



DIGITALIZATION AND AUTOMATIZATION IN HORTICULTURE

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FACULTY OF HORTICULTURE

BLENDEN INTENSIVE PROGRAMME 2021/2027

CLIMATE CHANGE IMPACT ON GLOBAL HORTICULTURE - TRENDS AND CHALLENGES

MAY 7TH-12TH, 2025, BUCHAREST, ROMANIA

What are the current challenges for conventional horticulture ?

- Disorders in farm management due to many uncertainties and frequent changes that occur during the crop production
- Higher costs for the repetitive operations during the vegetation season (mowing, spraying, weeding)
- Lack of labor availability, both trained and gross labor force
- High cost with herbicides, pest and disease control
- Unpredictable yield in terms of harvest time, quantity, quality from the start of the season.
- Lower or less profit due to capabilities to control the risks.



PREDICTIVE ANALYTICS

Advantages of Horticulture 4.0



- transform the way producers cultivate, harvest, and distribute horticultural products.
- create robust, adaptative and resilient systems for plant growing
- enhancing crop quality and production/yields
- connecting farms, farmers, bring together all key actors in the food production chain, including consumers



Advantages of Horticulture 4.0

- fostering the innovation transfer from primary production through whole chain
- Increase sustainability of the agro-ecosystems by decreasing the impact on water, climate, soil, biodiversity and all natural resources.
- empowering economic efficiency / reducing losses and waste
- provide remote intelligent horti-monitoring system and control functionalities available for farmers



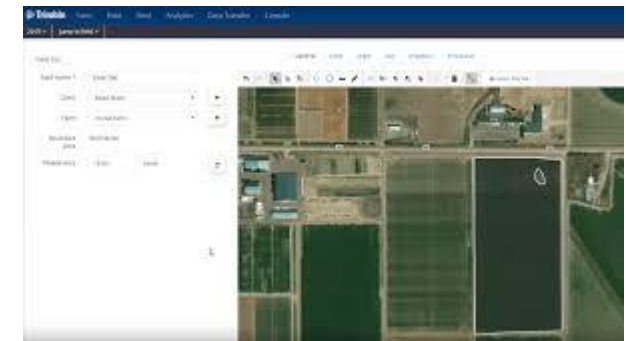
What will be the best enablers for transitional agriculture to Agri 4.0 ?

- Incentives for farmers and input companies to implement digital tools and devices dedicated for precision technologies (e.g. Italy from autumn 2021 support companies to produce tractors and machineries with GPS and active sensors for specific needs)
- Training courses, workshops, open days, demonstrations in the field, hackathons, exhibitions, living labs



Enablers

- Affordable devices and softwares
- Friendlier and intuitive interfaces of the digital farm programs
- digital equipment and machines requires specific skills and competences – train the trainers programmes / learning by doing



USAMV Bucharest & Faculty of Horticulture believe in digital horticulture !

- Since 2018 we have 2 meteo station (Pinova and Enten), now we own 3 (+ Pessl) and soon we will have 10 in our campus and research stations
- Enten station is fully equipped with sensors for remote monitoring of growing and development parameters
- Since 2020 we start developing tailored made digital applications and for precision horticulture
- Since 2021 we start recording phenotyping in blueberry pot crop, pear, peach and other species

