

# Luke Insect Pest Monitoring by IoT in season 2019 at Jokioinen and in season 2020 Tammela (Mustiala)



# Etäluettavat hyönteisansat: Tutkimuskykykset

- 1. Miten laitteet toimivat teknisesti?
- 2. Miten laitteet keräävät hyönteisiä?

# Tulevaisuuden suunnitelmat

The best way to  
predict your future  
is to create it.

Abraham Lincoln

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- Täysin automaattinen ja energiaomavarainen ansa, jossa on:
  - Hahmontunnistus
  - Koneoppiminen
  - Automaattinen hyönteislaskenta

## Yhteistyötahot

- Apetit Oy
- Biotus Oy
- Ruokavirasto
- HAMK, Bioinsinöörit, Forssa
- HAMK, Mustialan tila, Tammela
- Hedelmä- ja marjainviljelijän liitto
- ProAgria
- Siemen Forelia Oy
- Tapio Silva Oy



# 3.6.2020 Jokioinen, Ilmala. – Hernekärsäkkääät tulivat.



# 20.6. 20W aurinkopaneeli herneellä Jokioinen, Ilmala.



# Laidunkärpäsia....



21.6.2020

uonnonvarakeskus

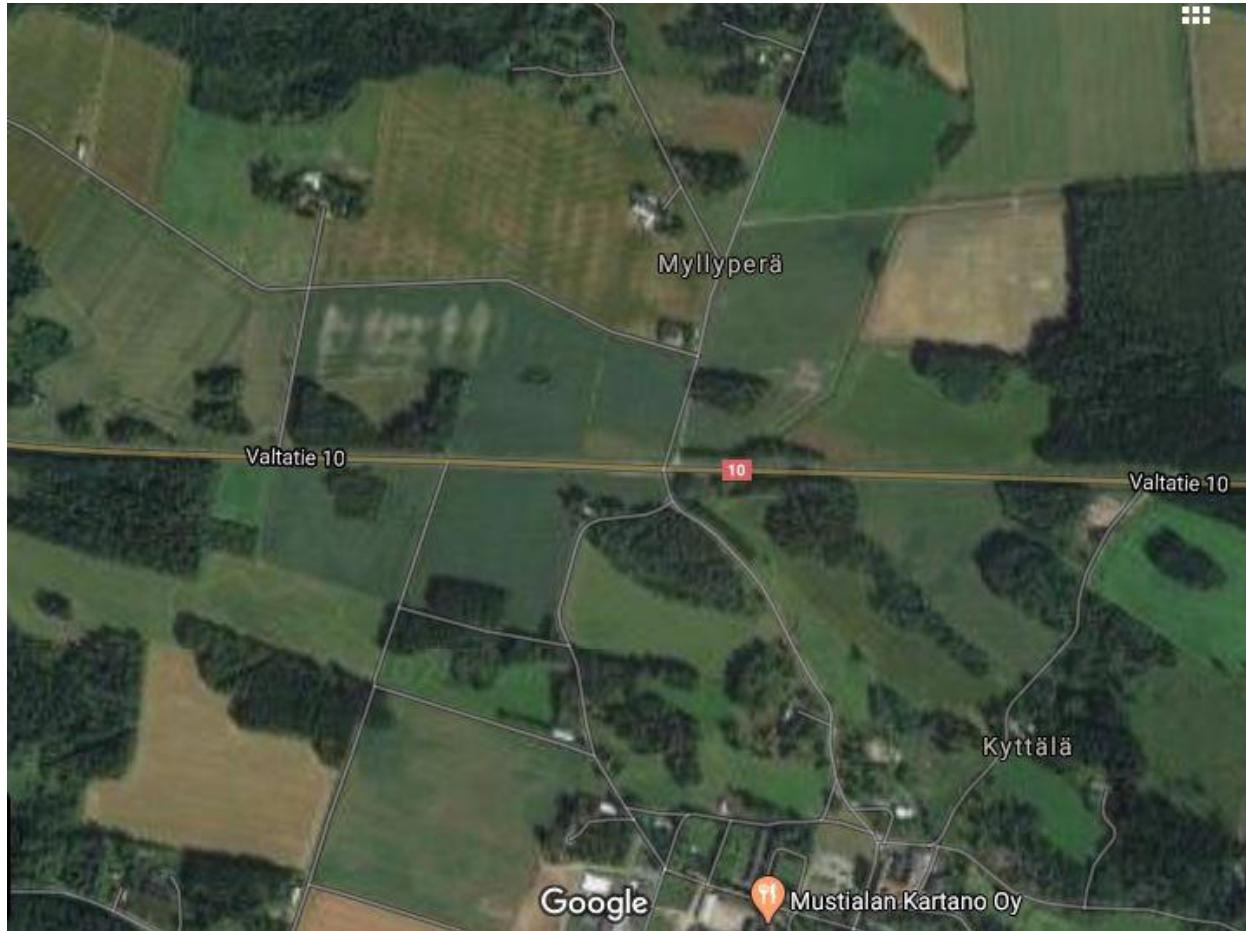
Sopivuus herneelle... kokeessa omat protot ja kaupallisista malleista tehdyt variaatiot, "kehitelmät" kokeiden ulkopuolella.



