

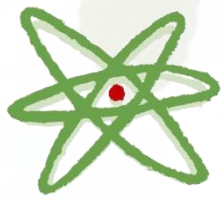


Precision farming and drones: revolution in fruit growing?

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Research Station for Fruit npo (pcfruit)
University of Leuven

Prognosfruit 9 August, 2019 Alden-Biezen, Belgium



Precision farming / digital farming / Agriculture 4.0 ?



Agriculture 1.0 (< 1950)

- Labour intensive
- Low productivity



Agriculture 2.0 (1950-2000)

- Green revolution: PPPs, fertilizers, ...
- Breeding



Agriculture 3.0 (2000 – 2015)

- GPS & Variable Rate Application
- Data management & DSS



Agriculture 4.0 (2015 - ...)

- Internet of Things with cheap sensors
- Cloud based ICT



Agriculture 5.0 (next ...)

- Robotization
- Integration physical & digital

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As is

To be ?

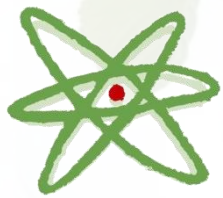


Increase
homogeneity



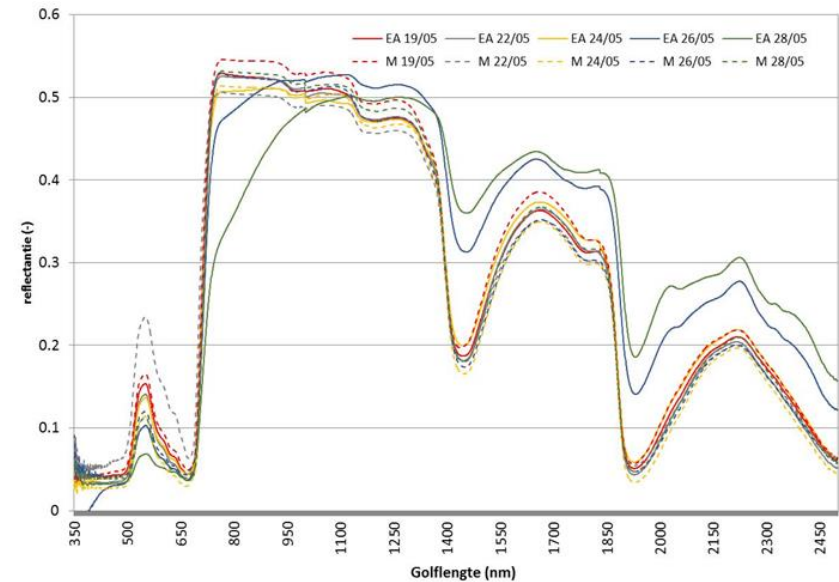
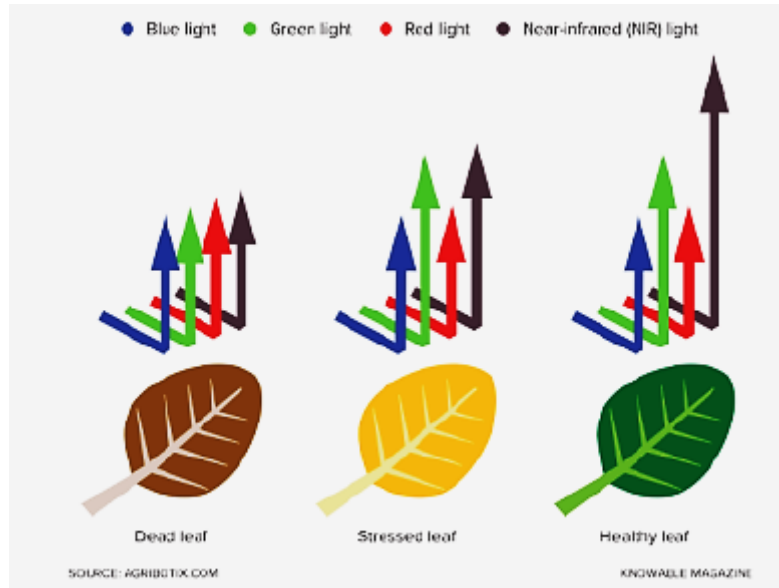
Maximize per
plant or per m²

Crispr
/cas ?