'Nero' and the spraying drone



Nero - Agricloud



Drone - Agricloud



Indoor plant factory– strawberry – Greentech NL



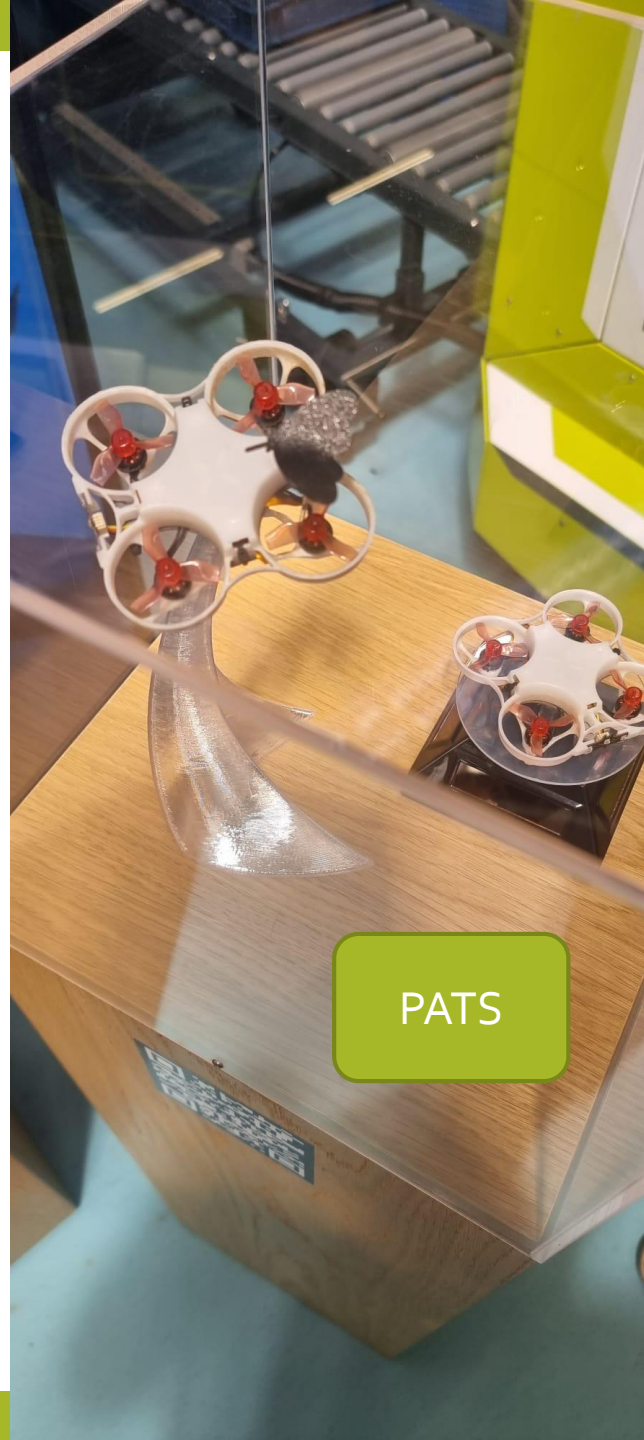
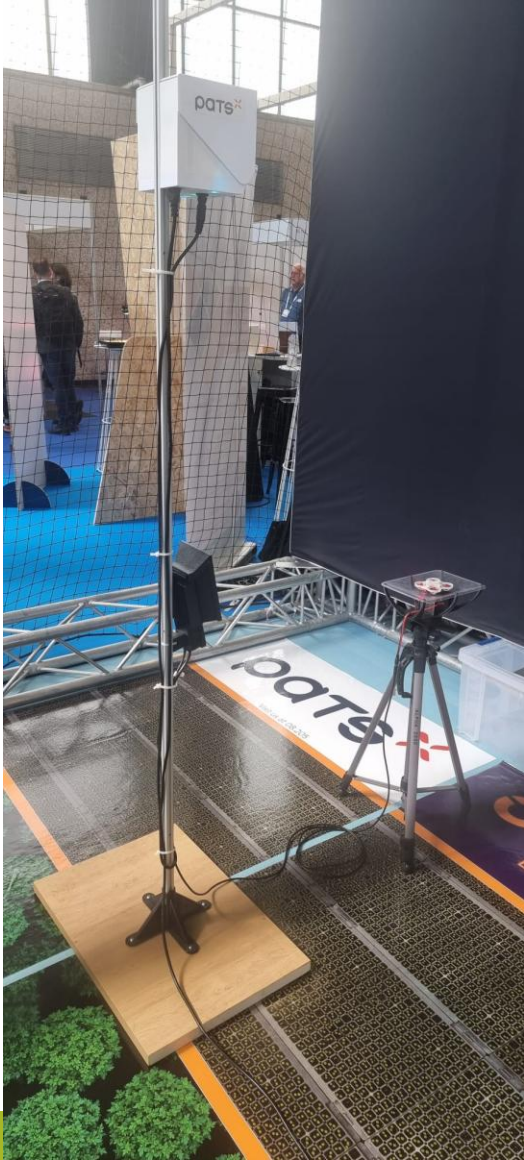
June, 2023



Full option



Hunting mini drone



Instead of insect trap



Instead of sprayings UV treatments against powder mildew –
Saga robotics 2021



1.5 Ha /
night

Protection with UV-B & UV-C (powder mildew and trips)



Antobot (UK) and CleanLight (NL) – autonomus platform for 'spraying'



Clean food in the future

Where Is Everybody? Hello !



Clean light – 1 operator – 3 robots



UV-C light prevents mildew and mites, without chemicals.

Harvest ? Labor problems guys ?

Harvester for
strawberries-Dogtooth
(2023)



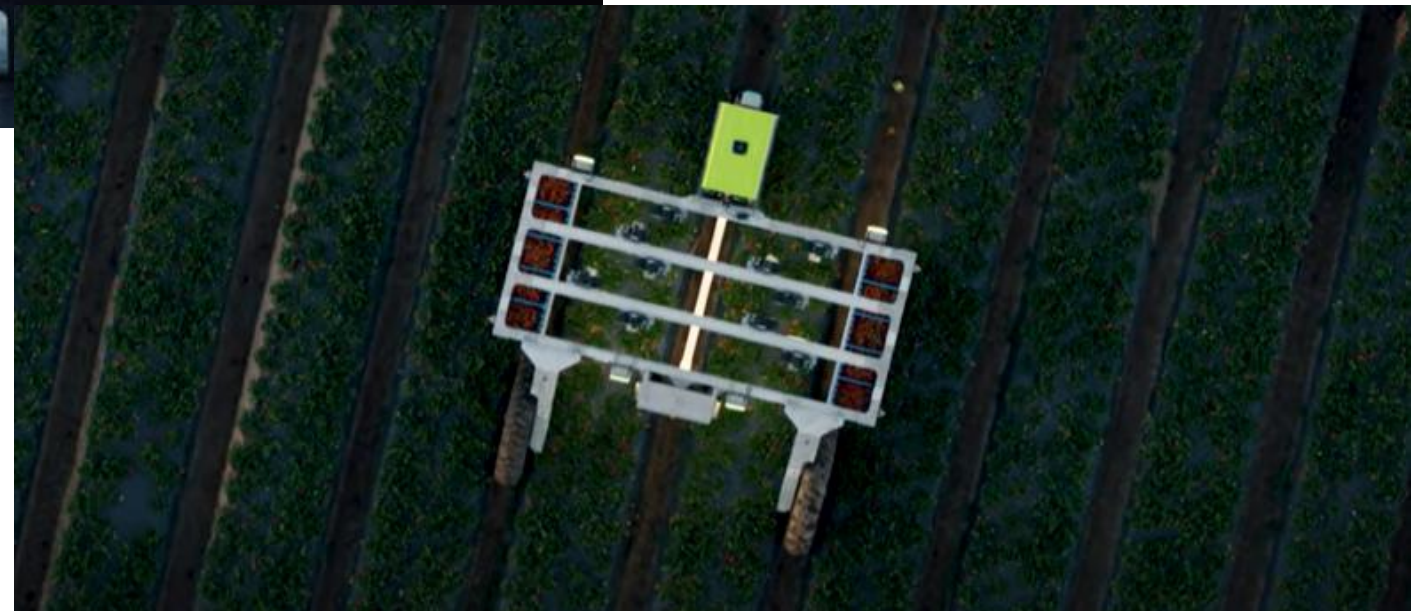
AGROBOT



AGROBOT



Works ... 24/7 ... on all weather conditions



No complains, no work protection,
no special fees for extra hours



Blueberry harvester – Harvy 500



<https://www.futurefarming.com/tech-in-focus/field-robots/fifteen-harvy500-picking-robots-to-harvest-blueberries/>

