

Expectations on digital tools from the agricultural sector

ITU/FAO Workshop on „Digital Agriculture at Scale:
Sustainable Food Systems with IoT and AI“
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Dr. Andreas Meyer-Aurich

Digitalization in Agriculture



Digitalisation in Agriculture

● What is it about?

- Efficient use of resources (farming by soils)
- User friendliness
- Higher work productivity
- New business opportunities
- Chances for environmental protection and biodiversity

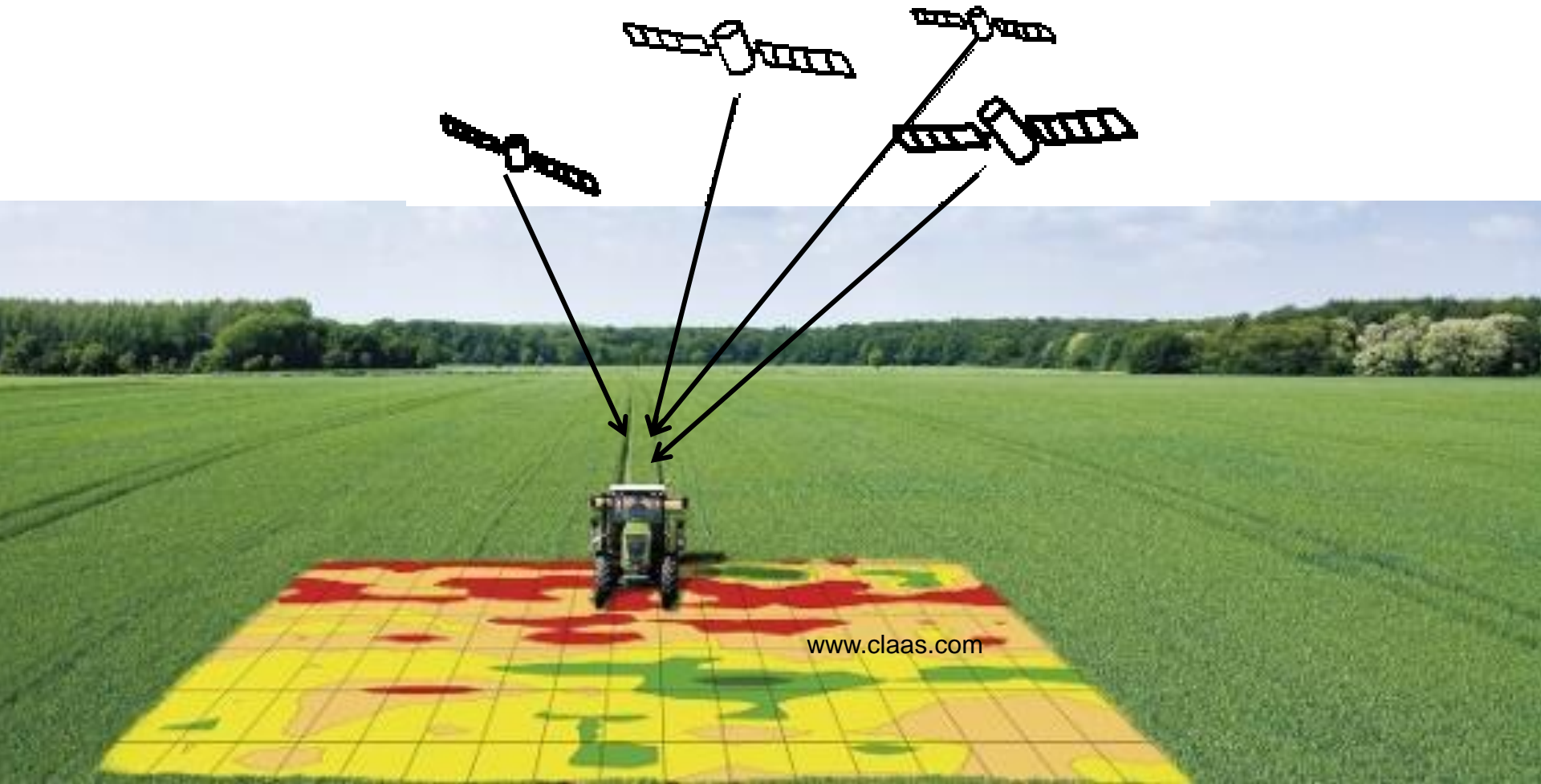
The beginning of digitalisation in agriculture