Example 1: Disease detection

Fire blight case



EA : fire blight; M: Mock (blank)



Infected pear orchard - September 2013

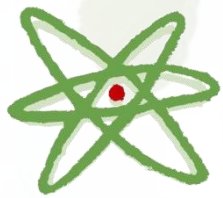


Aim:

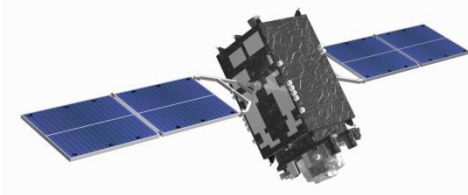
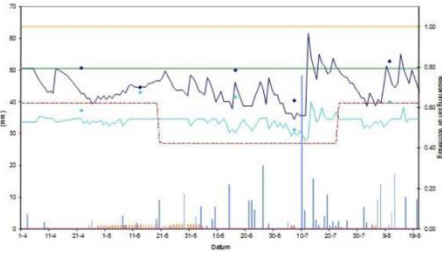
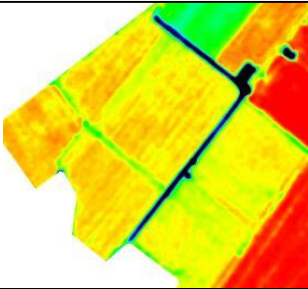
- Monitoring fire blight free zones for export

Status:

- Detection @ 5 dpi
 - 30 % false positive (shadow effects)
- Next stage project with topdown and side monitoring to improve accuracy



Ex. 2: Efficient & sustainable irrigation

sensor	satellite	drone
		
		
cheap	Open access (delayed)	In line with irrigation blocks
Spot measurement	Clouds, resolution	Expensive (unless regional service)



NDRE
via
Drone
(multi-
spectral)

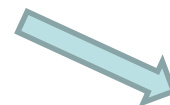
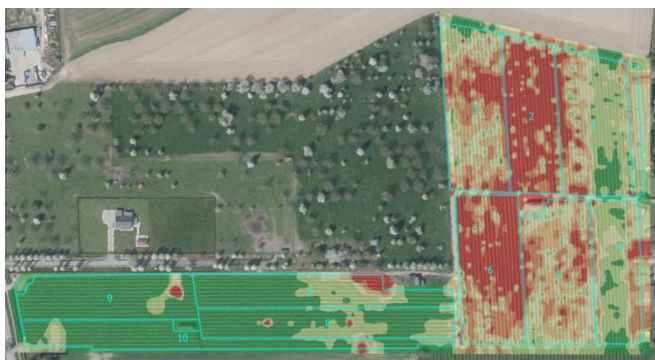


06/2018



08/2018

EC
(Soil
scan)



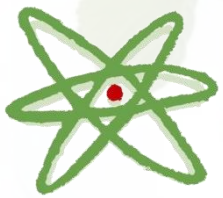
Algorithm



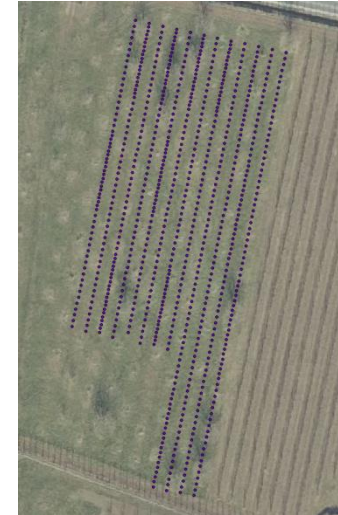
irrigation



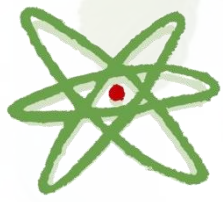
Yield pear cv.
Conference
size 60-75
correlates $R^2=0,82$