Raspberry harvester robots



Digital harvester



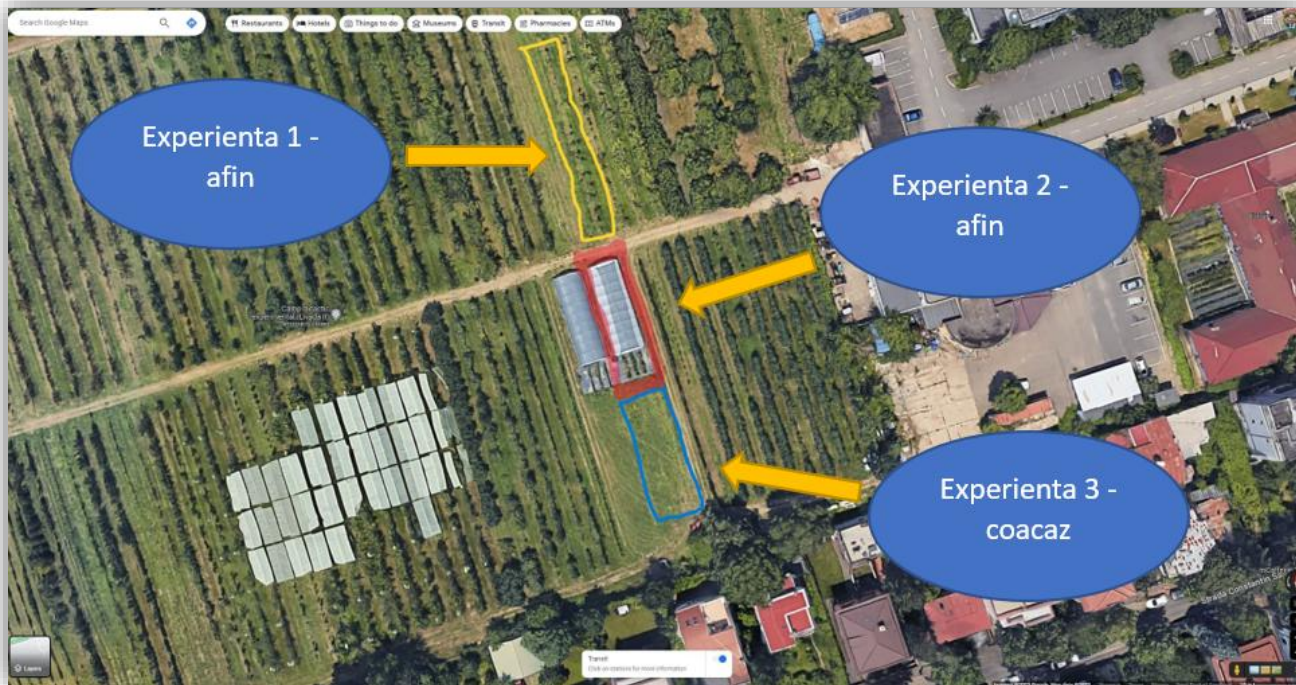
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Location of experimental plot



USAMV Bucuresti – Faculty of Horticulture
– berry research plot (blueberry and currant)



1

Blueberry in raised beds

A irrigation system (with and without watermark sensor)

B blueberry variety



Left A with sensor
Right A without sensor

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2

Blueberry in pots

A – crop system (indoor / outdoor)

B – blueberry variety



Outdoor module
(October 2023)

3

Currants

A (*Ribes nigrum* si *Ribes rubrum*)

B currant variety



Red currant – left
Black currant – right
October 2024

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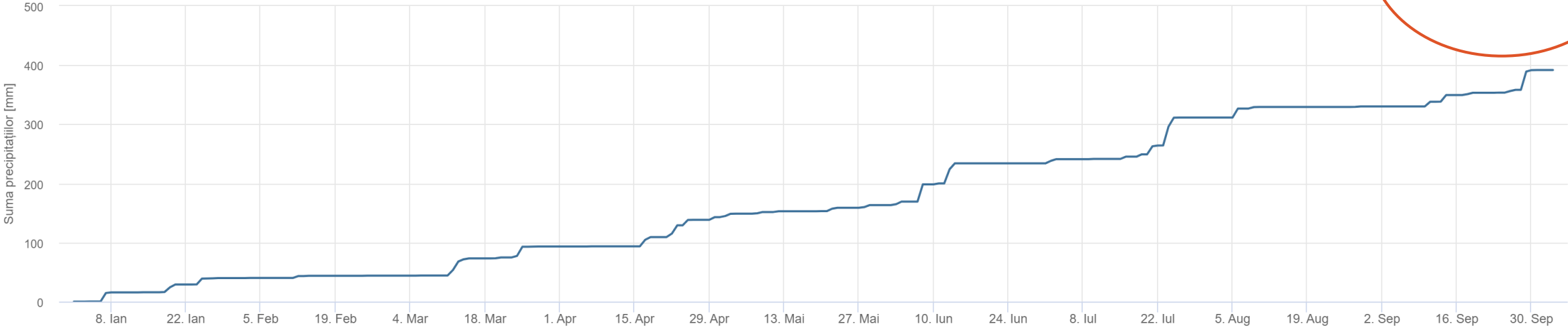
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- Pessl Instruments
- Climatic data, sensors, datalogger, solar battery GPRS for data transmission