# Kasvustokamera



# Mustialan hanelohko 10-tien lähellä...





# Hukka-herne ja härkäpavun viljelyn kehityshanke

## 21.6.





# Tekijöitä 13.5. HAMKIn Mustialassa..



# Edullisia komponentteja...



Petrimalja-testi – Kokeillaan 15.6. alkaen kaupallisten laitteiden lajin-tunnistusominaisuksia syöttämällä myös tunnettuja ”vääriä hyönteislajeja” tunnistettaviksi.



# Mustialan lohko 26.... 8 koejäsentä



# Insect Pest Management

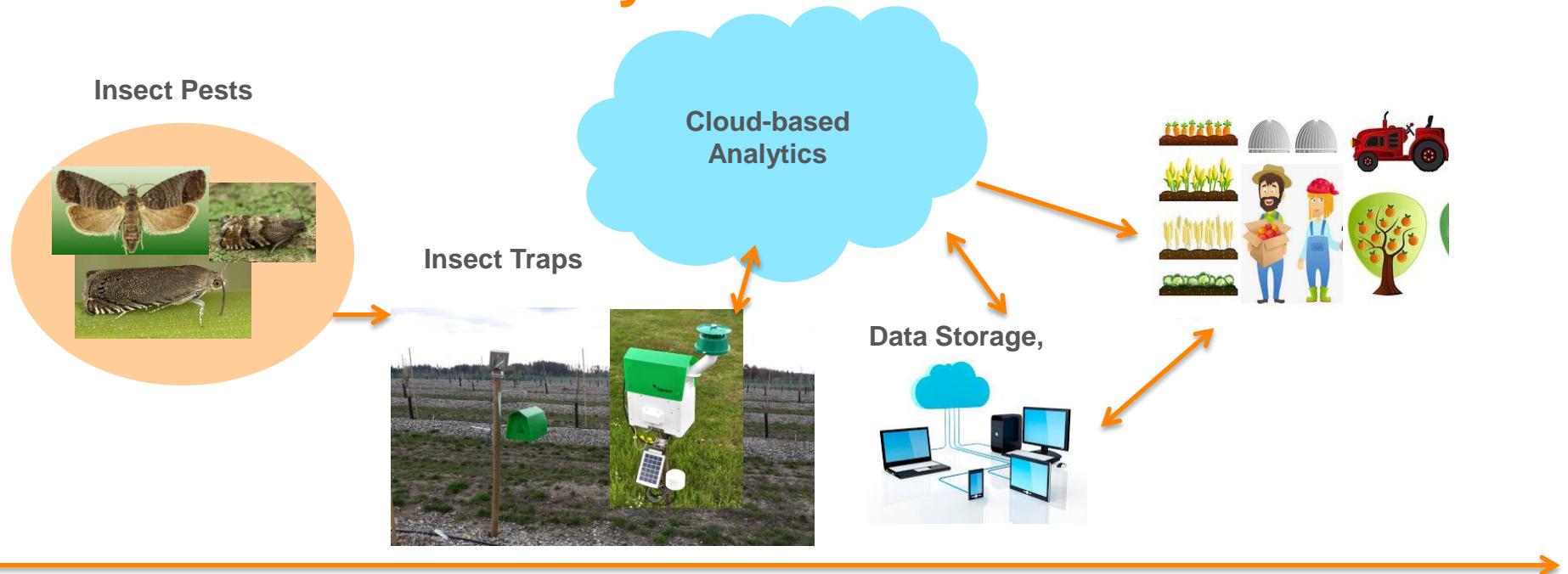
- Traditionally two kinds of traps used: 1)Glue traps and 2) Pheromone traps
  - Glue traps (yellow, blue): collect all flying insects
  - Pheromone delta-traps: Collect specific insects sensitive for the pheromones