- Heterogeneity in soils in Brandenburg, Germany



Foto: Hierold

Farming by soils .. with GPS technology in the 1990's

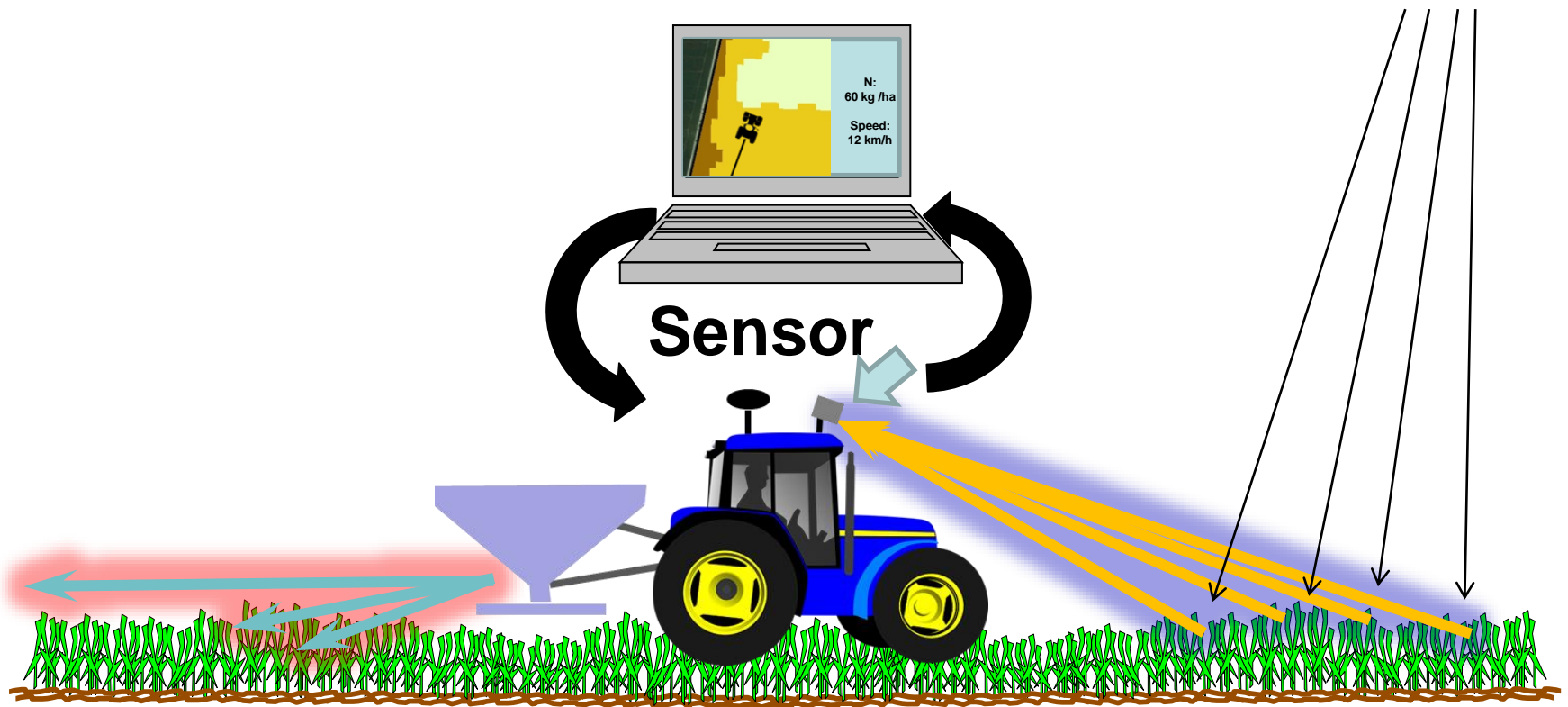


www.claas.com

