

## Nutikad lahendused aiandustootmises

11.12.2024



### Päevakava:

- 10.00 – 11.00. Ülevaade uudsetest lahendustest aiandustootmises: külvist saagikoristuseni. *Priit Põldma, Eesti Maaülikool*
- 11.00 – 12.00. Kastmise automatiseerimine ja kastmisvajaduse prognoos katmikalal. “Digital Greenhouse” projekti esmased tulemused. Juhtmevabad andurid taimede kasvukeskkonna tingimuste seireks. Tomatikasvuhoone automatiseerimisest tootja vaatenurgast. *Tamar Nassar (Tami Automatics OÜ) ja Mirko Metsaoru (Weiss Aiand OÜ)*
- 12.00 – 12.40 Lõunapaus
- 12.40 – 14.00 Taimekahjustajate seire nutikad lahendused ning haiguste prognoosimudelid erinevatel kultuuridel avamaal. *Priit Põldma*
- 14.00 – 15.10 Erinevate seireseadmete ja ilmajaamade demonstratsioon. Arutelu, kohapeal tekkinud küsimused.

## Nutikad lahendused aiandustootmises

11.12.2024



## Ülevaade uudsetest lahendustest aiandustootmises: külvist saagikoristuseni

*Priit Põldma, Eesti Maaülikool*

## Uusi, nutikaid lahendusi on ja tuleb aina juurde

- Sordiaretus → CRISPR tehnoloogia
- Uued sensorid, mis aitavad paremini kontrollida taimede kasvukeskkonda
- Automatiseerimine ja robotika
- Taimekaitse: seire, diagnostika, töötlemistehnoloogiad
- 
- Pakend, toote jälgitavus
- 
- jne

## *Fruit Logistica 2012 uudised*

- Seemneteta maguspipra sort '**Angello**'<sup>tm</sup>
- Syngenta Seeds, Holland
- Kuulub minipaprikate rühma (väikeseviljalised)
- Fruit Logistica Innovation Award 2012



## Fruit Logistica 2016 uudised

- Punase ja kollase triibuline sort 'Enjoja'
- Enza Zaden, Holland
- Fruit Logistica Innovation Award 2016



<http://www.enjoja.com>

## Fruit Logistica 2020 uudised

FRUIT LOGISTICA  
**Innovation Award**  
2020



- Kõrge antotsüaanide ja karotenoidide sisaldusega kokteilitomati sort



<https://www.yoomtomato.com/>

## Fruit Logistica Innovation Award 2023

- Suupiste paprika sort 'Tatayoyo'
- Rijk Zwaan, Holland
- Magusama ja tugevama maitsega (flavor)
- seemneteta



