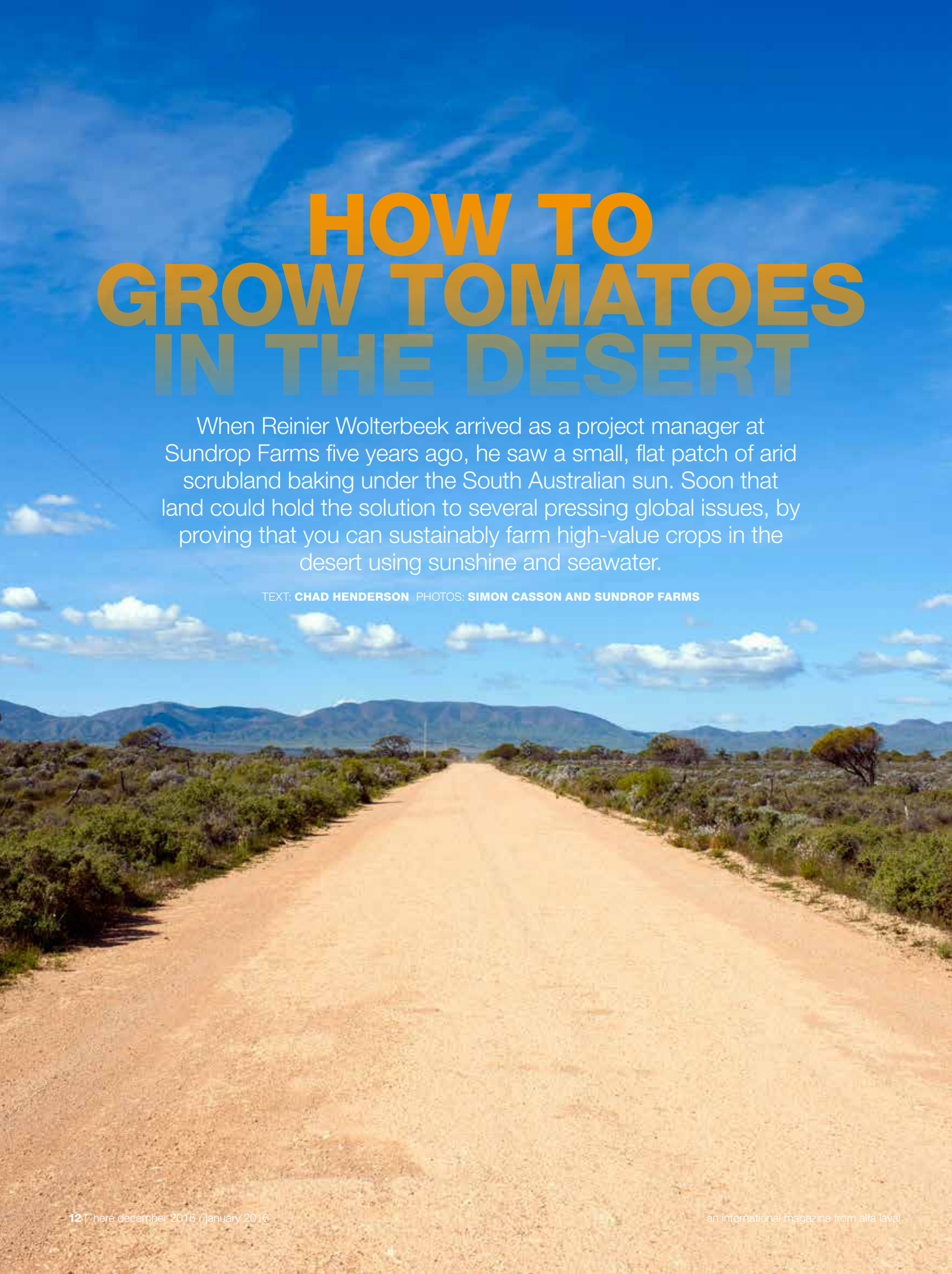
HOW TO GROW TOMATOES IN THE DESERT

When Reinier Wolterbeek arrived as a project manager at Sundrop Farms five years ago, he saw a small, flat patch of arid scrubland baking under the South Australian sun. Soon that land could hold the solution to several pressing global issues, by proving that you can sustainably farm high-value crops in the desert using sunshine and seawater.

TEXT: **CHAD HENDERSON** PHOTOS: **SIMON CASSON AND SUNDROP FARMS**



GOOD DAY SUNSHINE: Mirrors reflect the radiant energy from the sun -- which shines 300 days a year here -- on to the central tower, where the solar energy is converted into thermal energy.

Wolterbeek, now the CTO of Sundrop Farms, says the vision for the company started with the idea of taking the volatility out of farming. "Agriculture is a quite volatile business, both on the revenue and cost sides," he says. "Utility prices are always going up and down, basically following oil prices, and water prices are endlessly going up – it's not a very attractive business. To make it more attractive, we tried to find which of those fluctuations in the market we could stabilize, by providing sustainable sources of energy and water."

SUNDROP FARMS IS BUILDING a massive greenhouse complex with a technological solution and commercial scale that has never been attempted before. A state-of-the-art integrated solar energy system, provided by Aalborg CSP, will heat the greenhouses, produce electricity and generate energy to run a desalination unit from Alfa Laval, which will produce freshwater to irrigate the crops.

Wolterbeek says that another farming challenge is that all of the good agricultural land is already taken. Which is why he found himself watching a fence being built around that patch of arid Australian scrubland five years ago.