Trap checking is labour demanding work and it doesn't offer "online-information". The traps are usually visited 1-2 times/week – At first time used in Finland over 30 years ago.



# Insect Pest IoT Ecosystem



## WP1-2

### Plant/Insect Research: (Agri WP1, Forest WP2)

Research objectives  
Project design  
Methodology  
Experiments planning  
Results  
Marja Aaltonen, Tiina Ylioja

## WP3 Engineering:

Needs and constraints  
Research problem  
Develop possible solutions  
Select promising solution  
Build a prototype  
Test and evaluate prototype  
Redesign/Improve as needed

## WP4 Data Management:

Network & connectivity

Software & scripts

Data:

- Quality
- Security
- Integrity
- Storage

## WP5 Data Analysis

Detection  
Automatic Counting  
Image Recognition  
Processing  
Modeling

## WP6 Communications & Reporting

Results & interpretations  
Publication & distribution  
IPR & productization  
Marketing  
Communications

# 1. Trial 2019: In May apple codling (*Cydia pomonella*) monitoring – very few insects > no results!



# The old apple orchard – the trial orchard

## Not enough *Cydia pomonella*!!



## 2. Trial: Cross-over exp. Method: 7 trial members in field pea





Ca. 2km to previous year  
pea is the risk disstance

# Trial members, cross-over method

> No pesticide sprayings



## Koejäseniä 7 kappaletta:

1. Deltaansa ilman feromonia (kontrolli 1) ← The trap did not attract the pest
2. Deltaansa, jossa feromoni (kontrolli 2) ←
3. Trapviewansa, perus (Standard) ←
4. Trapviewansa, puhdistava (Self-cleaning, sis. lpt- ja kosteusanturit) ←
5. Metos iScout ←
6. Prototyyppi 1 (Hamk) ← The traps did not properly attract the pest
7. Prototyyppi 2 (Hamk) ←

# Cross-over exp. Method: 7 trial members on field pea



# 1. Delta trap without pheromone



## 2. Delta Trap with the pheromone (Control), the traditional way used for the monitoring.



## 2. Control, both blue and white glue bottom paper.



3. The Trapview Standard Delta: Wind sensitive (big and light), opens easily by itself and material wilts and softens (duration 1 growing season ?). - Taping demanded! Fastening threads weak > own systems...



3. Trapview Standard: Birds!, - Sticks on the solar panel to prevent birds from sitting and defecating on the panels and grids to prevent birds to go into traps.



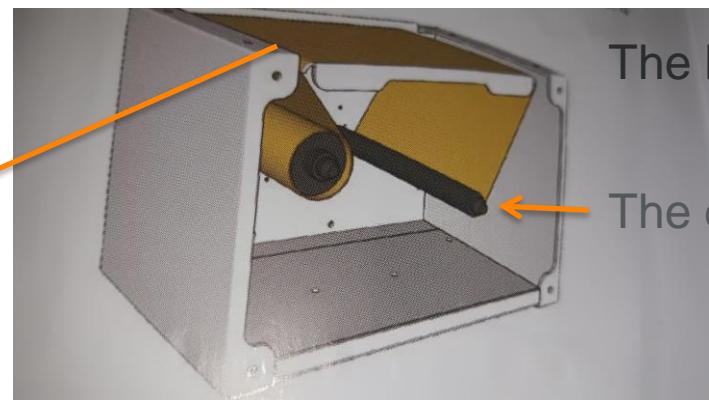
## 4. Trapview self-cleaning, nick name "The chimney trap"



## 4. Self-made work with Trapview Self-cleaning



#### 4. "The chimney trap" for apples...



4. The chimney replaced with a grid for field pea:  
> no birds inside, good spread of pheromones by airflows. Negative the greenish shadows.