Rain Sum Chart_Fri Oct 04 2024 19:53:10 GMT+0300



391.8 mm pâna in
4 oct 2024

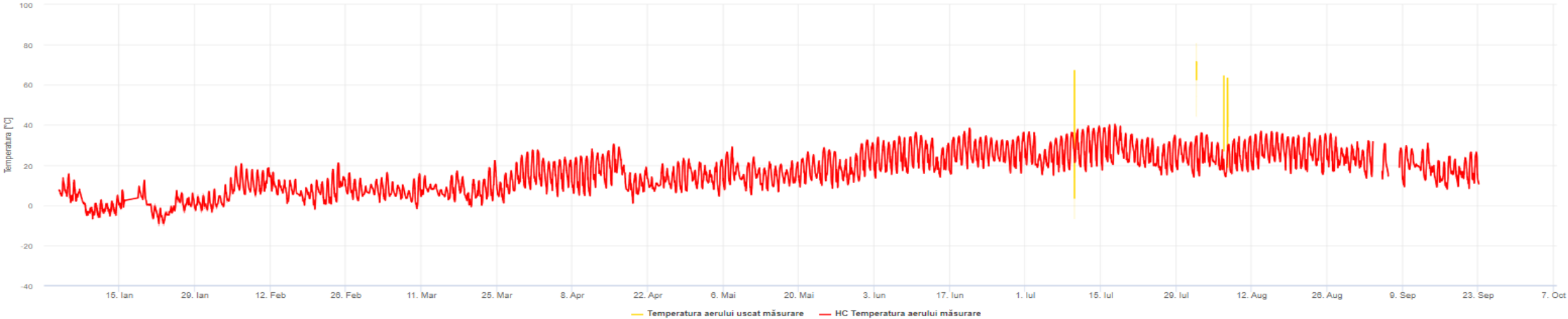
Monitorizarea temperaturii extreme

24 de ore / brut

03/01/2024 19:00

04/10/2024

ACTUALIZARE



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Water management

- Humidity sensors Watermark



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Control apa

- Unitate de management al apei si fertilizantilor
- Contorizare consumuri



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Water management



Monitoring and
registering the
water consumption
system EFEN

DOSATRON

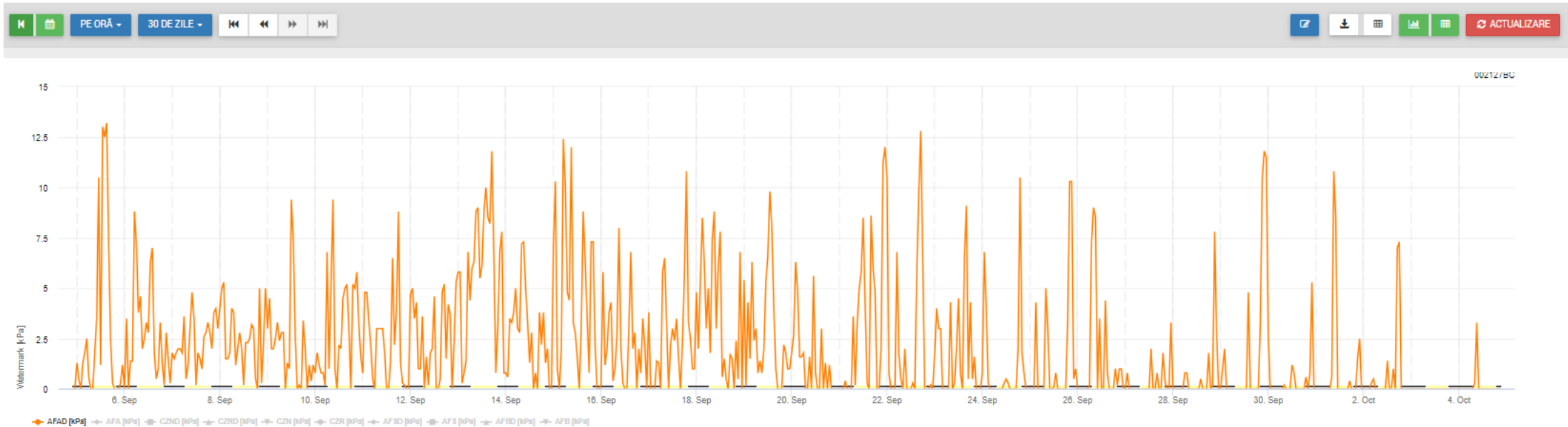
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Senzori de umiditate

