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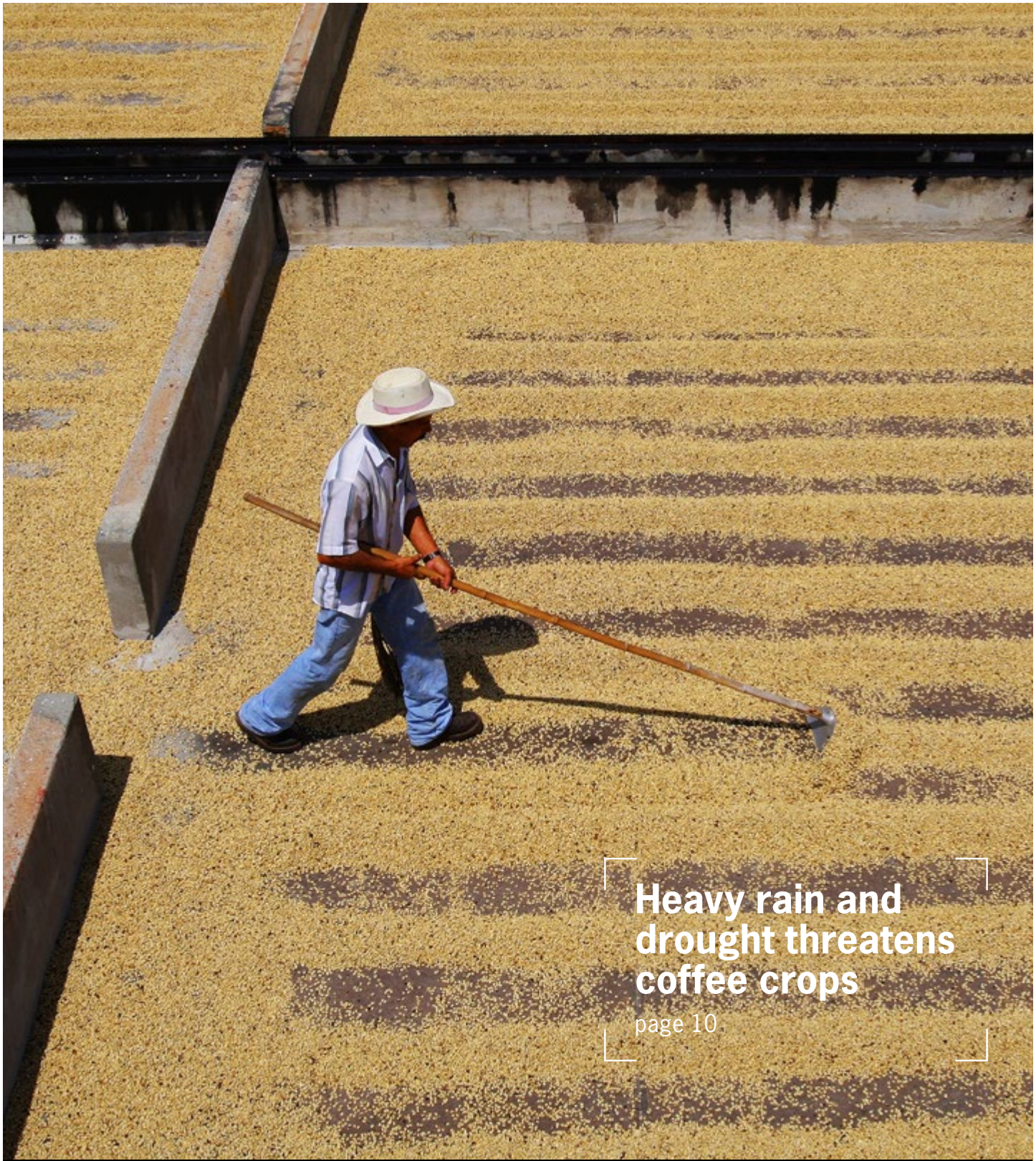

Heavy rain and drought threatens coffee crops

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Time to bring back **the bean** | Farming with **field birds** | Impact: guaranteed **gluten-free oats**
Protecting **sea turtles** in the Caribbean | Towards a **sustainable city** | **Cockerel** back on the menu

WELLENSIEK'S LEGACY

In search of the perfect plant shape

Prof. Leo Marcelis and PhD candidate Maarten Verhoog are researching the conditions that produce the optimally shaped plant, using a 3D computer model they developed themselves. Innovative research that was made possible by the bequest of the late Prof. Wellensiek.