## 5. Metos iScout – compact and ready to use. <https://ng.fieldclimate.com/auth/login>. - Energy problems with all traps!



## 5. Iscout Metos



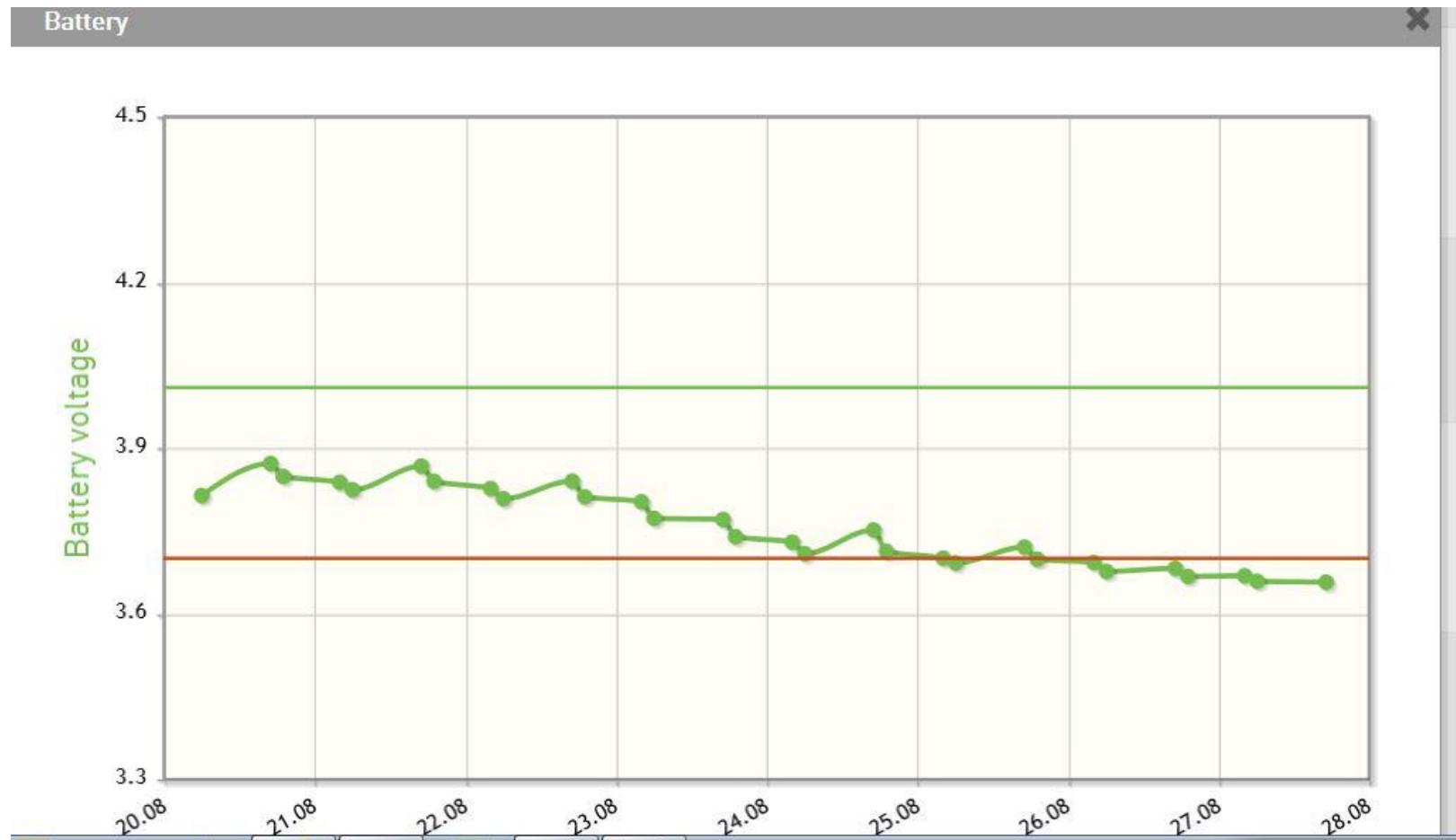
In general: It took 2 people to move the traps on the exp. field, especially the big Trapview self-cleaning... As accessories available a net box for ampoules. – Not in other traps.