Example 3 : GPS planting

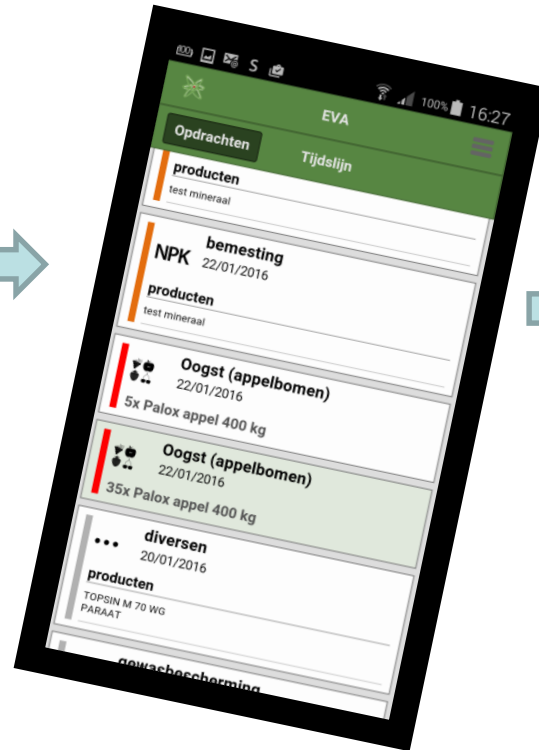


- Remote sensing & data processing
- Mechanical weeding
- Precision application
- Mechanical thinning
- Mechanical picking
- Robotisation in general



Example 4 : Data management

- PPP
- Fertilizers
- Workers
- Tasks
- Monitoring
- Harvest



- reports
- overviews
- Stock mgt



BELORTA
redefining fruit & vegetables

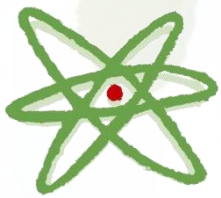


EVA® app



How do you want to spend your Sunday afternoon?





Let's make it smarter... IPM

$$30\% + 30\% + 30\% + 30 = 76\%$$

→ “Man made pests” coming up again...