<https://www.rijkszwaan.com/tatayoyo>

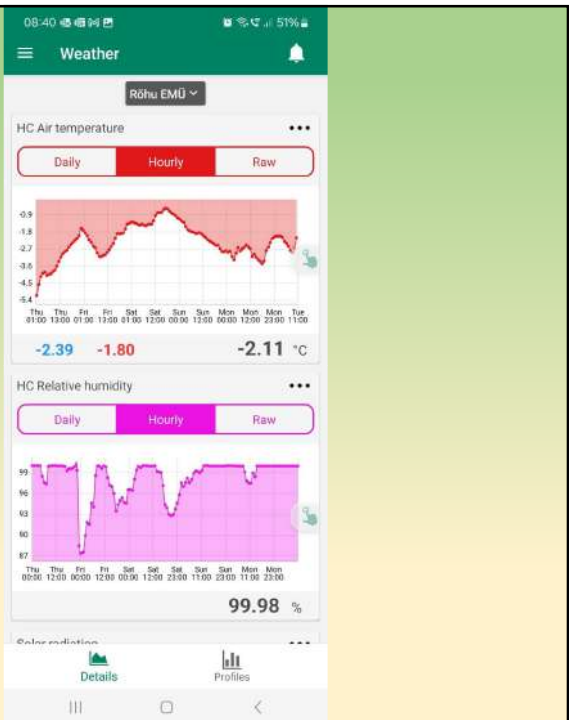
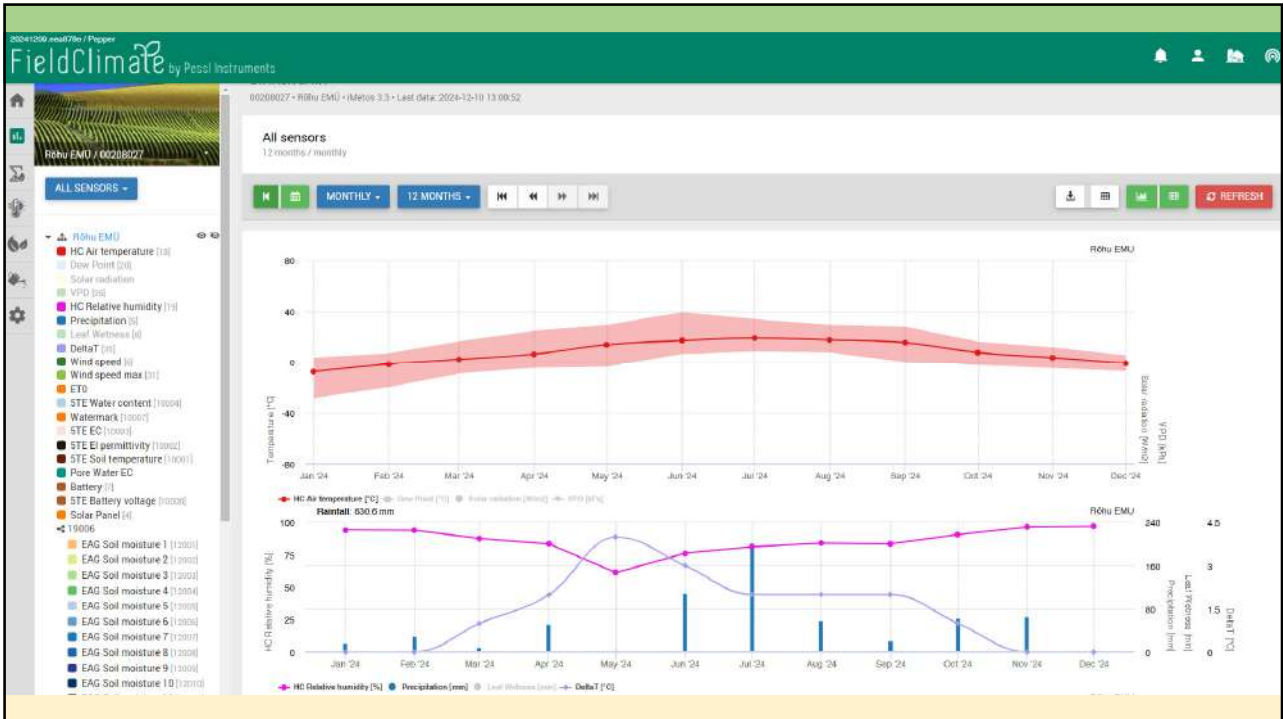
## Ilmajaamad