11% of pods damaged



# Problems with the energy.... 2W solar panels in Trapview and Metos quite similar (secret information).



# Trapview Standard – flight peak

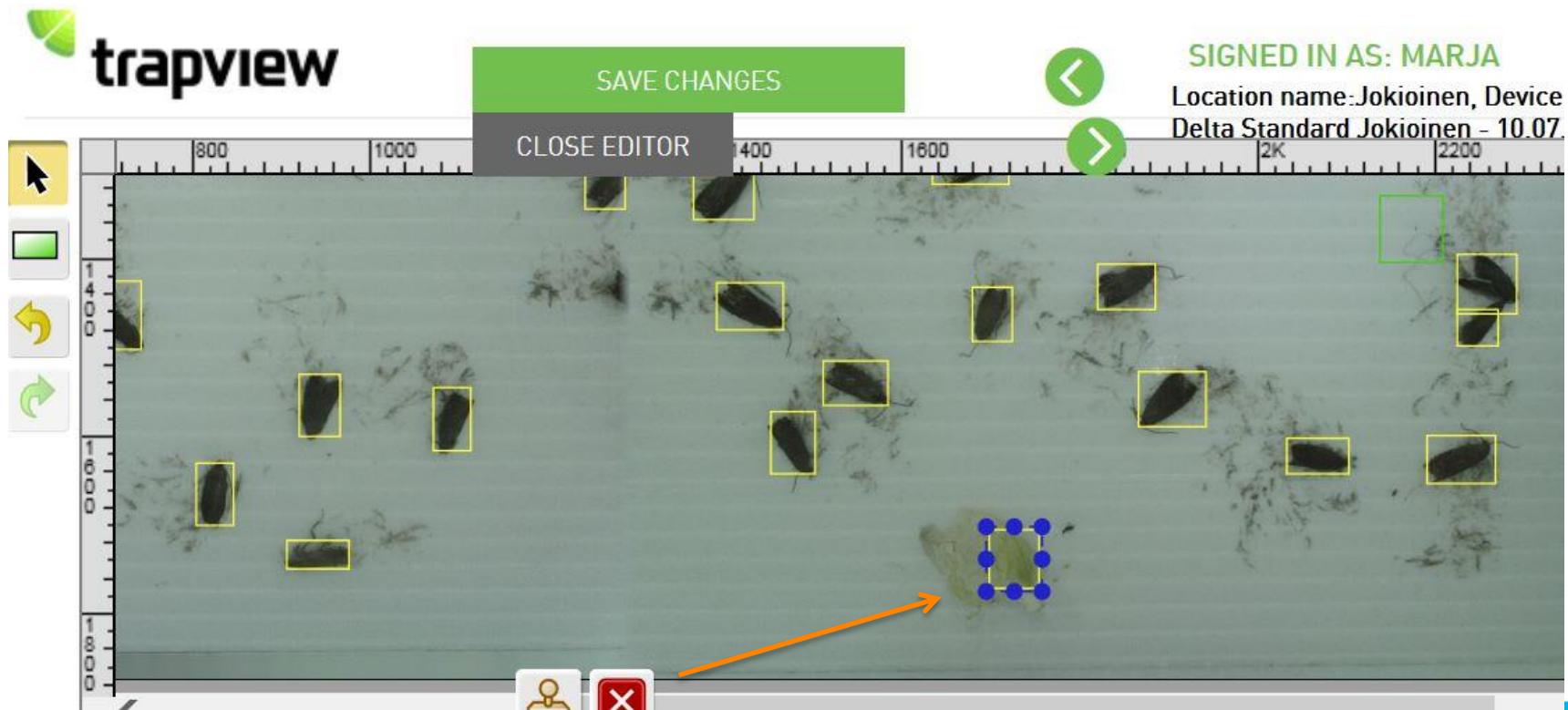
Location name: Jokioinen, Device: S03041 Herne Delta Standard Jokioinen