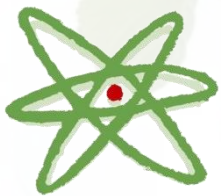


Panonychus ulmi



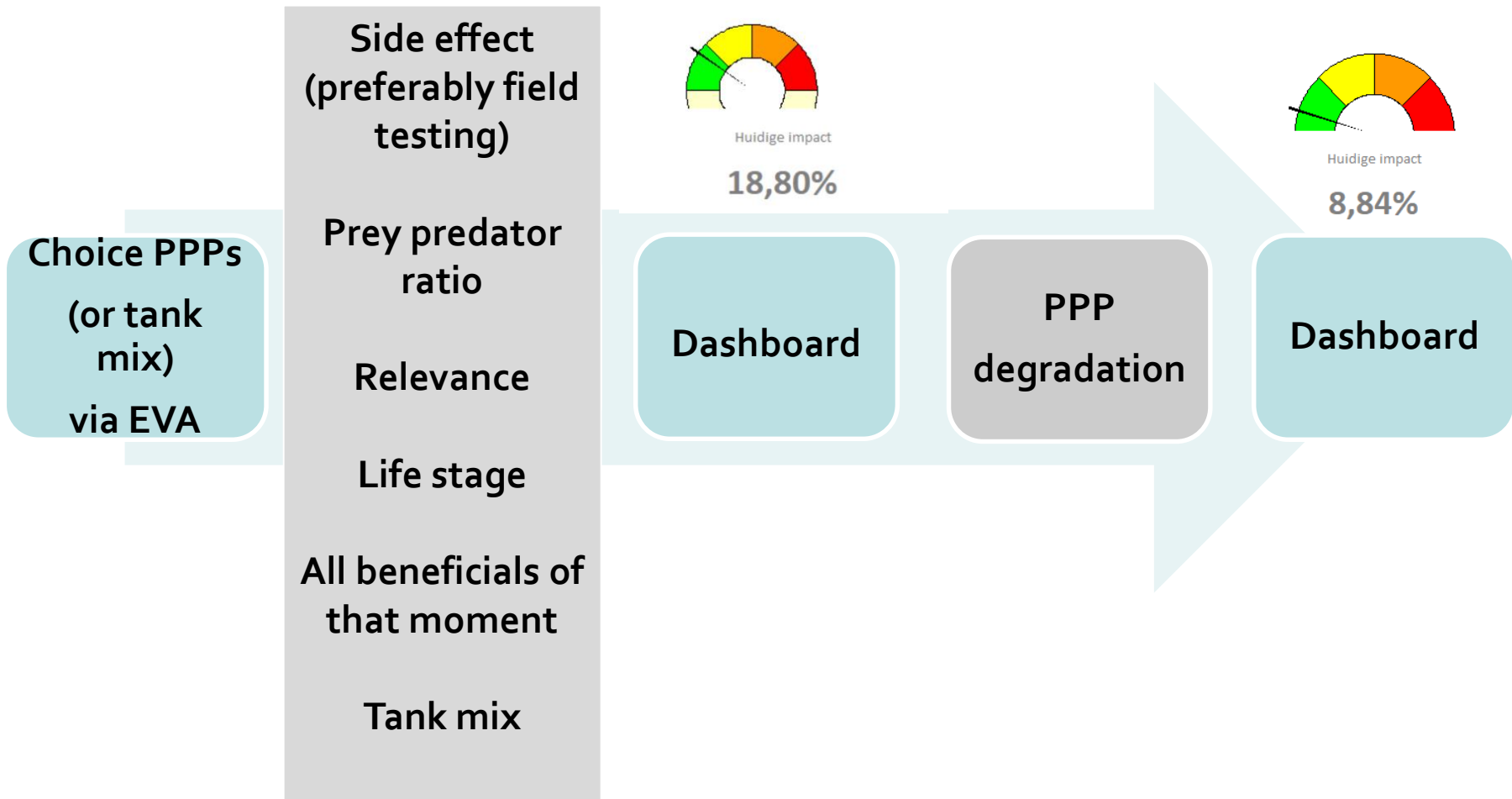
Cacopsylla pyricola

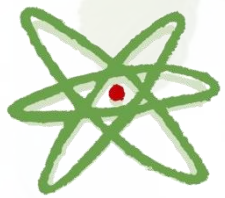
→ Easy accessible information needed :
the “impact indicator”