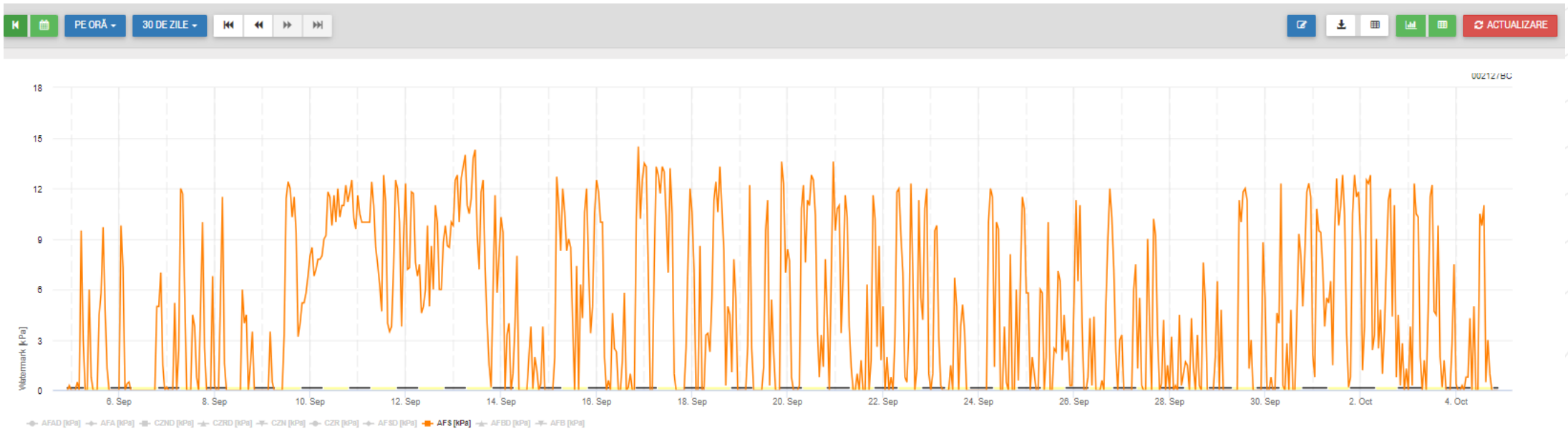
Toți senzorii
30 de zile / pe ora



Soil humidity variation –container outdoor blueberry pots

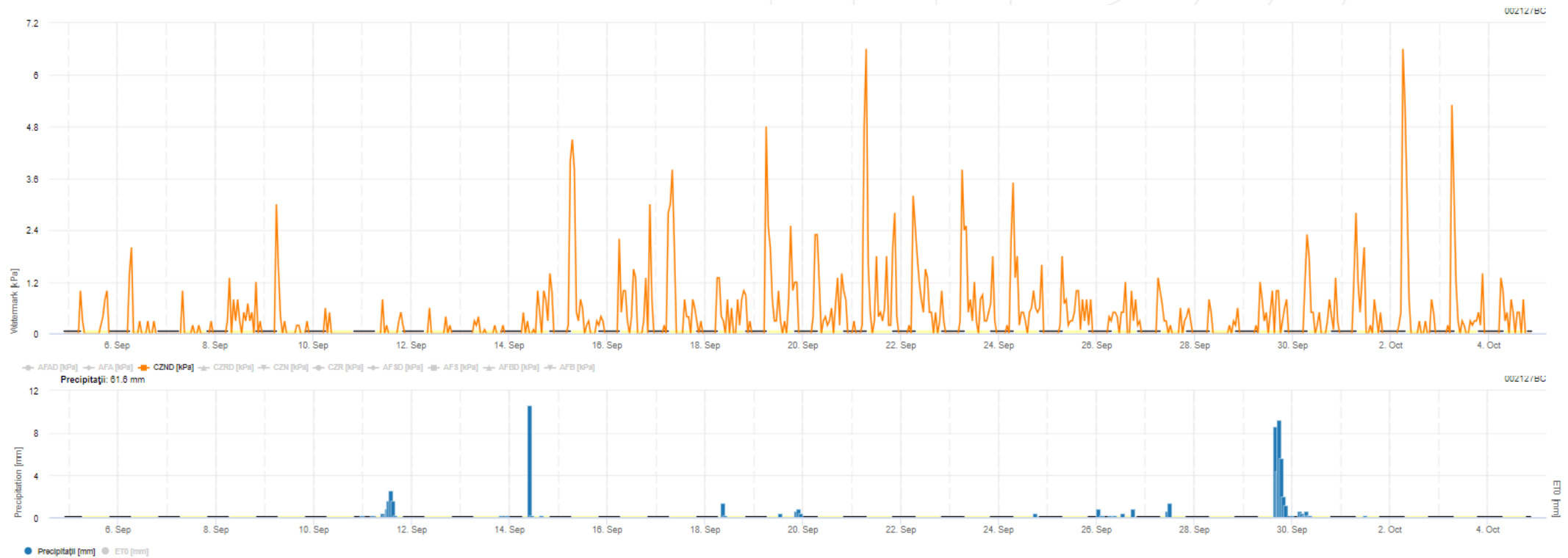
Senzori de umiditate

Toți senzorii
30 de zile / pe oră



Soil humidity variation –container indoor blueberry pots

Senzori de umiditate



Soil humidity variation – black currant outdoor

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Senzori de umiditate

LANȚ	CANAL	CODUL	NUME	UNITATE	AVERTIZARE LA MIN	AVERTIZARE LA MAX
1	0	600	Radiația solară	W/m2	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
1	4	30	Panoul Solar	mV	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
1	5	6	Precipitații	mm	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
1	7	7	Baterie	mV	6300	Praguri (de exemplu, 4, -5, 22)
1	8	4	Umiditatea pe frunză	min	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
3	4000	16391	U-sonic wind speed	m/s	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
3	4002	16393	Rafala de vânt	m/s	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
6	10000	30741	STE - Voltajul bateriei	mV	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
6	10003	17921	AFAD	kPa	10	20
6	10004	17921	AFA	kPa	10	20
6	10009	30741	STE - Voltajul bateriei	mV	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
6	10012	17921	CZND	kPa	10	20
6	10013	17921	CZRD	kPa	10	20
6	10015	17921	CZND	kPa	10	20
6	10016	17921	CZRD	kPa	10	20
6	10018	30741	STE - Voltajul bateriei	mV	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
6	10024	17921	AFSD	kPa	10	20
6	10025	17921	AFS	kPa	10	20
6	10030	30741	STE - Voltajul bateriei	mV	Praguri (de exemplu, 4, -5, 22)	Praguri (de exemplu, 4, -5, 22)
6	10036	17921	AFBD	kPa	10	30
6	10037	17921	AFB	kPa	10	30

Coacaz

Min 10
CbarMax 20
Cbar

Afin

Min 10
CbarMax 30
Cbar

SALVAȚI SETĂRILE DE ALERTE

21:27

79%

< Yoxo Cartela Pessl M... >

PSI).