Jump to  Jump to date

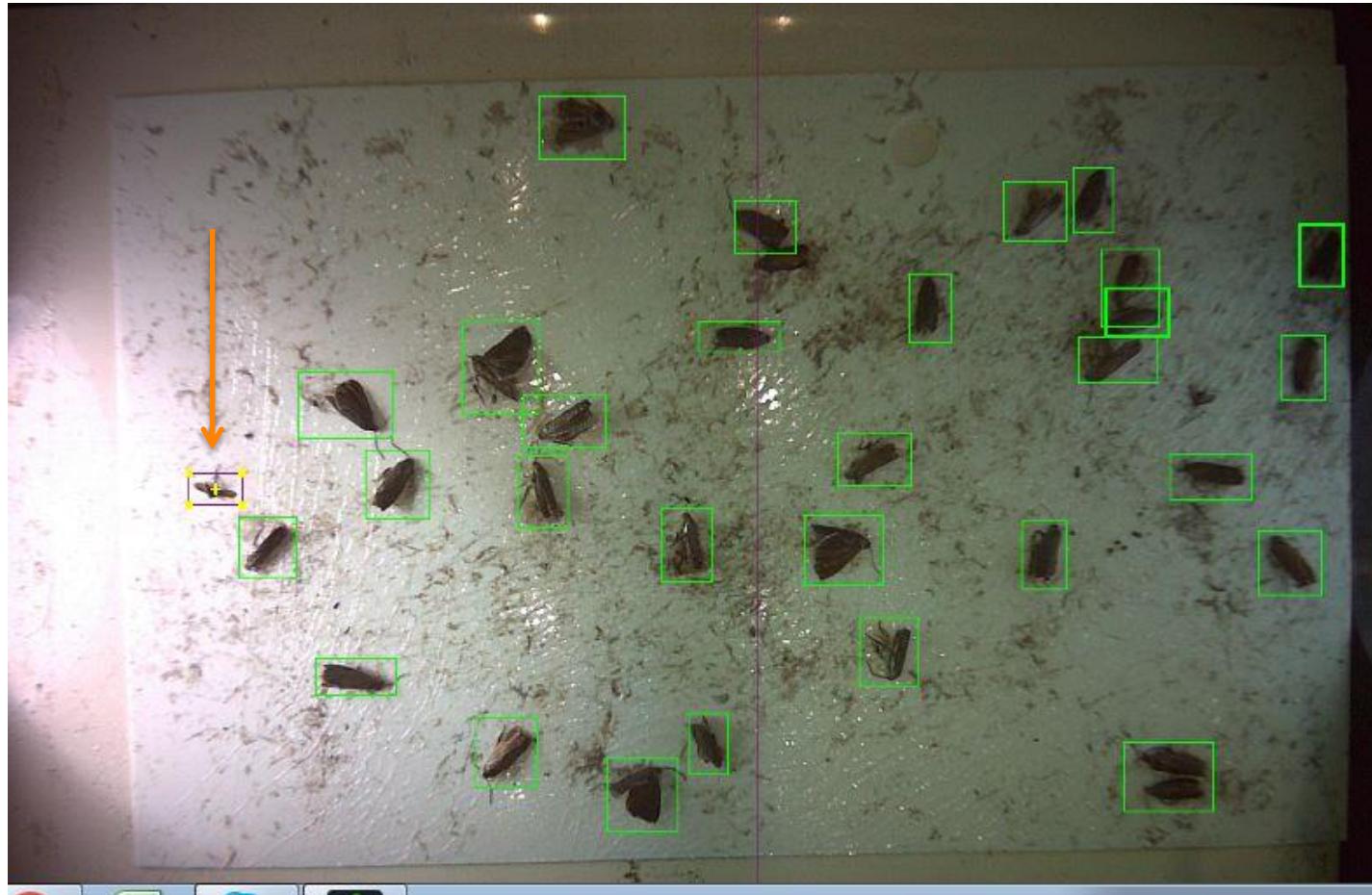
▼ IMAGES

The interface shows a series of trap images from June 28 to July 1, 2019. An orange arrow points to the image from July 1, 2019, at 12:04:00. Below the images is a navigation bar with tabs: Image, Pest chart, Device events, Location events, and Notes. The main area displays a green trap board with numerous small black spots (pea moths) highlighted by yellow boxes. On the right, a sidebar shows the pest information: Pest: Pea moth (Cydia nigricana), Location name: Jokioinen, Options (with edit icons), Date: 01.07.2019, Time: 12:04:00, and No. of pests in trap: 69 (with an edit button). A 'SAVE CHANGES' button is at the bottom.

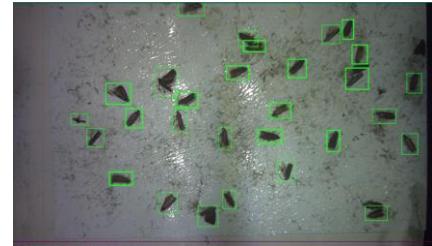