Early research N Management/ Precision Farming

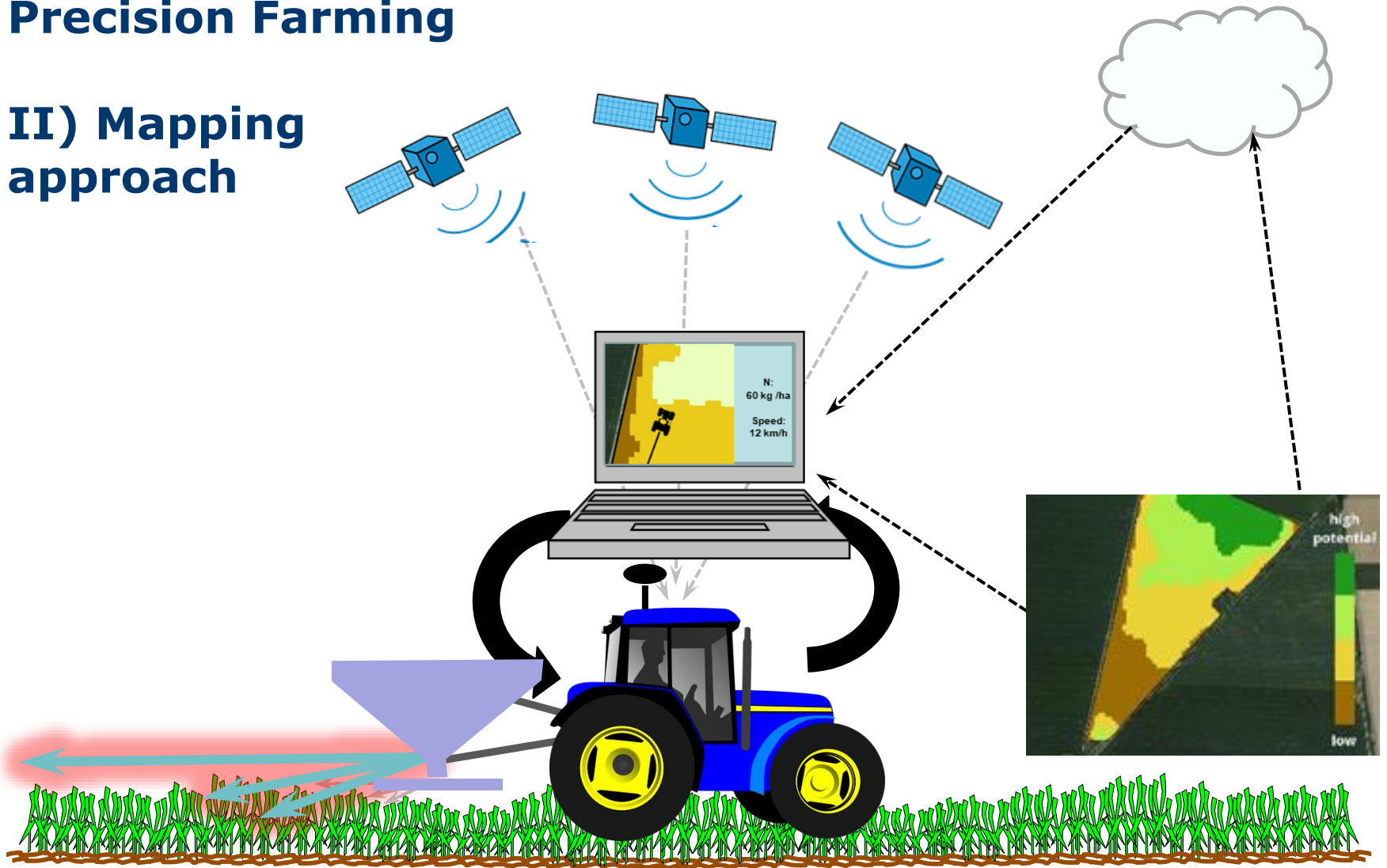
2 Approaches

I) N Sensor



Precision Farming

II) Mapping approach



Examples: Available sensor based VRT (Germany)