20:12

iMetos Alarm Service

Name: iMetos 3.3

SN: 002127BC

Water mark (CH10036)
value 8 CBar (1.2 PSI) under
10 CBar (1.4 PSI).

iMetos Alarm Service

Name: iMetos 3.3

SN: 002127BC

Water mark (CH10037) value
1 CBar under 10 CBar (1.4
PSI).

20:13

iMetos Alarm Service

Name: iMetos 3.3

SN: 002127BC

Water mark (CH10025) value
0 CBar under 10 CBar (1.4
PSI).

21:01

iMetos Alarm Service

Name: iMetos 3.3

SN: 002127BC

Water mark (CH10016) value
7 CBar (1.0 PSI) under 10
CBar (1.4 PSI).

21:16

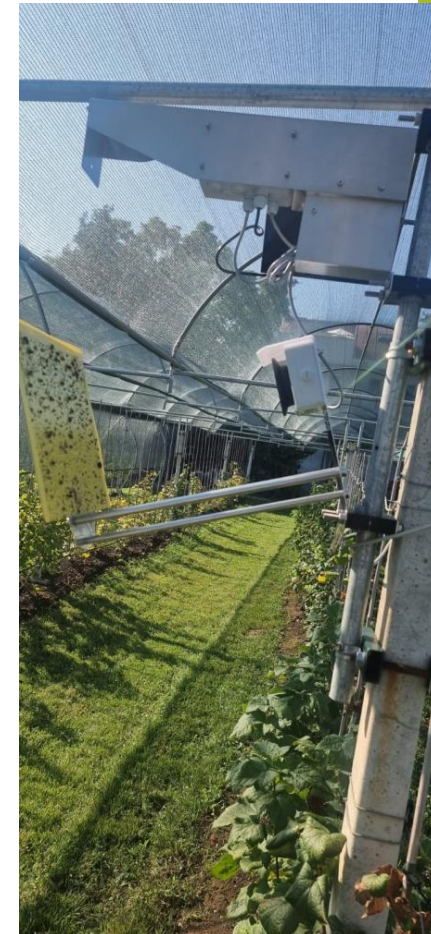
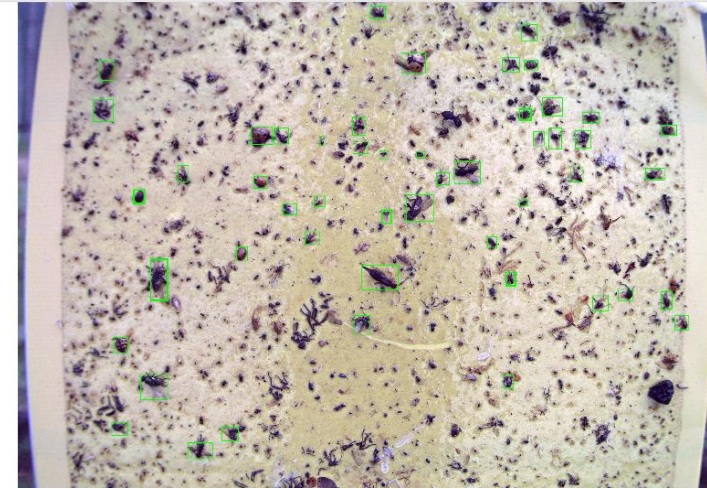
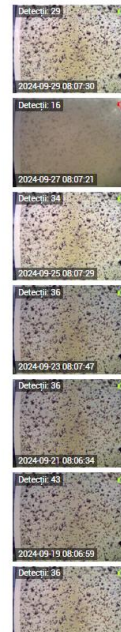
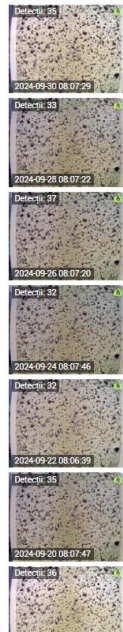
Warning SMS for humidity over or under threshold

Monitoring sticky yellow panels



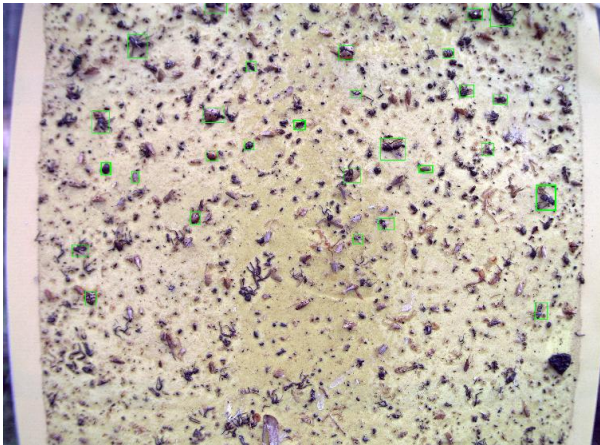
- Real-time monitoring of pests trap iMETOS
- iSCOUT® (hardware and software mix for remote control)