Lokaalsed põlluilmajaamad

- Metos Pessl
- FieldSense
- Davis Vantage
- WatchDog

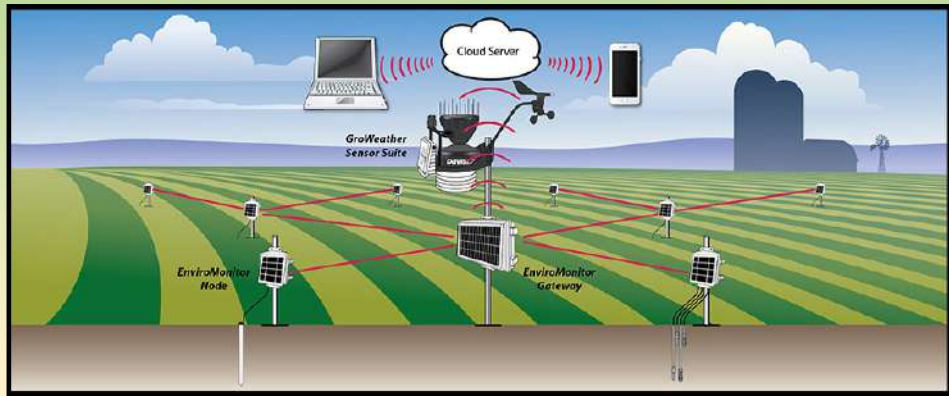






Ilmajaamad on ühendatud võrgustikku → annab täpsema prognoosi võimaluse

iMetos  
UC Davis



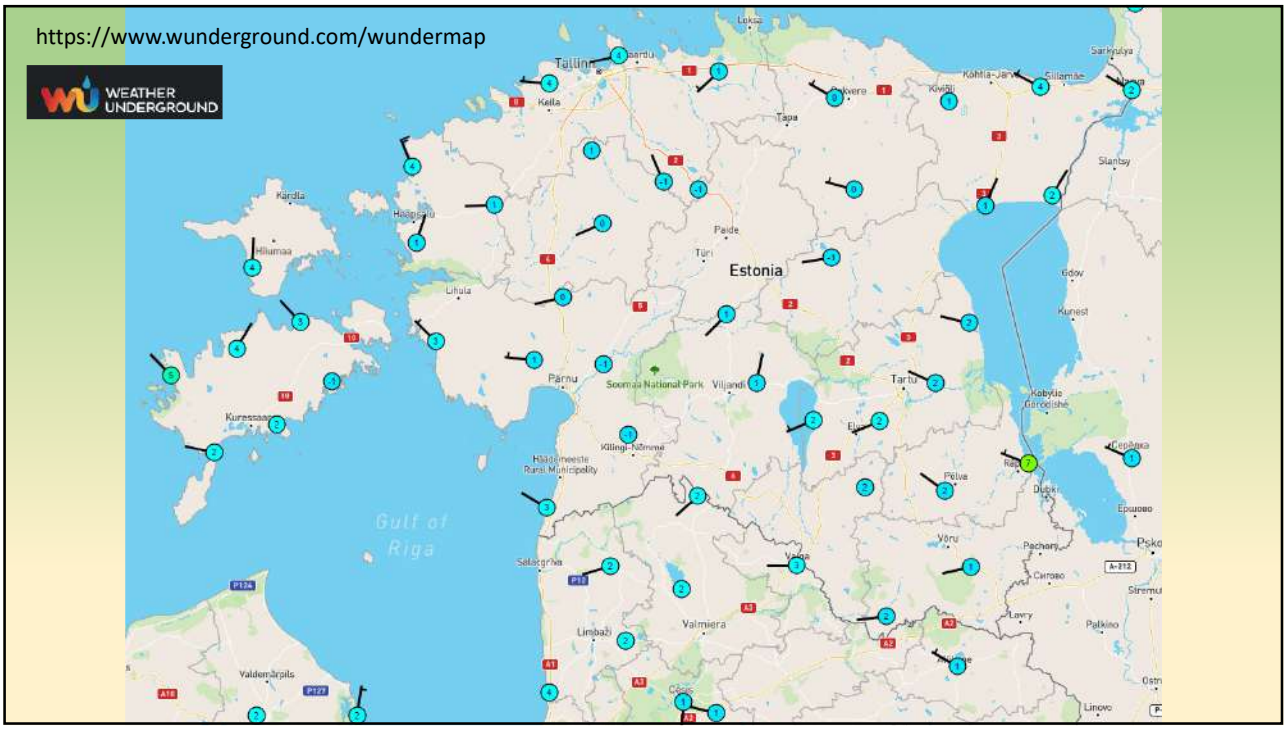
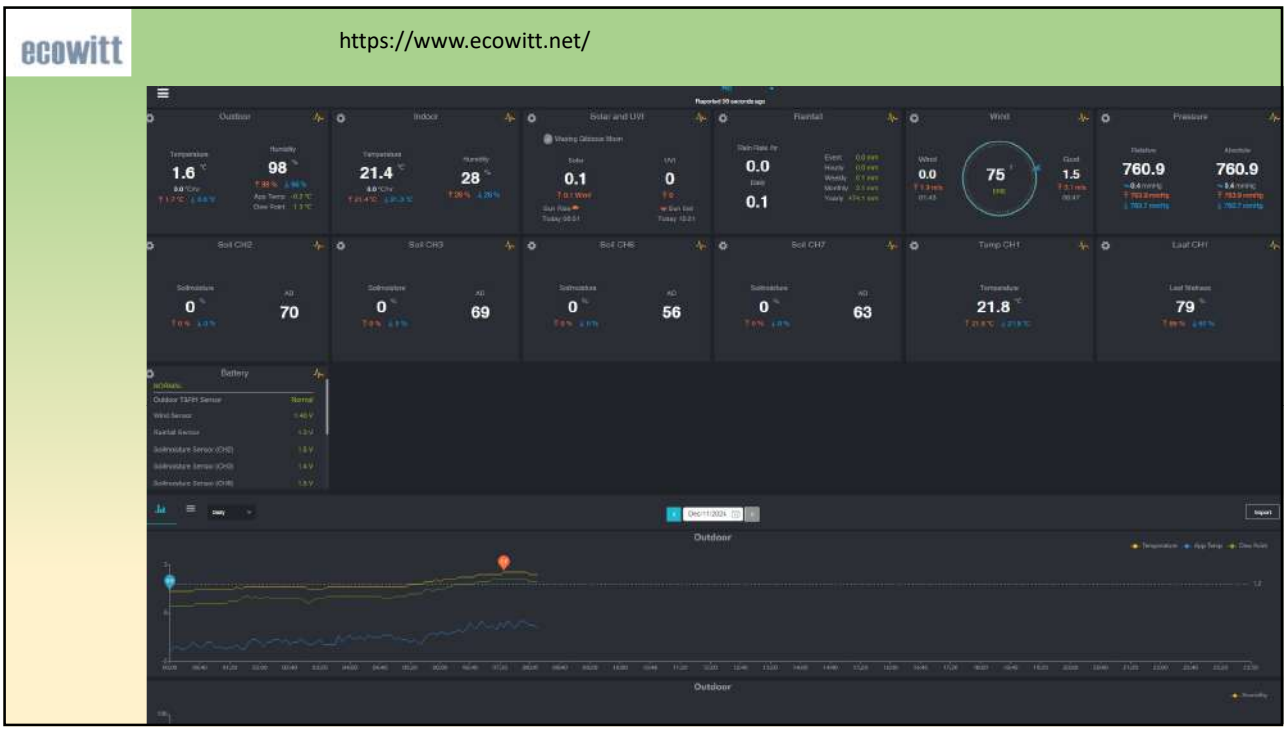
## Ilmajaamad