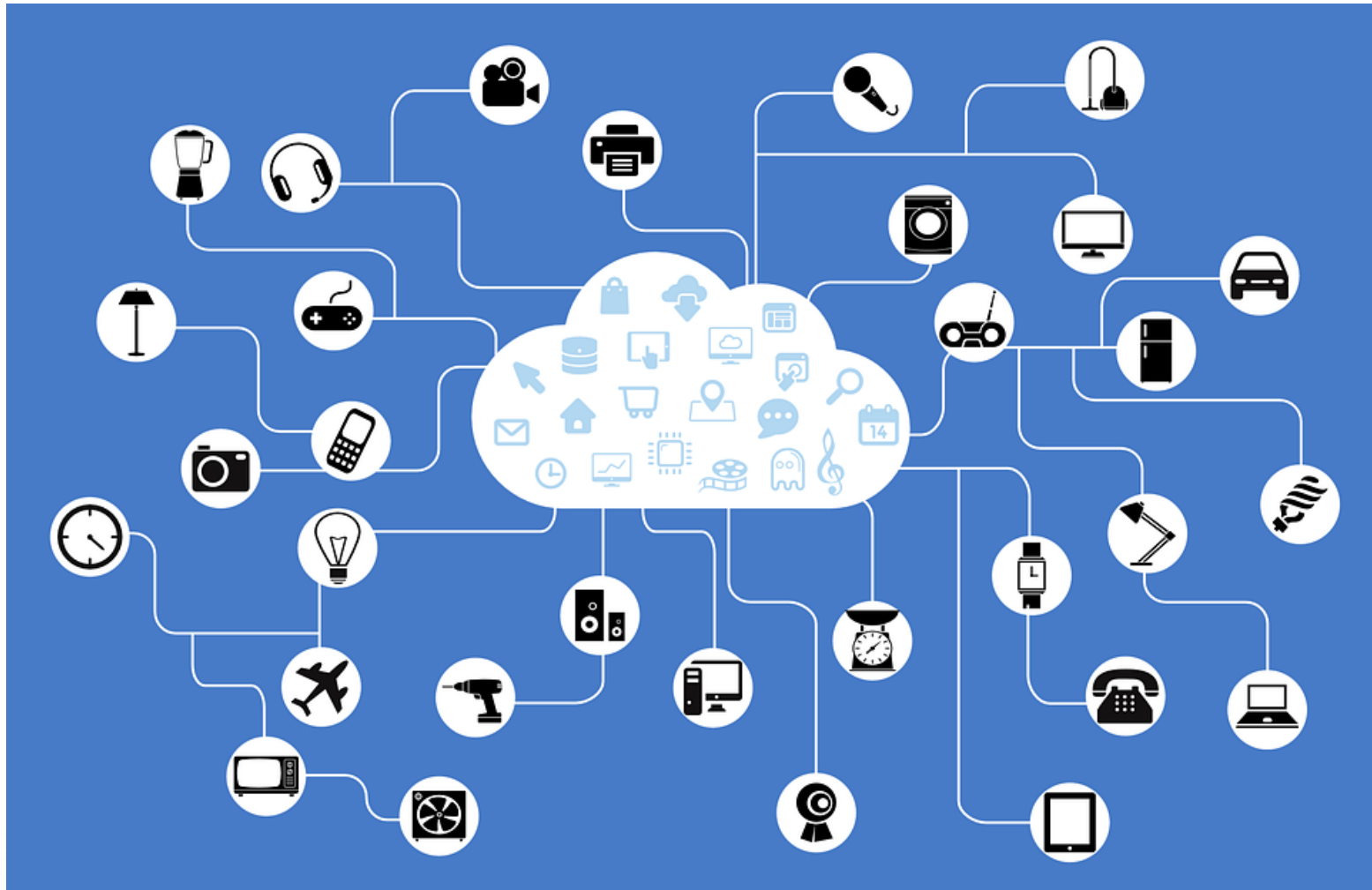
The impact indicator: how does it work ?

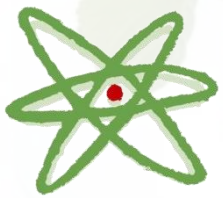
(in final phase of development)





Example 4 : Internet of Things





IoT : automatic hail nets



Fact:

Hail nets in Conference orchards
reduce flower bud formation

→ permanent hail nets not advised

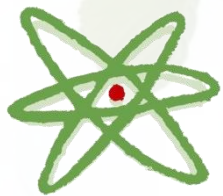
→ Automatic opening / closing

Triggers:

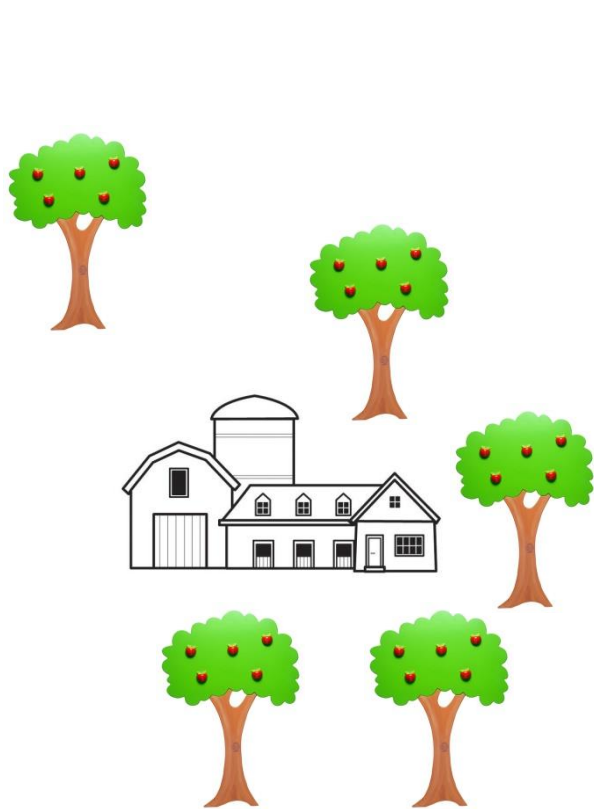
Now: smart phone

Future: sensors

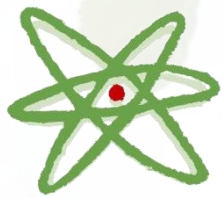
- light Δ ?
- RH & T ?
- wind ?



IoT: Wash off PPPs in remote orchards



Did it rain after treating that orchard ?
How late did it start raining after treatment?
What is the rain fastness of the products?
Do I have to retreat?



Dashboard (to be integrated in EVA®)



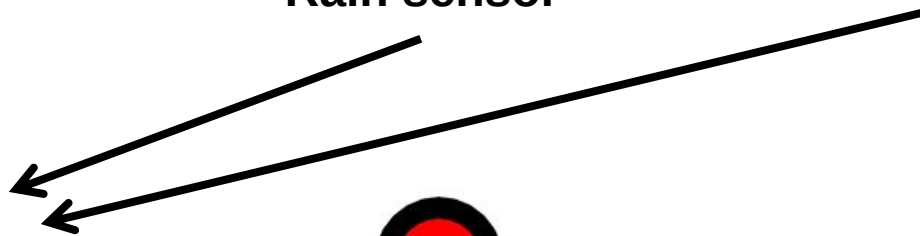
tracker



Rain sensor



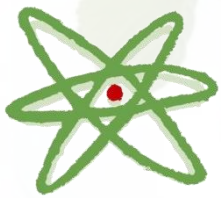
EVA®



RETREAT

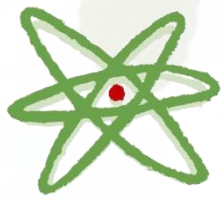
Retreat X, but not Y and Z

No need to retreat



Conclusions

- Problem + Drone = ~~solution~~
 - Precision agriculture has infinite opportunities → revolution? possibly
→ change? certainly
- but...
- discriminate 'nice' from 'need'
"what's in for the grower?" (€)
 - from data to actionable information
this process is still bottleneck but fast progress
by artificial intelligence & machine learning
 - it's not about the technology (drones, ...) but about
the added value of the outcome of information
 - more precise / lower input
 - labour reduction
 - decision support → yield or quality
 - lower inputs



and the grower becomes obsolete?...

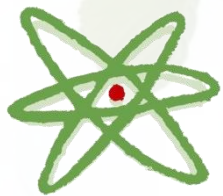
No !

Fruit growing is extremely complex with numerous parameters and interactions

Precision agriculture will never replace the farmer's knowledge and experience...

It will just complete and facilitate it





Thanks to ...

- Collaborators:

- RS: Serge Remy, Joke Vander Maesen,
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- IoT: Wannes Akkermans, Bart Vanhoutte,
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- Data: Femke De Vis, Tim Beliën, Kris Ruysen,
Tessa Debaets, Kim Koopmans
- GPS: Kris Ruysen, Jef Vercammen, Ann Gomand



- Sponsors:



- Partners:

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