Septembrie, 2024

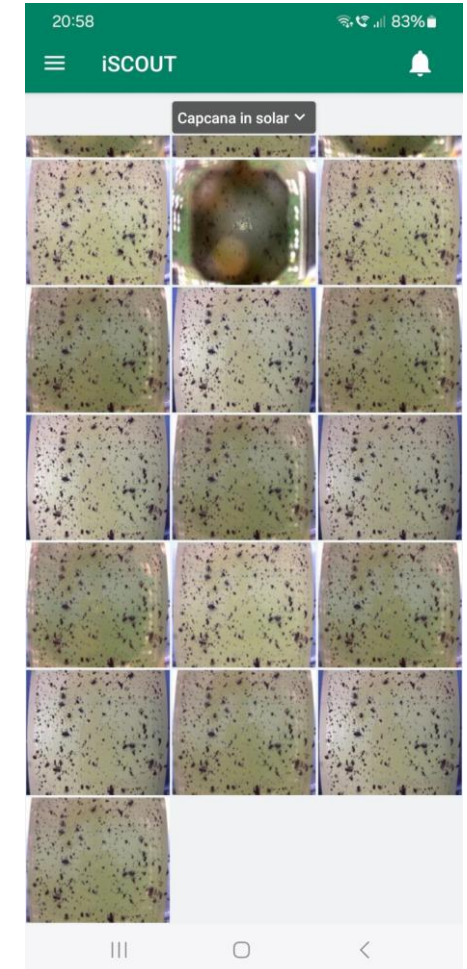
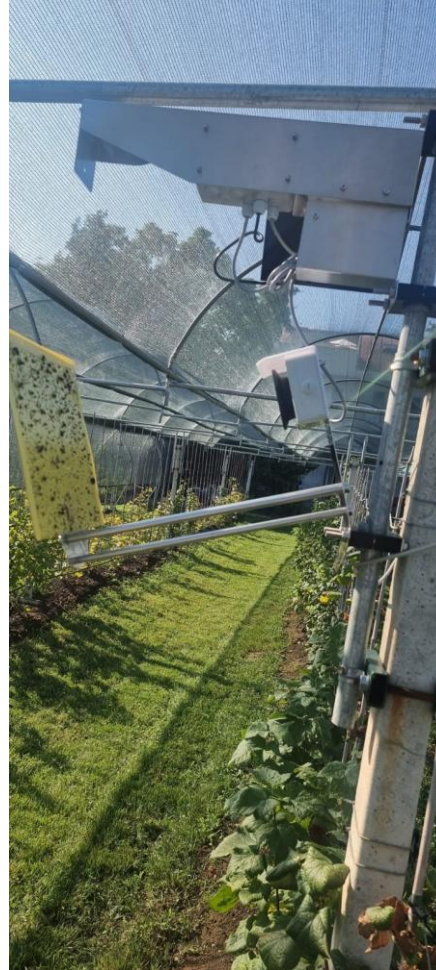


Monitoring sticky yellow panels

- Real-time monitoring of pests trap iMETOS
iSCOUT® (hardware and software mix for remote control)



- 25 iulie 2024 – 47 detections



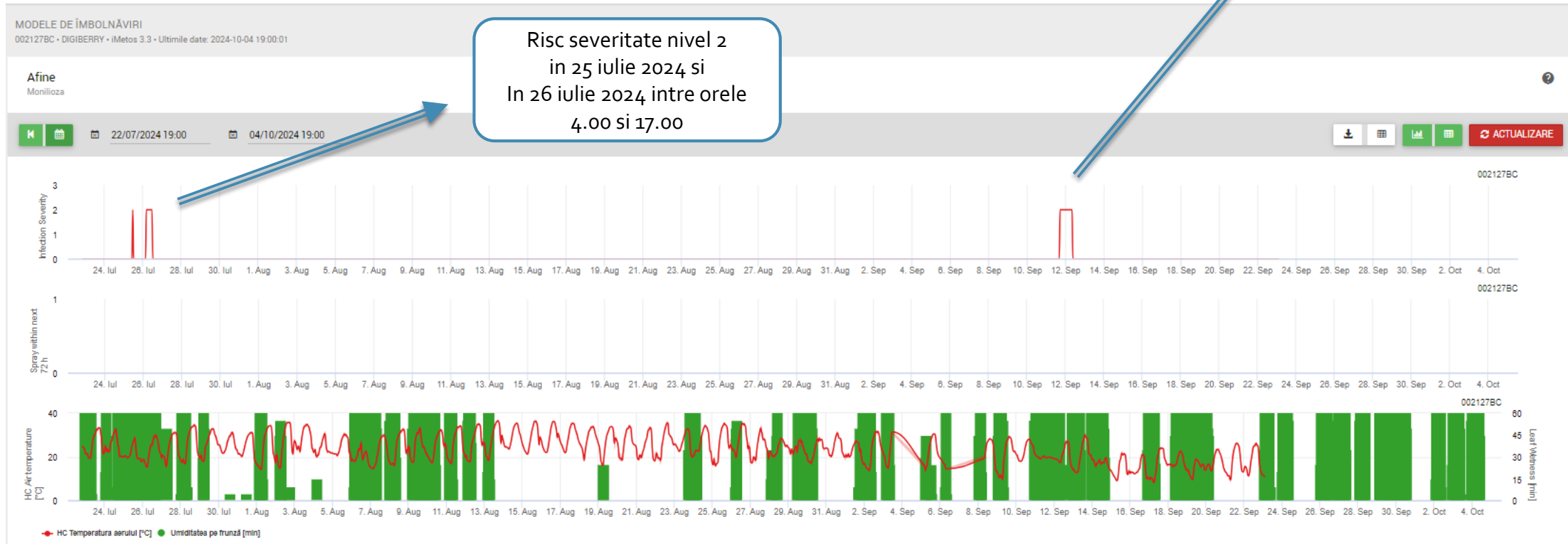
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Blueberry disease models

Monilioza
Cancer bacterian
Phomopsis
Putregaiul cenușiu
Antracnoza
Colletotrichum