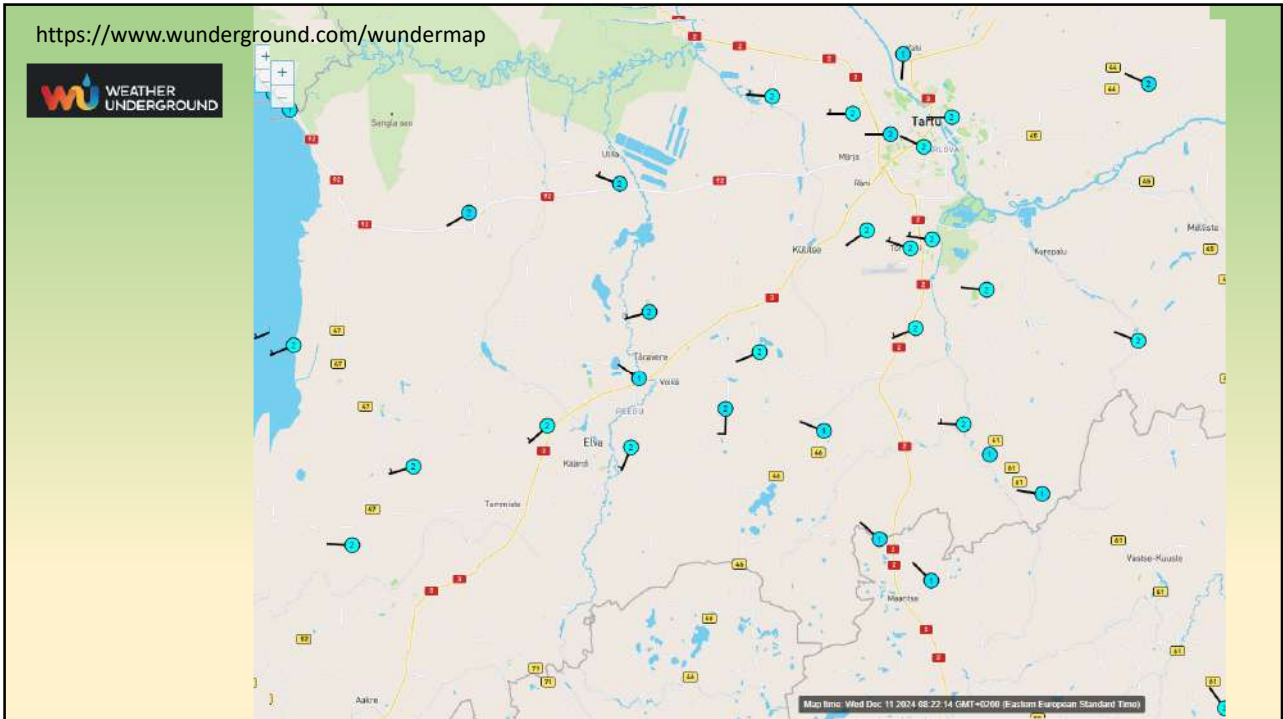
<https://www.froggit.de/>

**froggit®**



<p>HP2000 7-in-1 Ultra WiFi Weather Station RRP 299,99 EUR <b>Only 299,99 EUR</b></p>	<p>DP2000 7-in-1 Ultra WiFi/Lan Gateway Weather Station... RRP 239,99 EUR <b>Only 199,99 EUR</b></p>	<p>WH2900 WiFi Multisensor Internet Wireless Weather... RRP 139,99 EUR <b>Only 89,99 EUR</b></p>	<p>DP1500 PRO Wi-Fi Weather Server USB Dongle &amp; WH3000SE... RRP 139,99 EUR <b>Only 124,99 EUR</b></p>
<p>DL5000 TWIN (2 displays) Weather data logger Thermometer... RRP 209,99 EUR <b>Only 189,99 EUR</b></p>	<p>HP2000 Wi-Fi Internet Wireless Weather Station... RRP 279,99 EUR <b>Only 239,99 EUR</b></p>	<p>DP2000 WiFi Gateway Single Sensor Weather Station... RRP 199,99 EUR <b>Only 179,99 EUR</b></p>	<p>DP1100 7-in-1 Ultra solar sensor outdoor sensor... RRP 199,99 EUR <b>Only 179,99 EUR</b></p>





## Ilmajaamad

<https://www.froggit.de/>



DP1500 PRO Wi-Fi Weather Server USB  
Dongle incl. 6 x DP50/WH31A thermo-  
hygrometer wireless sensor

Shipping time: ● ca. 3-4 days (abroad may vary)

RRP 149,99 EUR  
**Only 144,99 EUR**  
incl. 19% tax excl. [Shipping costs](#)





### Kastmisvajaduse hindamine mullaniiskuse sensorite abil

**WATERMARK**



**SOIL SCOUT**



**Tensiometer  
IRROMETER SR**



The diagram illustrates an irrigation system with various sensors. Above the ground, there are two handheld devices labeled 'Handauslesegerate' with displays showing '120' and '25'. A 'Regenmesser' (rain gauge) and a 'Wasscruhr' (water meter) are also shown. Below the ground surface, a 'Manometer' is connected to the water line. Three sensors are embedded in the soil: 'Watermark' (3 Messstiefen), 'SM100' (3 Messstiefen), and 'Tensiometer'.

### Watermark ja tensiomeetrid (irrometer)

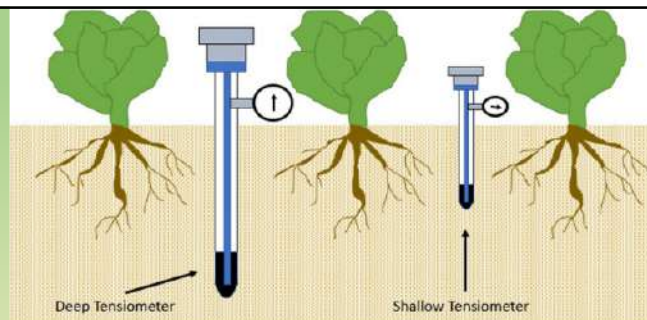
- Analoog/digitaal



The image displays four different types of soil moisture sensors. On the left is a 'Watermark' sensor with a green display showing '10.1'. In the center are three 'SM100' sensors with green cables. On the right are two tensiometers: an analog one with a circular gauge and a digital 'Blumat' sensor with a circular display showing '100'.