To Wolterbeek and the Sundrop Farms team, however, the location they chose was perfect. The company built a pilot project, consisting of a hydroponic greenhouse powered by solar energy. The farm – about 16 kilometres southeast of Port Augusta – receives 300 days of sunshine per year, and saltwater is obtained from the nearby Spencer Gulf.

AFTER THREE YEARS of trial and error, including honing skills with different high-value crops and technologies, Sundrop Farms decided it had enough experience in the system to roll out the development, ownership and operations of the Sundrop Farms greenhouses.

"We wanted to grow our operations several hundred-fold, and to get there we needed additional equity," says Wolterbeek. "It was difficult at the start, because for the general investment funds and banks it wasn't clear what we were, whether we were agriculture, infrastructure or renewable."

Finally, Sundrop Farms partnered with KKR, a global investment firm that enabled the company to realize its expansion both in Australian and in other interesting markets abroad, with the remaining funds coming from Australian banks.

"With the growing population we need more produce. But on the other hand we have limited resources, like fossil fuels, and freshwater is under severe stress in certain regions with long-term droughts," says Wolterbeek. "Our solution could have a really big impact."

Sundrop Farms' expansion project in Australia, which should be complete in October 2016, uniquely combines technology from some of the top suppliers in their respective fields.

At the heart of Sundrop Farms is the integrated solar energy system supplied by Aalborg CSP, which has cooperated with Alfa Laval for several years. The system will be capable of providing freshwater by desalinating seawater, heating the greenhouses in wintertime and on cold summer nights, and running a steam turbine to produce electricity.

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SUNSHINE AND SEAWATER

“These mirrors reflect the radiant energy to a receiver in the tower. The receiver is basically an advanced boiler system that absorbs the radiant energy and converts it to thermal energy.”

SVANTE BUNDGAARD, CEO OF AALBORG CSP

SUNDROP FARMS: The CSP system explained

- Radiant energy from the sun hits a field of mirrors that have a combined surface area of more than 50,000 sq metres. Together they are capable of producing 267,000 MWh on a perfect solar day.
- The mirrors, curved in a D shape around the south side of a 116-metre-high tower, reflect the radiant energy to a receiver on the tower. The receiver – an advanced boiler system – converts the solar energy into thermal energy, which runs the desalination unit, drives a steam turbine, and heats the greenhouses.
- Of the 44 gigawatt hours of energy produced each year, 40 percent is used to produce freshwater in Alfa Laval’s desalination unit, 50 percent is used for heating, and ten percent for electricity.
- During the winter period, a diesel backup boiler sustains production. It accounts for about five percent of total annual energy production.

REINIER WOLTERBEEK: Our solution could have a really big impact..

SVANTE BUNDGAARD: This project has incredible potential to solve one of the biggest issues we face.

Svante Bundgaard, CEO of Aalborg CSP, says that Sundrop Farms’ integrated solar plant will be based on concentrated solar power (CSP) tower technology. “Radiant energy from the sun hits a number of mirrors,” he explains. “These mirrors then reflect the radiant energy to a receiver in the tower. The receiver is basically an advanced boiler system that absorbs the radiant energy and converts it to thermal energy. The thermal energy is used to drive the steam turbine, heat the greenhouses and run the desalination unit.”

UNLIKE A PHOTOVOLTAIC power (PV) plant, which only produces electricity, the unique, integrated solar energy plant at Sundrop Farms will produce multiple streams of energy that can be both stored and used to run several operations on the farm. The desalination unit from Alfa Laval will be the largest solar-powered unit of its kind ever made. The unit works by using steam generated by solar energy to evaporate seawater into pure water vapour.

“This project has an incredible potential to solve one of the biggest issues we face: providing food to a growing global population while arable land decreases,” says Bundgaard. “Sundrop Farms has built a profitable business case that can be used to sustainably produce food in similar climates around the world.”

The expanded Sundrop Farms will focus on producing truss tomatoes, and aims to grow 15,000 metric tonnes per year. The Australian supermarket chain Coles has already signed a ten-year contract to buy the tomatoes.

These days Reinier Wolterbeek works from Sundrop Farms’ London office, where he is making plans to duplicate the Port Augusta facility in other parts of the world. Sundrop Farms has already opened an office in the Middle East and is looking at other regions with similar climates.

“This is the best job I’ve ever had and ever will have,” he says. “I think it’s great. I’m doing exactly what I always wanted to do, making freshwater for agricultural purposes, and we’re doing it in a sustainable manner, which is even greater.” ■

SUNSHINE AND SEAWATER

GREEN GROWTH: A supermarket chain has signed a ten-year contract to buy the sustainably grown tomatoes from Sundrop Farms.

SUN, SEA AND SALT:
How solar-powered desalination works

■ The Alfa Laval multi-effect desalination (MED) unit is based on the evaporation of seawater. Solar energy heats seawater feed in a titanium-plate heat exchanger. Part of the seawater flow is evaporated to pure water vapour.

■ The water vapour is then utilized as evaporation energy for the subsequent effect, after which the same process is repeated several times corresponding to the number of effects. The water vapour generated from the last effect is condensed in the main system condenser cooled by seawater. The solar desalination freshwater is then used to irrigate crops.

■ "This project was a fantastic opportunity to further advance our desalination technology," says Steen Rosenbom, Business Manager, Oil & Gas Technology, Alfa Laval. The company has more than 50 years' experience around the world in desalination. "We hope this project will be an example to others, where high-quality freshwater can be produced at a low cost, using only solar energy."

ADRIAN SIMKINS, HEAD GROVER