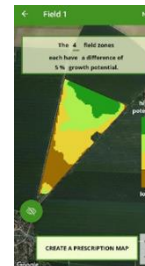
- Yara N-Sensor
- Isaria
- Greenseeker
- Solorrow/ ANA
- atfarm



Agricon GmbH



fL, Institut für
Landtechnik und Tierhaltung



Solorrow

Agricultural Systems of the future



Agricultural Systems of the future

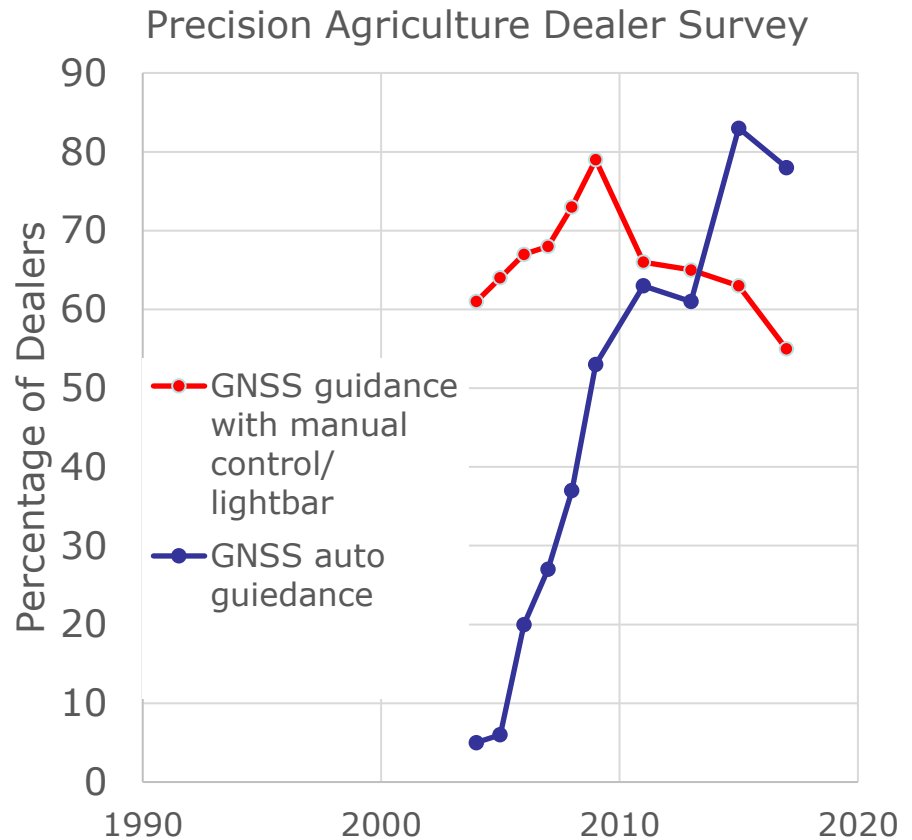
Digitalisation - Where does the journey lead to?



- Can sensors, AI, IoT and actuators substitute farmers?
- Is it economically feasible; environmental consequences
- Expectations and needs from the Agricultural sector