# Trapview machine learning...the removal of wrong choices and those confirmed by machine intelligence choices



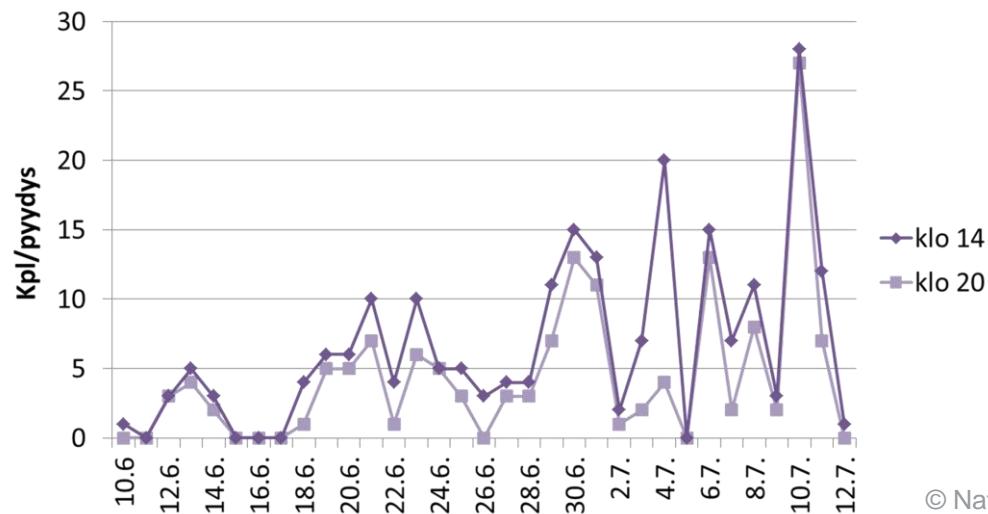
Iscout Metos: checking the automated recognizes  
- the users will clear the error selections > good  
machine learning after that....



# Tulokset 2019



- Kaikki ansat lähettilivät käyttäjälle säännöllisesti kuvia ansasta
  - Kaksi kaupallista ansaa pystyi myös tekemään pienitä hahmontunnistusta tietyille lajeille
- Vain hernepellolla oli tarpeeksi kohdehyönteisiä (*Cydia nigricana*) tulosten saamiseksi
- Haasteet:
  - Laitteiden energiansaannin varmistaminen
  - Ansojen muodot -> Ansat keräsivät eri määrään hyönteisiä riippuen ansan muodosta



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