+</sup> ions and electrons. You can harvest those electrons and hey presto, you've got electricity.

The plant-microbial fuel cell is essentially a planter with a few simple technical fittings to collect the electricity. Plant power is still pioneering work. Marjolein Helder, a PhD student, says the system is still something of a black box. 'We have some insight into which bacteria are doing the work. We know that bacteria of the *Geobacter* genus

are able to make electricity and we have seen them in our system, but we don't know how much fuel a plant produces. These exudates are difficult to measure as they are broken down in the soil straightaway. But the amount of fuel is obviously a decisive factor in the system. One of the challenges we are facing is how to increase that amount.'

## ANAEROBIC SOIL

Helder is using two model plants for her research. 'Reed meadow grass is a freshwater plant that can be found all over the campus in the ditches. Cord grass likes salty conditions and is found in coastal areas. Any plant will do in principle, as long as it grows in waterlogged, anaerobic soil. Oxygen is disastrous as it attracts the electrons that are released. Boggy areas, wetlands, deltas and paddy fields could well be highly suitable for this technology.'



### ROOF ELECTRICITY

How much electricity does a plant generate? The Environmental Technology number crunchers say an average flat roof of fifty square metres growing the right plants could in theory generate 150 watts continuously, about a third of what a household consumes.

According to Helder, plant power is the greenest energy imaginable. ‘You could generate electricity from plants eleven months a year in the Dutch climate. Day and night, because it works in the dark as well. The process only stops when there’s a ground frost and the system freezes’, says Helder. She and Strik founded the company Plant-e (pronounced plenty) two years ago as a vehicle for commercializing the new technology. The setup that makes it possible has been running on the roof of the new NIOO (Netherlands Institute of Ecology) building on the Mansholtlaan, Wageningen, since August. It consists of sixteen square metres of ‘green battery’ with reed meadow grass and cord grass: Plant-e’s first large-scale experiment. This larger scale should enable the generation of the first ‘useful electricity’, with sufficient voltage and current to charge a mobile phone, for instance. The NIOO trial should pave the way to developing a real product. It has not yet been decided what form that will take. Helder: ‘Should we start with a gadget for a window box? Should it be a do-it-yourself pack or should we market ready-made planters? This should become clearer over the coming year.’ ■