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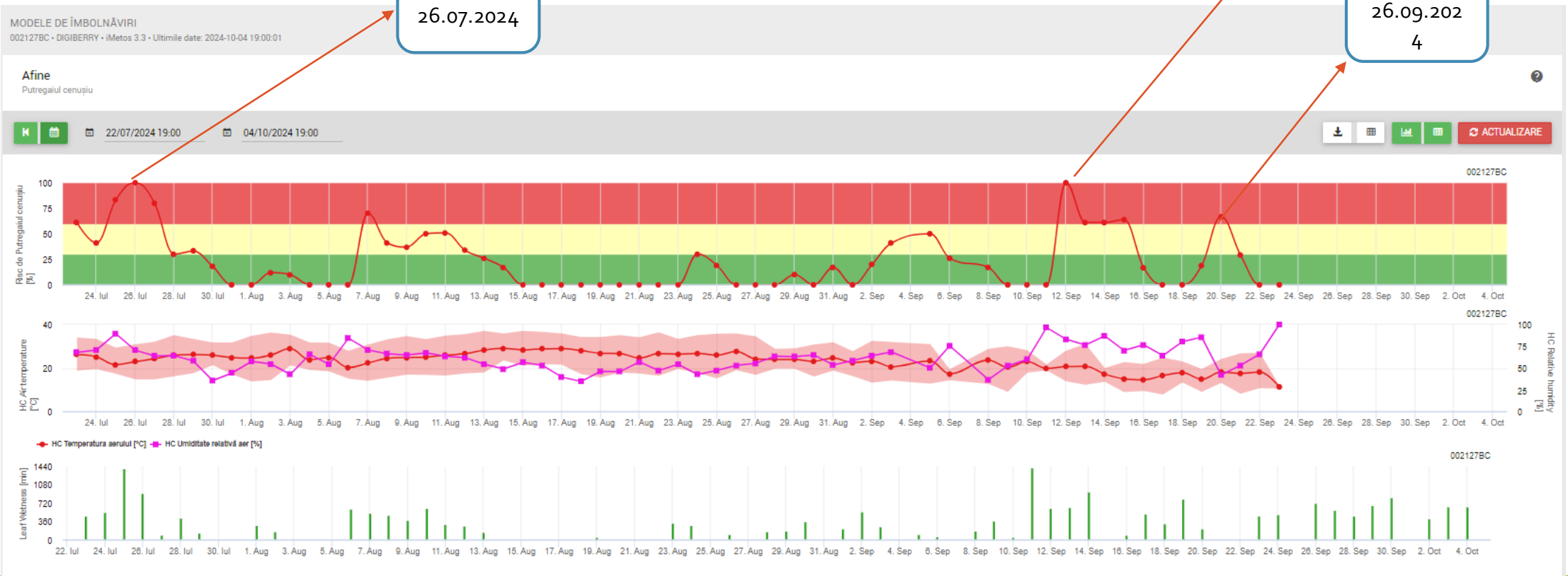


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Risc severitate nivel 2
in 25 iulie 2024 si
In 26 iulie 2024 intre orele
4.00 si 17.00

Monilioza
Cancer bacterian
Phomopsis
Putregaiul cenusiu
Antracnoza
Colletotrichum

Disease models for blueberry



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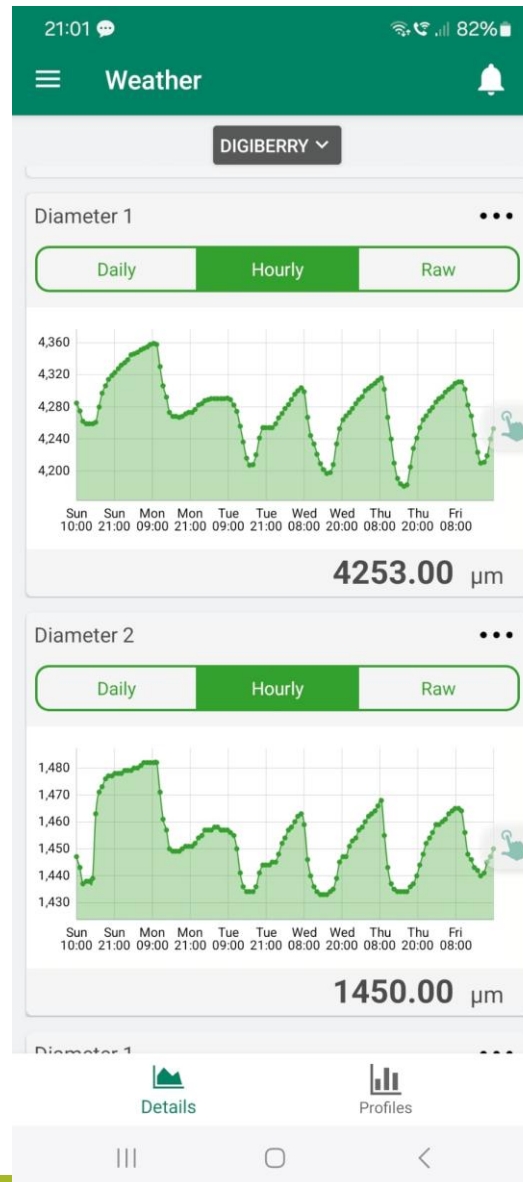


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- Digital dendrometers fertirrigation
balance with BBCH and plant growth
dynamic and water stress



Dendrometers



Phenology cameras



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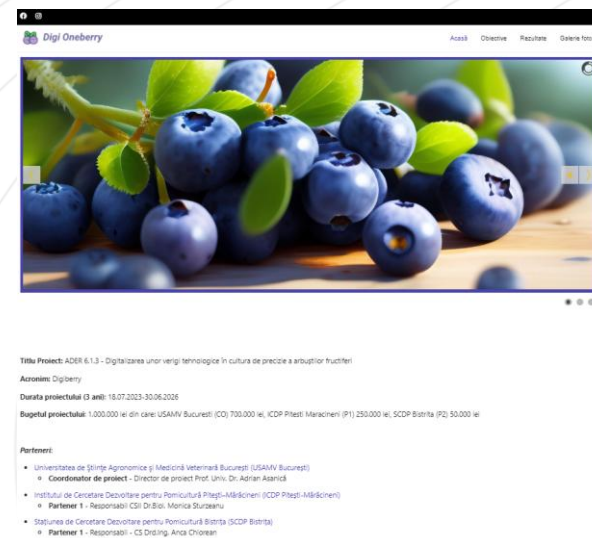


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Diseminare

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- Thank you for your attention