TEXT YVONNE DE HILSTER **PHOTOGRAPHY** JORIS SCHAAP

There is a portrait of Professor Wellensiek, a former professor of horticultural botany in Wageningen, on the wall of Leo Marcelis's office on Wageningen Campus. 'I sometimes used to see Wellensiek walking around the department when I was a horticulture student here,' says Marcelis, professor of Horticulture and Product Physiology. 'He was long retired by then but he continued working until a great age.'

When Marcelis was appointed professor in 2013, he could never have imagined that his famous predecessor would be helping to him by funding innovative research.

Susan Wellensiek, professor of Horticultural Botany in Wageningen from 1946 to 1969, was the founding father of horticultural botany in Wageningen. When he passed away in 1990, part of his estate was transferred to a fund for horticultural research. After the death of his widow Anneke Wellensiek-Manger in 2012, the fund received a further substantial sum from the estate. Since it was established the fund has supported three young scientists in their work.

One of them is PhD candidate Maarten Verhoog. He studies tomatoes, investigating the variations in plant growth that arise from adjusting the plant spacing, the greenhouse climate and cultivation factors. His model crop is the tomato, for which he is developing new simulation models that show which changes result in a plant with the optimum shape and more homogeneity between plants.

MORE UNIFORMITY

Having homogeneous plants is very important in greenhouse cultivation because the plants are grown in controlled conditions, explains Marcelis. 'Variation between plants causes problems; diseases occur when there are extremes. If a plant has a lot of leaves in one spot, that spot may remain more humid, giving moulds a chance to develop that can in turn affect other plants. More uniform plants will make the microclimate more uniform too, which allows more energy-efficient climate control.'

Marcelis submitted a grant application to the Wellensiek Fund for the development of new simulation models for the growth and development of plants. 'We have a strong base in crop growth models but many more scientific challenges lie ahead in the new dynamic, functional-structural plant models,' says Marcelis.

Traditional dynamic crop growth models perform calculations of various processes in the plant, such as photosynthesis and the distribution of the sugars that are formed through this. But they do not take account of the plant's shape, even though this has all kinds of consequences for how the plant functions. Newer models that do take this 'architecture' into account are often static: they look at the effect of a measure at one particular point in time. In the newest dynamic 3D models, you can simulate the plant's growth yourself and also allow for

Prof. Leo Marcelis and PhD candidate Maarten Verhoog

the fact that plants influence one another. These models look like a lively 3D animation film. ‘Ideally you would want leaves to catch a lot of light everywhere as that’s best for yields,’ explains Marcelis. ‘You can influence the plant’s architecture by pruning, but also through the atmospheric humidity, colour of the light and positioning of the plants relative to one another. In dynamic models, you can constantly adjust these factors.’

TIPS FOR GROWERS

Verhoog hopes eventually to be able to use his research to give growers practical tips. The research is also important for plant breeders and companies that develop climate control technologies and lighting systems for greenhouse horticulture.
Verhoog graduated as a plant scientist in Wageningen in 2015. In his Master’s, he focused on data analysis in greenhouse horticulture. ‘Formulas are fun,’ says Verhoog. He finds the modelling the most exciting part of his research: getting a good simulation of plant growth under different circumstances. But he still spends many hours in the greenhouse. That is because you never develop a model without doing field trials, as Verhoog explains: ‘You can use your model to calculate 100 scenarios and try to identify the trends. You then test those outcomes in a number of focused trials. So simulation models both save time and allow new avenues to be explored that can then potentially be studied in practice.’ So he measures and weighs numerous aspects of tomato plants, observing his subject matter as closely as an artist does so as to capture the plant as efficiently as possible in his computer model.
For Verhoog it is something special that he is now able to carry out his doctoral research thanks to Wellensiek. ‘I read up about Wellensiek and that gave me an insight into how horticulture developed. It is a nice feeling that I’m able to contribute to future developments.’
Marcelis took on three more PhD candidates this year for projects in this area. The way their projects tie in so well with Verhoog’s ongoing research probably helped the group get funding, thinks Marcelis. Wellensiek would be proud of him. ■

UNIVERSITY FUND WAGENINGEN

The Wellensiek Fund is managed by the University Fund Wageningen.
More information: *www.universityfundwageningen.eu/wellensiekfund* and *www.universityfundwageningen.eu/howtodonate*