## Tensiomeetrid (irrometer)

Oluline on tensiomeetri õige paigaldus



## Spectrum Fieldscout TDR 150 mullaniiskuse mõõtja

Mõõdab korraga mulla veemahtutavust ja EC-d  
(elektrijuhtivust ehk toitesoolade sisaldust mullas)



Fieldscout TDR 300

## Erinevate mullatüüpide jaoks on määratud maksimaalne mulla veehoiuvõime

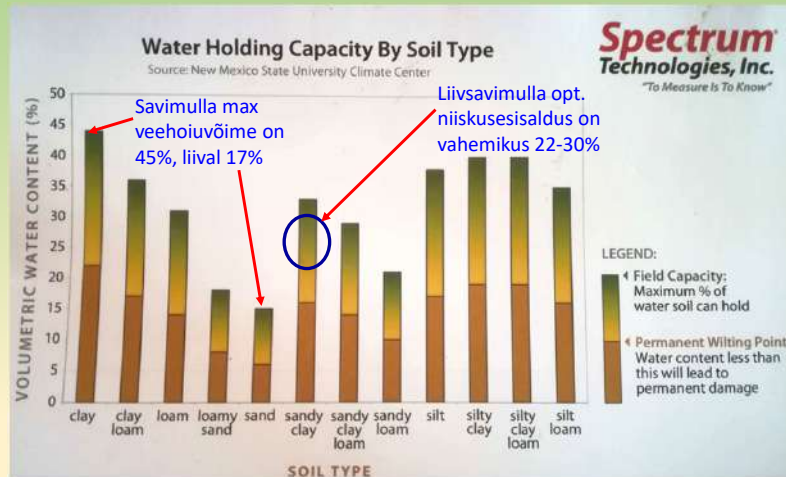


Foto: Ulvi Moor

## Kastmisvajaduse hindamine mullaniiskuse sensorite abil



SM-100



SMT-100



EC-5



SMEC-300

Erinevad sensorid on veidi erinevate tööpõhimõtetega

- Mineraalmullal kasutamiseks
- Kasvuhoones substraatidel kasutamiseks
- Hind 100 – 450€

<https://mmm-tech.de/index.php/en/volumetric>



TEROS 12

## Kastmisvajaduse hindamine mullaniiskuse sensorite abil



Käsiseadmed sensorite lugemiseks

- Hind 350 – 650€

Saadaval on ka logerid andmete pidevaks jälgimiseks

<https://mmm-tech.de/index.php/en/volumetric>

## Kastmisvajaduse hindamine mullaniiskuse sensorite abil

**SOIL SCOUT**



- Temperatuur, niiskus, EC
- Mõõdab iga 20 min järel
- Kuni 20 aastat
- Pilvepõhine teenus