Adoption digital tools in Agriculture

Success story: autosteering/ light bar systems

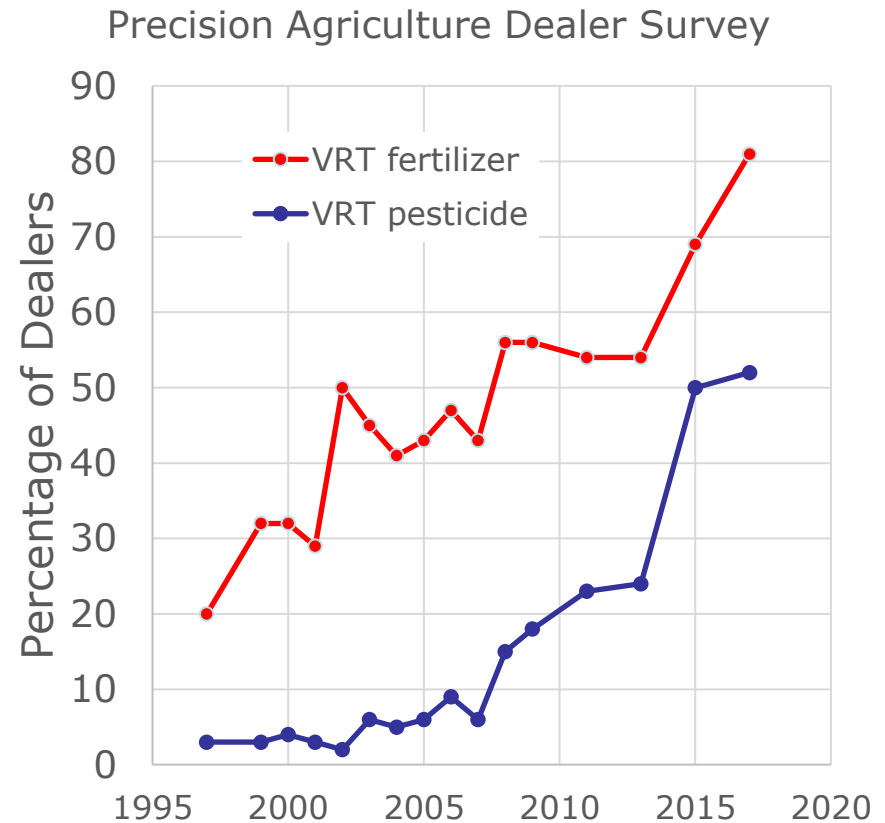


Date: Lowenberg-DeBoer & Erickson, 2019

Adoption digital tools in Agriculture

