



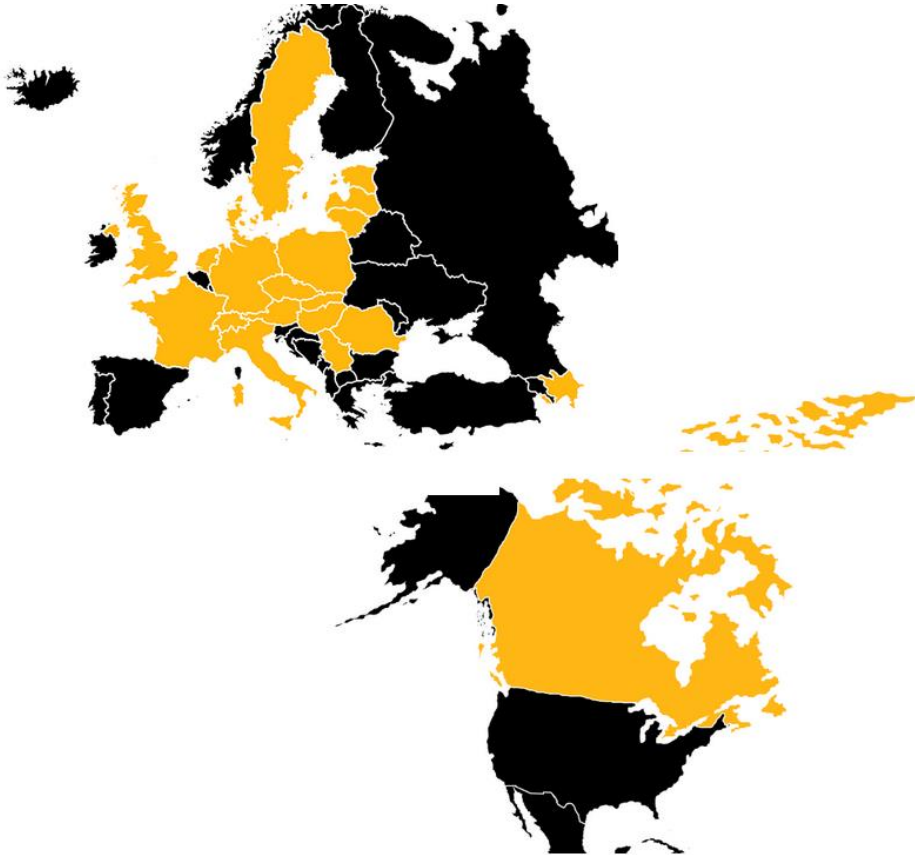
Euroopa Maaelu Arengu
Põllumajandusfond:
Euroopa investeeringud
maapiirkondadesse

Robots in agriculture and their implementation

Victor Bloch, LUKE (Finland), ARO Volcani (Israel)
Reetta Palva, TTS (Finland)



Existing commercial field robots



- Naio – France
- FarmDroid, Agpointelli – Denmark
- AgXeed – The Netherlands
- Burro, Farm-ng, Bluewhite, GUSS,
- Carbon – USA
- DJI – China
- XAG – Australia

Existing field robots

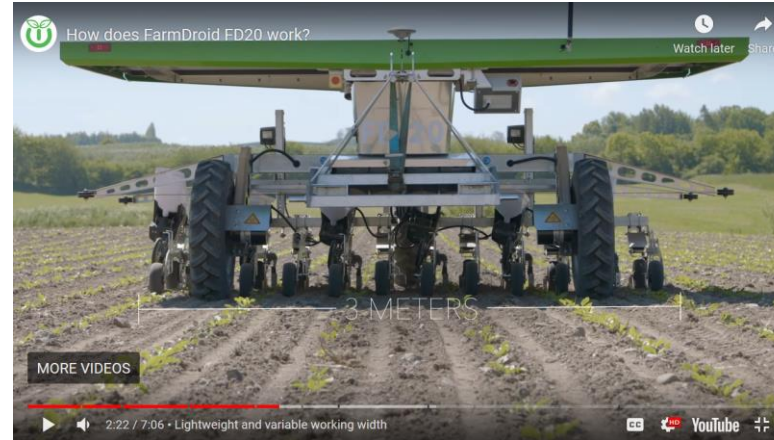
<https://www.futurefarming.com/dossier/multifunctional/>

~170 000 E



<https://www.naio-technologies.com/en/orio-is-the-most-versatile-tool-carrier/>

~80 000 E



<https://farmdroid.dk>

~30 000 E



<https://burro.ai/>

~270 000 E



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

~170 000 E



<https://agrointelli.com/>

~18 000 E



<https://ag.dji.com/>

Why not everybody use them??

~170 000 E



~

120/100 Horse Power



<https://agrointelli.com/>

- Cost
- Limited tasks
- Not enough experience
- Farmers benefit and inertia

~18 000 E



<https://ag.dji.com/>

Research of robots

Why the low adoption of robotics in the farms? Challenges for the establishment of commercial agricultural robots

Gustavo Gil^a, Daniel Emilio Casagrande^{b,*}, Leonardo Pérez Cortés^c, Rodrigo Verschae^b
<https://doi.org/2022.100069.hceta.j/10.1016>

Farmers' perspectives on field crop robots – Evidence from Bavaria, Germany

O. Spykman^{a,b,*}, A. Gabriel^a, M. Ptacek^b, M. Gandorfer^a
<https://doi.org/10.1016/j.compag.2021.106176>

How much can farmers pay for weeding robots? A Monte Carlo simulation study

Linmei Shang¹ · Christoph Pahmeyer^{1,2} · Thomas Heckelei¹ · Sebastian Rasch¹ · Hugo Storm¹
<https://doi.org/10.1007/s11119-023-10015-x>

Digital technology adoption for plant protection: Assembling the environmental, labour, economic and social pieces of the puzzle

Katja Heitkämper^{a,*}, Linda Reissig^a, Esther Bravin^b, Saskia Glück^a, Stefan Mann^a
<https://doi.org/10.1016/j.atech.2022.100148>

Robots in agriculture: prospects, impacts, ethics, and policy

Robert Sparrow¹ · Mark Howard¹
<https://doi.org/10.1007/s11119-020-09757-9>

Received: 13 June 2023 | Accepted: 6 November 2023
DOI: 10.1111/wre.12603

ORIGINAL ARTICLE

WEED RESEARCH | WILEY

A comparison of seven innovative robotic weeding systems and reference herbicide strategies in sugar beet (*Beta vulgaris subsp. vulgaris* L.) and rapeseed (*Brassica napus* L.)

Roland Gerhards¹ | Peter Risser² | Michael Spaeth¹ | Marcus Saile¹ | Gerassimos Peteinatos³

<https://doi.org/12603.erw/10.1111>

AgriEngineering

MDPI

Article

Operational, Economic, and Environmental Assessment of an Agricultural Robot in Seeding and Weeding Operations

Mahdi Vahdanjoo^{1,*}, René Gislum¹ and Claus Aage Gron Sorensen²

<https://doi.org/10.3390/agriengineering5010020>

Farming Revolution W4[®]



Farmdroid FD20[®]



Amazone spot spraying[®] and precise band-spraying

KULT-Vision Control[®]



KULT-Vision Control[®] + in-row finger weeding



KULT-Hohenheim i-Select[®]



Project for field robot integration

Parsley



Onion



Beetroot



Working width: up to 3 meters, 4 - 8 rows
Area coverage: up to 20 ha
Row spacing: 22.5 - 75 cm
Speed: max. 950 m / h
Seed hopper: 6-litre capacity
Weight: 900 kg (140 kg additional)
Solar cell capacity: 1.6 kW



Robot performance



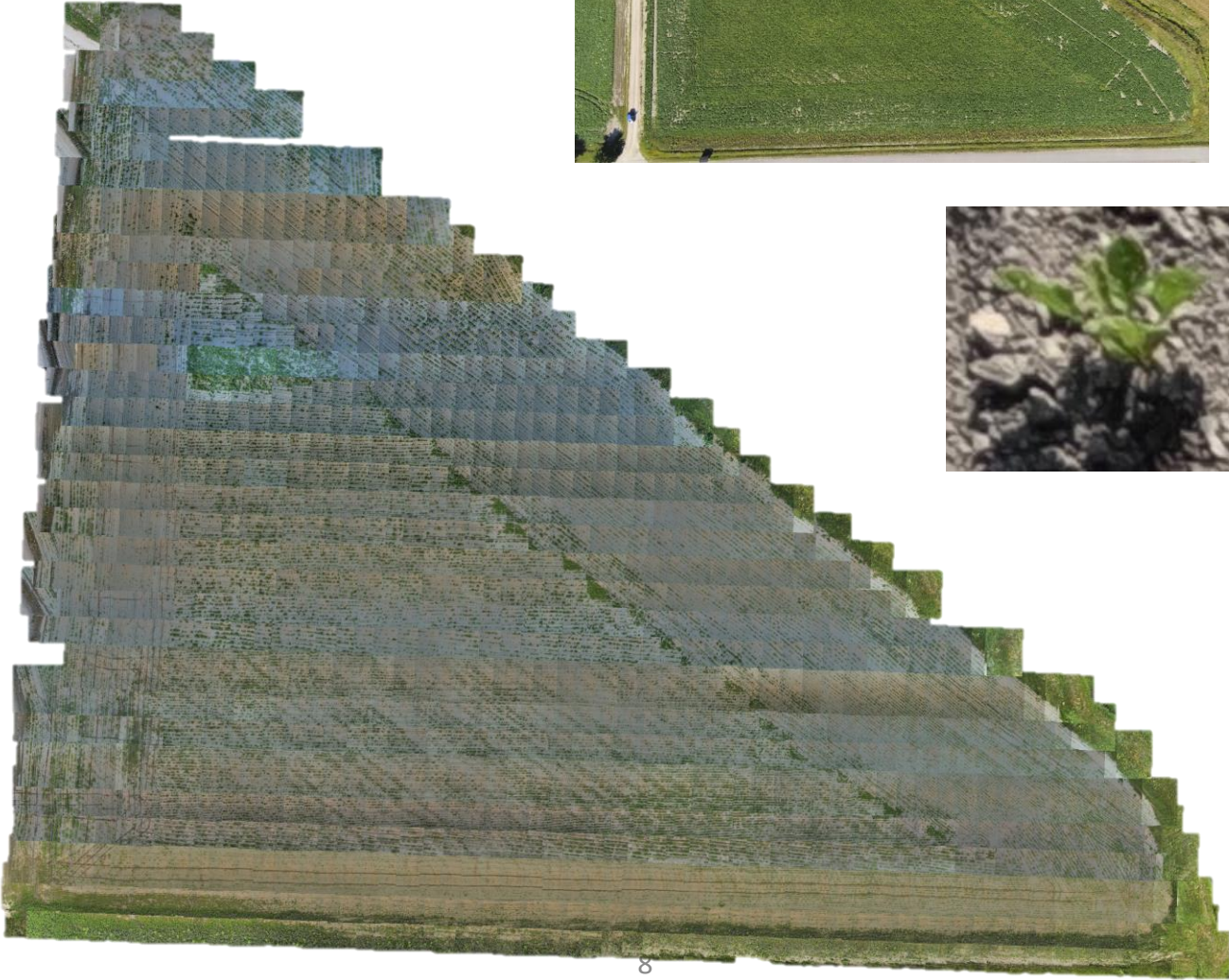
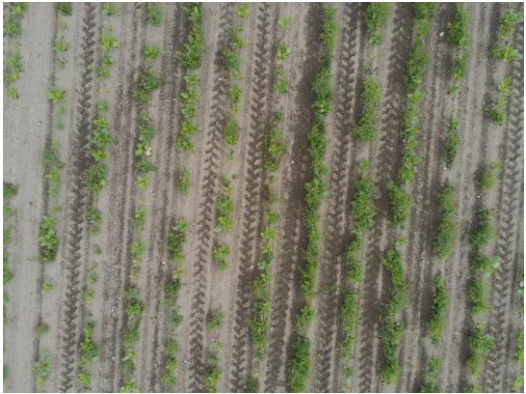
Control:
untreated

Control:
chemically
treated




Treated by the robot

Mapping entire field



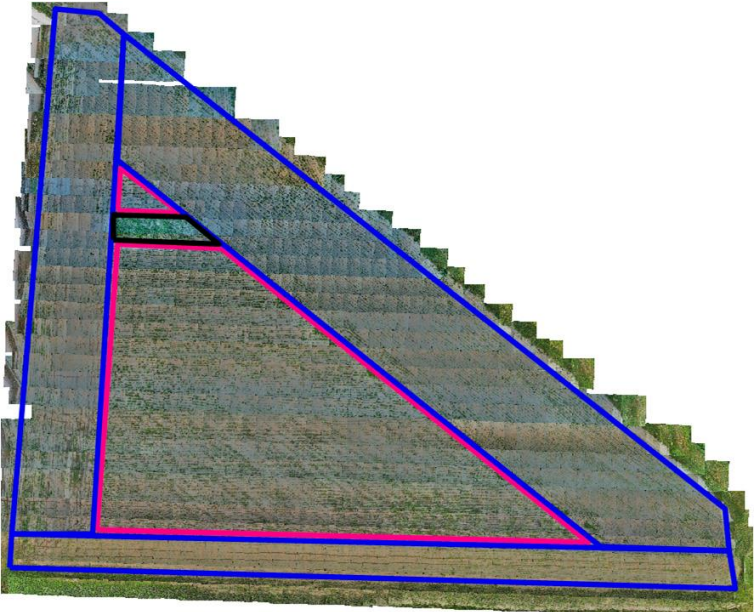
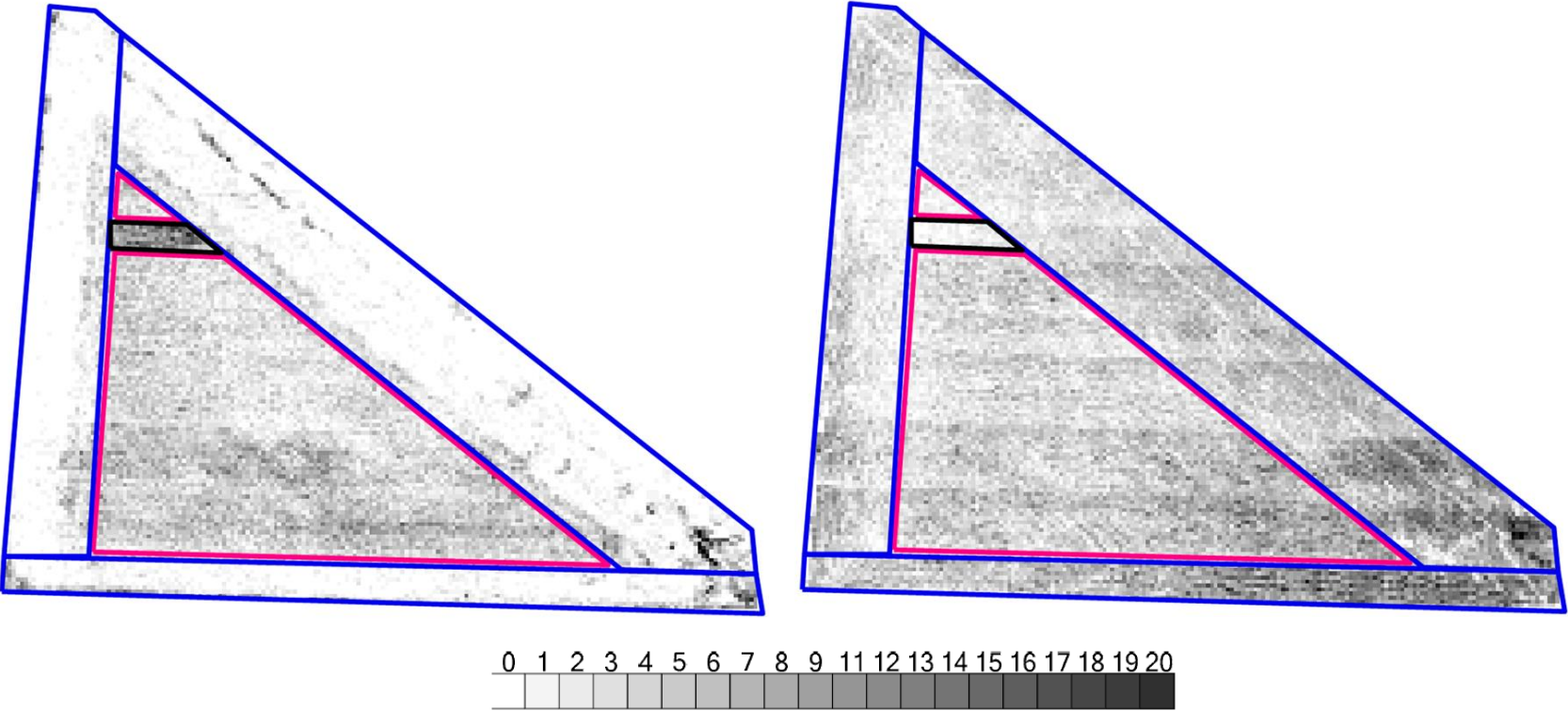
Robot performance

Communication
Assessment of the Performance of a Field Weeding Location-Based Robot Using YOLOv8

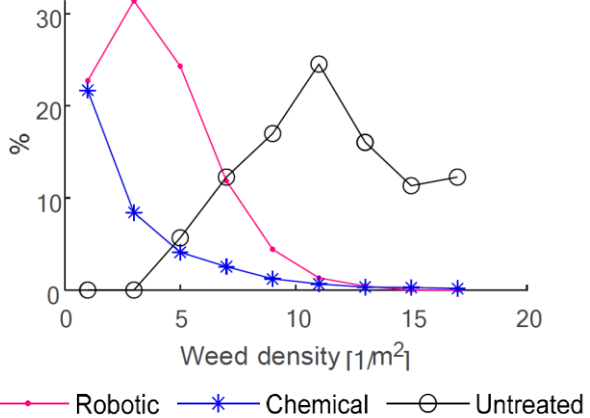
Reetta Palva ¹, Eerikki Kaila ¹, Borja García-Pascual ²  and Victor Bloch ^{2,3,*}

Weed density

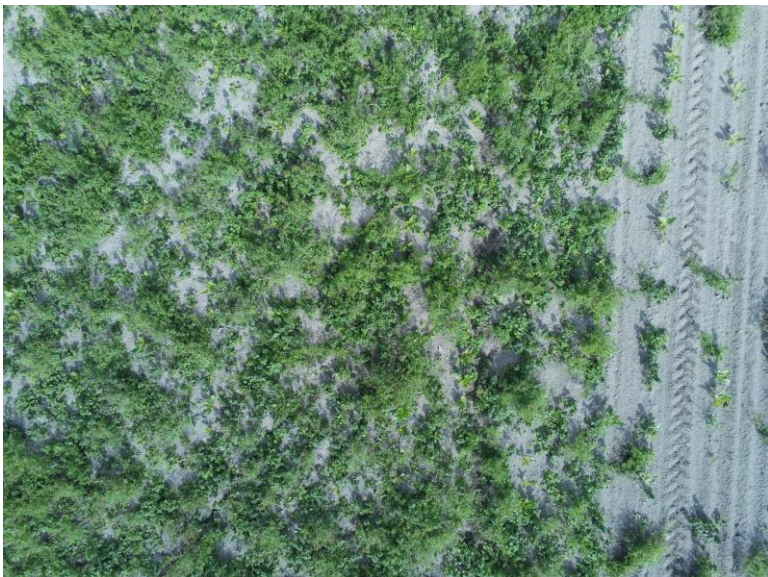
Plant density



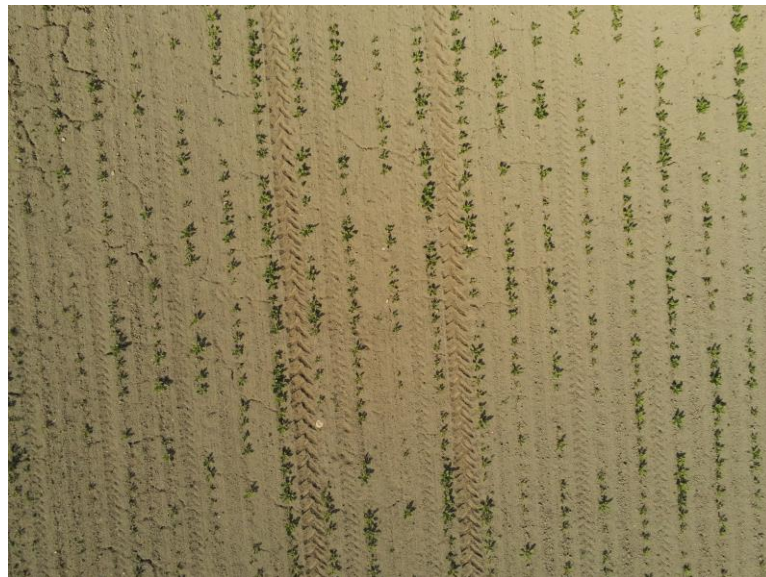
— Robotic
 — Chemical
 — Untreated



Control: untreated



Control: chemically treated



Treated by the robot



Still trying

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



<https://metomotion.com/>



<https://www.tevel-tech.com/>



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



Already not trying

[Automato Robotics](#)



[Naio Dino](#)



Academic development example: Strawberry picking robot

- Robot prototype
- Knowledge base
- Small Finnish farms
- Developed and produced in Finland

Piikkiö



Sotkamo



Paimio



Agricultural robotics in Finland

Kotimaa

Pellolla Huittisissa nähtiin maanviljelyn tulevaisuus – ”Kyllä ne varmaan aika nopeasti yleistyvät”

Tanskalaisen yrityksen maanviljelysrobotteja on maailman pelloilla kohta 500. Suomessa niitä on toistaiseksi kaksi.

Jaa

Tallenna

Kommentoi

☆ TILAAJILLE



<https://www.cultum.fi/>



<https://www.silvadrones.fi/>

Agricultural robotics in Israel

<https://agronimbus.co.il/en/enhome/>

<https://www.alumotsprayers.co.il/>

<https://www.agridrones.co.il/>

<https://www.seetree.ai/>

<https://alta.team/en/about/>



Conclusions

- Robots are still expensive and not ideal
- They must be further studies and improved
- The farms must be changed: infrastructure, knowledge, attitude of farmers
- We should act not wait

victor.bloch@volcani.agri.gov.il

<https://www.agri.gov.il/author/victor-bloch>

reetta.palva@tts.fi

<https://www.tts.fi/hankkeet/maatalous/uudet-teknologiat/>

“If I had asked people what they wanted, they would have said faster horses.”
- Henry Ford