<https://soilscout.com/>

Introductory Package





## Kastmisvajaduse hindamine mullaniiskuse sensorite abil

Paul-Tech

Paul-Tech mullajaam



<https://paul-tech.com/et/>

## Kastmisvajaduse hindamine mullaniiskuse sensorite abil

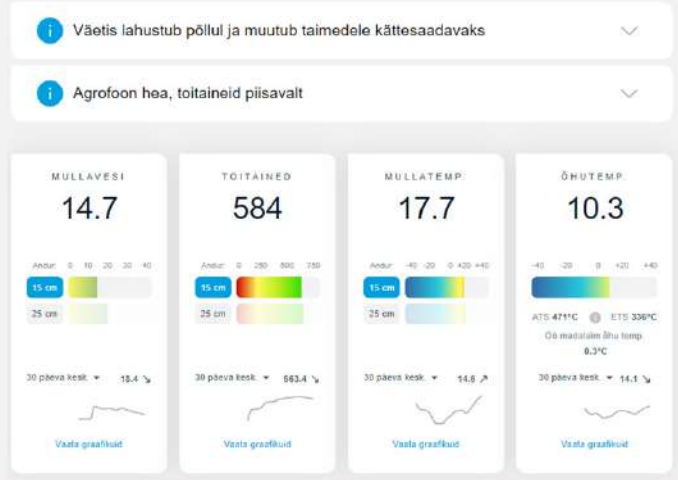
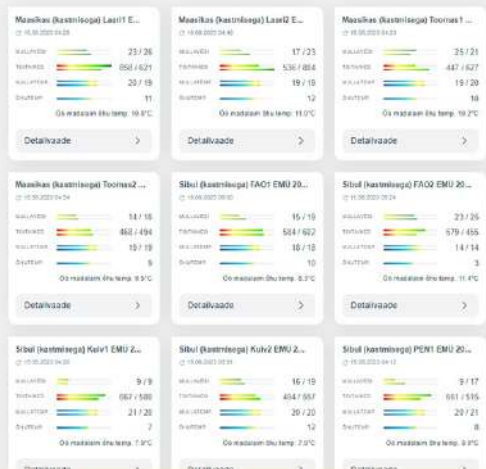
Paul-Tech

Mullajaam

Sibul (kastmisega) FA01 EMJ 2022/23

15.06.2023 06:00

Mullajaam



<https://paul-tech.com/et/soil-station-page/>



## Biotõrje tooted

- Abivahendid levitamiseks
- Airbug ja Mini-airbug
- (Koppert)



### Mini-Airbug

an easy tool to spread beneficials  
in the crop

#### BIOCAPTUR S50



Technological development level  
TRL 9

9

Scale of agricultural business  
Large scale, Small scale

Production systems  
Sheltered cultivation

Type techniques  
UV systems (Application techniques)

Scope of application  
Insects

Company Name  
ATG Engineering

Country of origin  
Spain

Contact Person  
administration@biocaptur.com

#### Description

BIOCAPTUR S50 is an innovative, ecological solution for pest control in intensive agriculture. It is a powerful device based on the emission of electromagnetic radiation and uses LED technology to emit this radiation. The equipment is designed to work at night, with its operation activated by photoelectric sensors that can be combined with hourly timers. BIOCAPTUR S50 works with specific LED technology to attract, suck away and finally capture pests.

For more information

[Visit website](#)

#### Can be used in the following crops:

- Tomato

#### Countries where it is used

- Chile
- Italy
- The Netherlands
- Poland
- Spain

#### Kind

- Absolutely everything

#### Examples/ Additional Information

Tests conducted with BioCaptur S50 and earlier prototypes in greenhouses in various agricultural areas have shown that the device is capable of permanently combating *Tuta absoluta*. By tackling the colony in the greenhouse from the early stages of its biological cycle, not only does the population decrease drastically, but there is also a negative impact on reproduction.



## UV - kiirgus haiguste tõrjel



<https://cleanlight.nl/>



<https://sagarobotics.com/>



<http://octinion.com/products/agricultural-robotics/lumion>



UV kiirgus jahukaste tõrjel viinapuudel ja viljapuu bakterpõletiku tõrjel

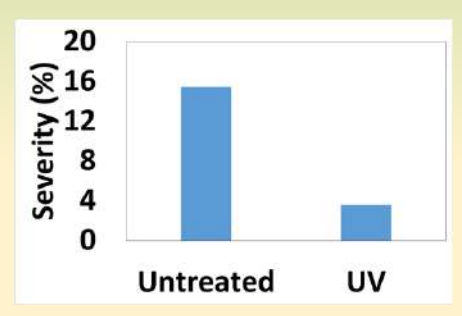
Source: <https://easyengineering.eu/interview-with-uv-boosting/>



## Robotic UV-unit (Saga Robotics) in Florida



## Saga Robotics unit in a 10 ha high tunnel commercial strawberry farm in Norway





## UV - süsteemid kastmisvee desinfitseerimisel



**ULTRAQUA**  
UV DISINFECTION SYSTEMS



<https://ultraaqua.com/application/uv-disinfection-horticulture/>



## Cleanlight õunte sorteerimisliinil



Lisaks teiste kultuuride pinna desinfitseerimisel tulbisibulad, kurk, tomat jne

## Porgandikärbse seire

- Kollased/oranžid liimpüünised põllu serva tuulepealsele küljele
- vähemalt 2 tükki lähestikku arvestusega 4-5 tk/ha
- 45° nurga all (vähem muid putukaid)
- Paigaldada enne kärbselenduse algust (mai keskel)
- Vahetada iga nädal
- Rebell® püüniseid on võimalik taaskasutada (pestakse puhtaks ja uus liim peale)



[www.andermttuk.com/rebell-carrot-fly-trap](http://www.andermttuk.com/rebell-carrot-fly-trap)



Fotod: P.Pöldma

## Porgandikärbse tõrjevõimalused

- Sibulaõli membraankapslid vihma eest kaitstud dispenseris
- Asetada põllule arvestusega 4 tk/ha (suure kahjurisurve korral 8 tk/ha)
- Igasse ca 30 g kapsleid → kestavad 1 hooaja
- NB! Liimpüünistest eemale panna



<https://biofa-profi.de/de/moehrenfliegen/Psila-Protect.html>



Fotod: P.Põldma



## Alapihustid (dropleg) täpsemaks pritsimiseks

Dropleg Beluga Standard



<https://www.agrotop.com/produkte/dropleg-beluga-standard>

## Robot pritsid kasvuhoones

Robotic spray robot OPRS 202 HYBRYDE



Self-propelled spray robot JET 300R



<https://www.agriexpo.online/prod/maryniaczyk/product-180820-52846.html>

## Droonid avamaal

- Seiredroonid

- Ulukikahjud,
- Üleujutuste kahjud
- Öökülmakahjud
- jne. visuaalsed kahjud



<https://www.dronevolt.com/>

- Töötlemine

- Biotõrje levitamine
- Väetiste levitamine
- TKV pritsimine

Seiredroonid



töötlemine



## HERCULES 20 SPRAY

Low-pressure Spraying  
drone

[Discover](#)

[Brochure](#)

Compliant with current European regulations:  
Validated for S1/S2 and S3 captive operations, with C.E. and  
C3/C5/C6 certifications available very soon.



<https://www.dronevolt.com/en/expert-solutions/hercules-20-spray/>

**Liblikaliste tõrje kasvuhoones**

***Pats - Indoor Drone Solutions***



**PATS-C**

<https://www.biobestgroup.com/products/pats-c>



**PATS-X**

<https://www.pats-drones.com/>

**Liblikaliste tõrje kasvuhoones**

***Pats - Indoor Drone Solutions***



**PATS-X**

<https://www.pats-drones.com/>



## Otto: the IPM scouting and yield forecasting greenhouse robot

[www.ecoation.com](http://www.ecoation.com)



The autonomous robot, OTTO, is equipped with ecoation's 360 "Virtual Walk" camera, a Universal Model for object detection, 3D climate and light measurement per sqm and a patented multi-modal "Plant Health Sensor" that can flag various crop health issues at early stages and inform growers for further investigation. The robot can navigate the greenhouse autonomously and it can work during the day and night.

<https://www.hortidaily.com/article/9476839/otto-the-ipm-scouting-and-yield-forecasting-greenhouse-robot/>

## Kasvuhoonerobot GROW

- Koristab saaki 24/7 tänu täiustatud öövaatlussüsteemile
- Vähendab viinamarjatomatite koristustunde minimaalselt 80%
- Kuni 50% kulude kokkuvõidu kogu koristusprotsessis
- Andmekogu (teadmised saagi prognoosimiseks ja tootmisanalüüside koostamiseks)



<https://grow.ridder.com/>

**Sweeper**  
ICT Robotic Use Cases project in the H2020 programme of the EU



<http://www.sweeper-robot.eu/>

## Pakend

- tehniline funktsioon
- kommunikatiivne funktsioon
- Taaskasutatav, väiksem CO<sub>2</sub> jalajälj



Komposteeruv pakend

## Tattooed cucumbers to fight against plastic

- Hollandi mahe PV/KV hulgimüügifirma *EOSTA* alustas 2017 kurgi viljadele laseriga siltide „põletamist“



<https://eco-mark.de/en/laser-labelling/fruit-and-vegetables/>



<http://www.hortibiz.com/item/news/tattooed-cucumbers-to-fight-against-plastic/>

## Täna kuulamast!

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