Adoption of Variable Rate Technologies (VRT) in the United States

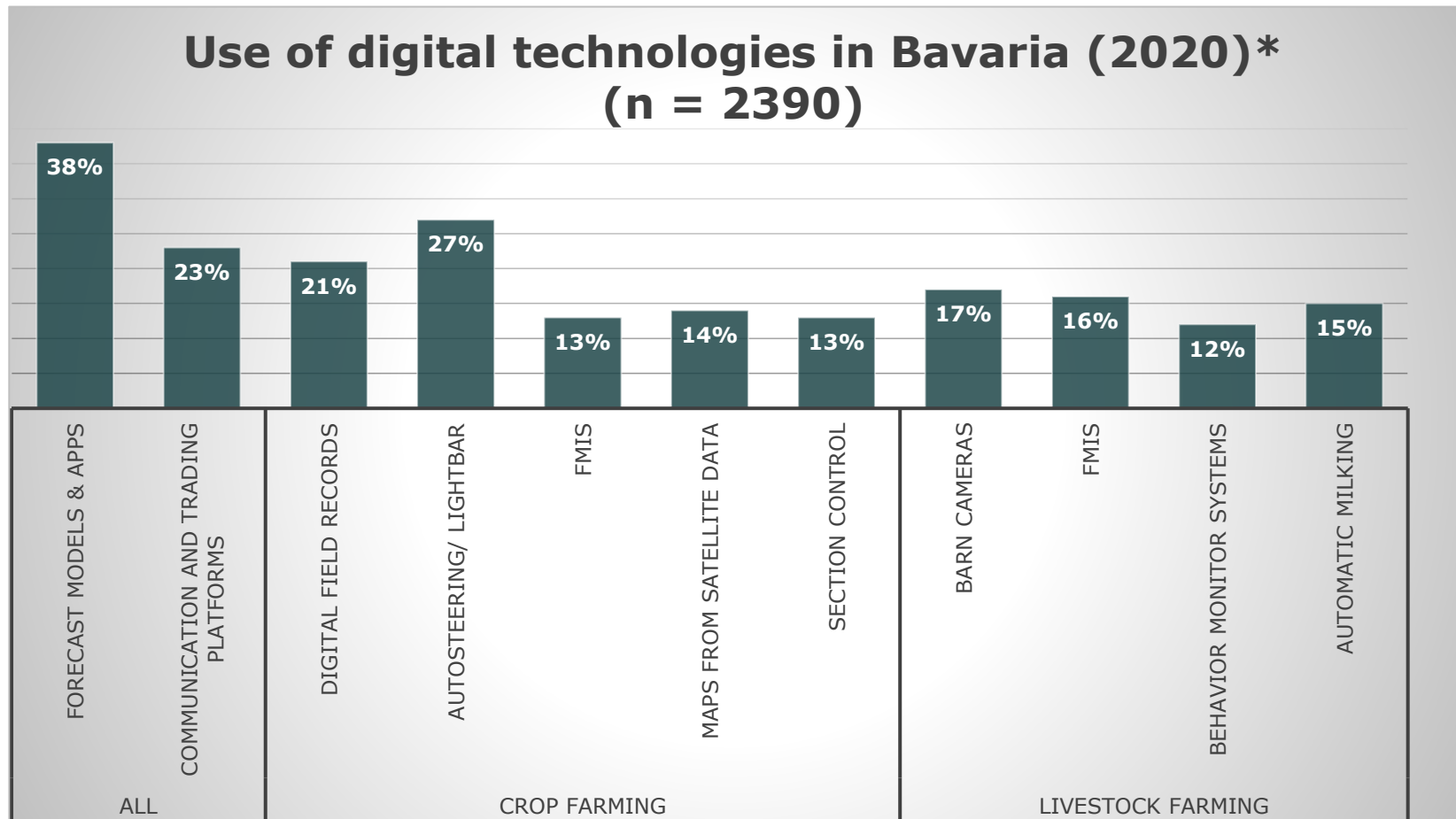
- Adoption of VRT by farmers lower (rarely > 20 %)
- Reasons:
 - Cost-benefit ratio
 - Complexity the technology



Data: Lowenberg-DeBoer & Erickson, 2019

Adoption data from Bavaria (Germany)

Survey with > 2000 farm responses

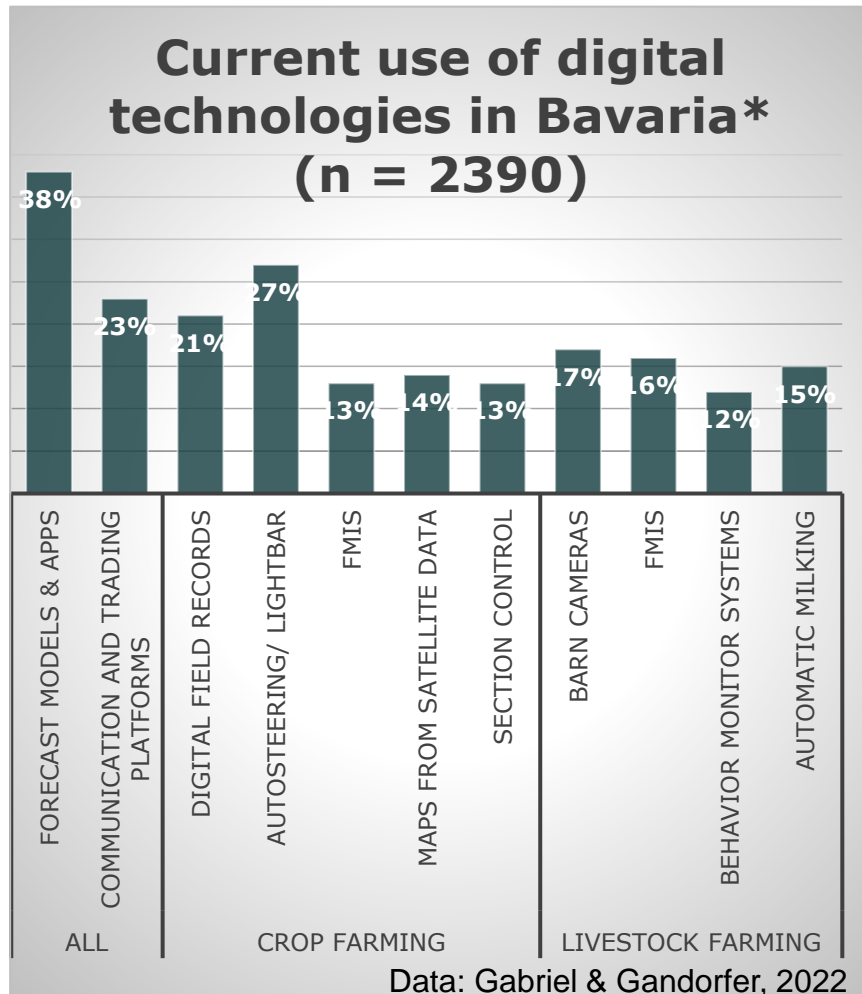


* Only technologies with more than 10 % adoption

Data: Gabriel & Gandorfer, 2022

Adoption data from Bavaria (Germany)

Survey with > 2000 farm responses



Technologies with less than 10 % adoption

- VR seeding
- VR fertilizer
- Yield mapping
- Drones
- Georeferenced soil mapping
- Fleet management
- Field robotics
- NIR sensors for crop quality

What are the drivers for adoption of digital tools in agriculture?

● Labor productivity

- Apparently the most effective driver (autosteering)

● Profitability

- Technology costs are typically high
- Cost savings from VRT often cannot cover the costs

● Robustness of models and algorithms

- Robust and reliable prescriptions (algorithms) for agricultural management are often not available or have drawbacks
 - optimal fertilizer rates are not known at the time of fertilizer application
 - Weed detection algorithms complex, robots slow

● Environmental effects

- Often claimed but seldom proved
- Without subsidies they have no effect on adoption

Which other technologies could have an impact in the future?

- Virtual fencing

- Animal husbandry at places, where humans cannot provide fences



www.nofence.no

Which other technologies could have an impact in the future?

- Robots
 - Swarm robots
 - Robots for weeding
- Currently of great interest in research
- Substantial barriers for diffusion because of safety issues



<https://www.fendt.com/int/xaver>

D4AgEcol

Start 01 Sept 22

DIGITALISATION FOR AGROECOLOGY

Fact Sheet

Objective

D4AgEcol will show the potentials of digitalisation as enabler for agroecological farming systems in Europe based on available knowledge and actors' and stakeholders' co-innovation capacity. Partners from seven countries across a wide spectrum of pedoclimatic zones in Europe will assemble a holistic evaluation of digital tools and technologies. This will be based on indicators for agroecology, economic considerations and investigations about perceived benefits for user and stakeholder. Drivers, barriers and risks of digital technologies for a transformation towards agroecology will be identified. The results of this analysis will feed in national and European roadmaps for agroecology, indicating the need for adjusted policies and a technology research and innovation agenda.

Fields of science

agricultural sciences > agriculture, forestry, and fisheries > agriculture

Programme(s)

HORIZON.2.6 - Food, Bioeconomy Natural Resources, Agriculture and Environment

MAIN PROGRAMME

HORIZON.2.6.3 - Agriculture, Forestry and Rural Areas

Topic(s)

HORIZON-CL6-2021-FARM2FORK-01-03 - Digitalisation as an enabler of agroecological farming systems



D4AgEcol

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DOI

10.3030/101080759

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End date

31 August 2025

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Germany

Conclusions

- Digitalisation offers chances and challenges for the agricultural sector
 - Disruptive development is not expected
 - Labour productivity and user friendliness are major drivers for adoption
 - Impacts on land use difficult to foresee
 - Environmental impact of digital tools not per se positive. Wise regulation might be reasonable.

Thank you for your attention!

Horizon Europe Project: Digitalisation as Enabler for Agroecology (D4AgEcol) check updates on www.atb-potsdam.de

References:

Lowenberg-DeBoer, Ericksen (2019): Setting the Record Straight on Precision Agriculture Adoption. *Agronomy Journal*

Gabriel, Gandorfer (2022): Adoption of digital technologies in agriculture – an inventory in a european small-scale farming region. *Precision Agriculture*