

'WE ARE 10 YEARS AHEAD OF THE REST OF THE WORLD'

New: the autonomous orchard sprayer

In collaboration with a group of companies, Wageningen researchers have succeeded in developing a self-propelling tractor fitted with an automatic sprayer for use in orchards. This could save a fortune in labour costs and in pesticides – sparing the environment into the bargain.

TEXT ALEXANDRA BRANDERHORST **PHOTOGRAPHY** NATIONALE BEELDBANK AND WAGENINGEN UR

From spring until picking time, between April and September, fruit growers spray their orchards at least once a week. On a fruit farm of 20 hectares that will keep one person busy for at least two days, says Marcel Wenneker, researcher at Applied Plant Research department PPO Fruit, part of Wageningen UR. 'Looking for ways of cutting labour costs, the fruit growing sector came to us with the request to develop a self-steering, automatic spraying machine.'

PPO Fruit and Plant Research International, another part of Wageningen UR, sought collaboration with KWH Holland, among whose products are spraying systems for fruit farms, with mechanization company Abemec, and with Probotiq, a robotics company which created an autonomous mower for golf courses. The Dutch Fruit Growers' Association helped think it through and the funding came from the Horticulture marketing board, closed down from 2014, and from the EU. In the space of three years, the researchers and companies have succeeded

in developing a self-propelling tractor with an automatic sprayer for semi-dwarf apple and pear tree orchards.

DETACHABLE SPRAYER

It is the combination of a tractor with a detachable sprayer that is particularly innovative. It means the fruit growers can use the tractor at other times, attaching a mower to it, for example. 'The greatest difficulty was communication between the two components. We needed Probotiq for that,' emphasizes Wenneker. Meanwhile the system is in use both in the Netherlands and abroad. 'Both growers and researchers everywhere are enormously impressed,' says the researcher.

Pear grower Johan de Ruiter in Erichem tested the system last year. To begin with he hung around the tractor, says Wenneker. 'But he quickly gained confidence in it and became very enthusiastic.' In a film by TV Gelderland about the orchard robot, De Ruiter says the system exceeded his expectations. He even goes so far as to describe it as

'perfect'. 'The question was how we could get a system to navigate autonomously through the orchard. Using magnets or GPS navigation systems was too elaborate and not precise enough. In an orchard you must not stray more than 20 centimetres from the path, otherwise you might damage the trees and the fruit,' explains Wenneker. In the end the developers opted for a 'teach and playback' navigation system. The fruit grower has to demonstrate the route and the actions once, and the system records it and can then do it itself. Its memory has space for the routes in up to 10 orchards. For safety reasons the tractor is equipped with a camera and a bumper with sensors. If an obstacle looms, it automatically slows down. 'Thanks to the camera the grower can keep track of the tractor with his smartphone. If there is a problem he gets a call and he can go and see what the trouble is.'

SCANNING TREES

The sprayer works entirely automatically too, and uses no more pesticide than strictly

Automatized cabin with

- navigation computer with GPS
- sprayer computer

bumper brace for emergency stop ultrasound sensor camera for monitoring via website



'Teach and play' navigation system.
Memory for ten orchards.

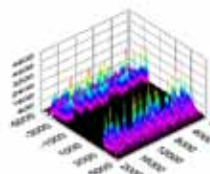
Sprayer installation with

- Wind metre
- Laser scanner
- GPS receiver

Adjusts spraying volume to number of leaves and type of tree.

Uses automatic drift-limiting techniques when there is water nearby.

Laser data



The grower can see the camera's image on a smartphone and gets a message if there is an obstacle.

Remote control with pause button and emergency stop function.



'In an orchard you must not stray more than 20 centimetres from the path, to prevent damage'

necessary, thanks to a laser scanner. The scanner scans the trees as it goes for species, size and shape. It also registers where there are leaves and where there are not. Wenneker: 'New spraying systems often use infrared sensors to detect crops, but a laser scanner is far more precise. Crop-specific spraying easily delivers savings on pesticides of 25 to 30 percent, which is that much less to end up in the environment. In this respect we in the Netherlands are 10 years ahead of the rest of the world.'

The sprayer can also help prevent pesticide from drifting on the spray. For fruit growers whose land borders water it is already compulsory to minimize this 'drift'. The new orchard sprayer can be fitted with a GPS map

with data on whether and where waterways run alongside the orchard. The sprayer then automatically uses drift-limiting techniques. In the near future, Wenneker expects this system to become relevant to all fruit growers. Rules and regulations are getting tighter in response to public concern about the effects of pesticides on local residents and the environment. 'Within a few years all farms, even those not bordering on water, will be obliged to use spray drift-limiting techniques.'

RECOUPING COSTS

Companies can buy the tractor and the sprayer separately. If a company already has a good tractor, for instance, it can invest in

the sprayer first. Or, if it already has a tractor with an automatic transmission, the autonomous steering system can be built in. The automatic sprayer is twice the price of a standard sprayer. 'But with the savings on labour and pesticides, growers recoup their costs within four or five years,' thinks Wenneker. 'With a view to the forthcoming legal requirements on drift, they are going to have to work with these kinds of sprayers anyway.' ■

www.wageningenur.nl/orchardrobot

Film on Dutch tv:

