Robotics, automation and ICT solutions for profitable greenhouse business

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The importance of agriculture in The Netherlands

The Netherlands

2nd largest export country in the world

€80,7 billion

export agricultural products

©Wageningen Economic Research

Horticulture

Production value:
€22 billion

Added value:
€10,3 billion

Employment opportunities:
400.000 labour forces

65505

Companies in agriculture and horticulture

9%

g.n.p. generated by agriculture and horticulture

77%

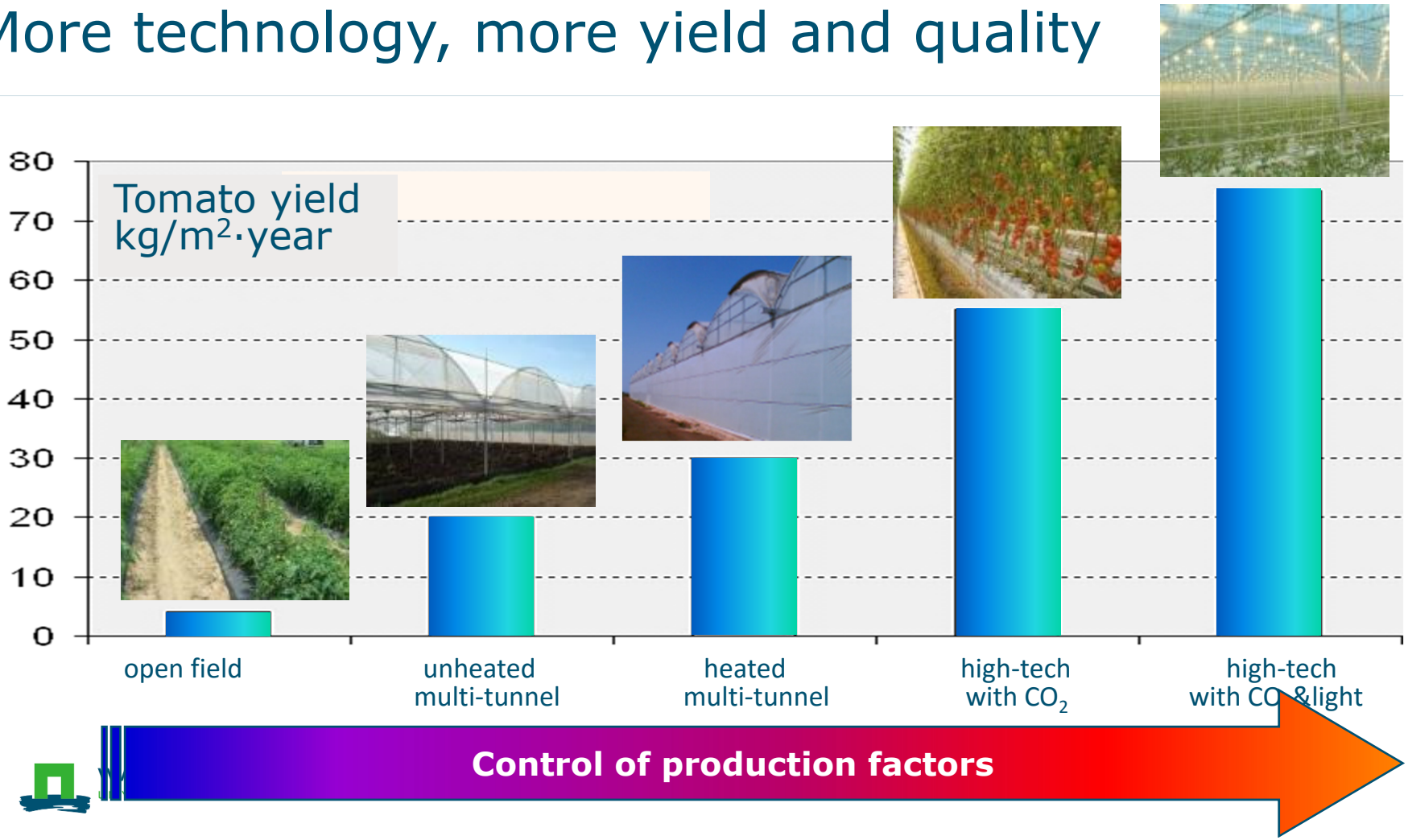
Export to other EU countries

8.8%

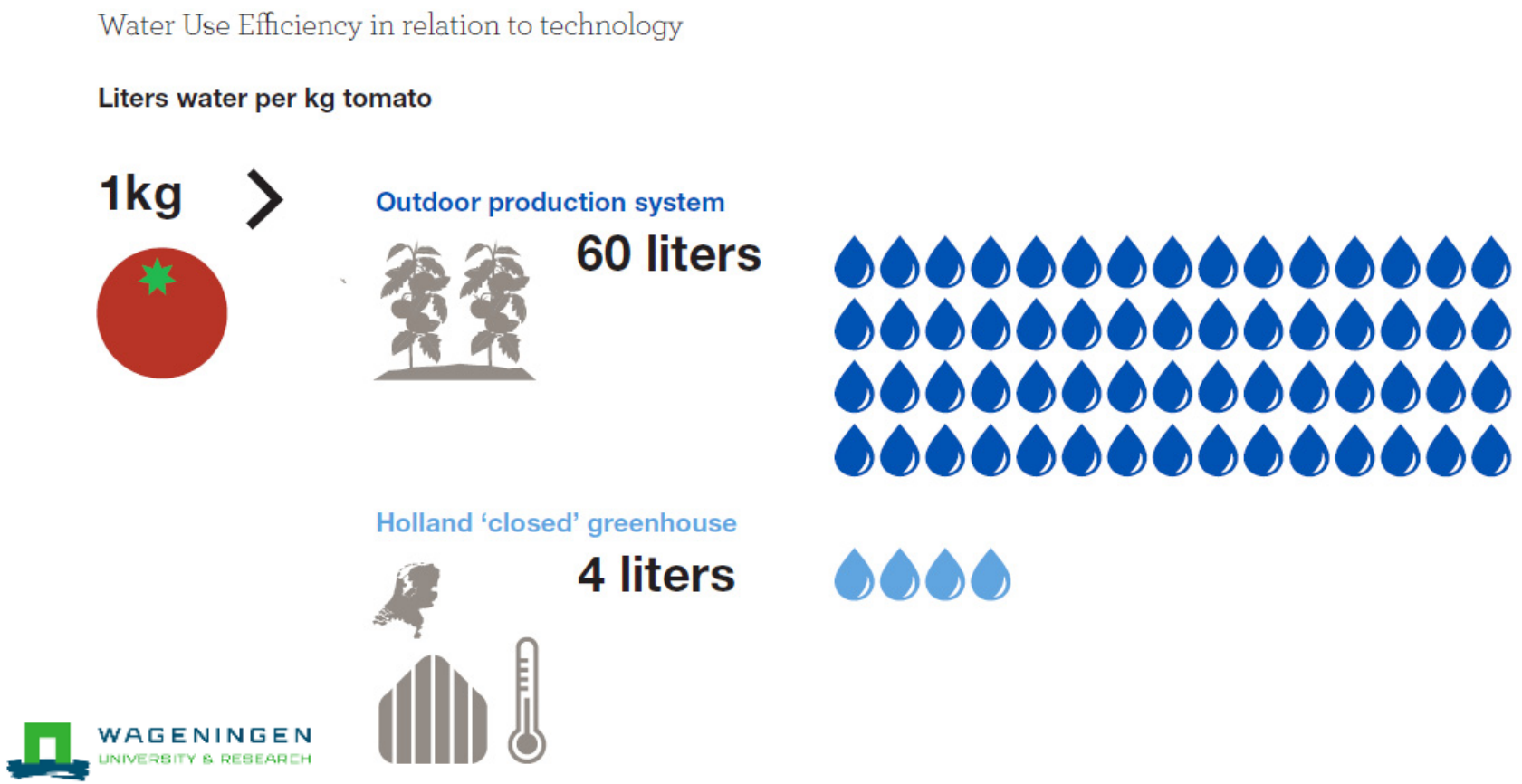
Employment in agriculture and horticulture

Sources: www.agrimatie.nl, www.topsectortu.nl,
Numbers are from the year 2014

More technology, more yield and quality



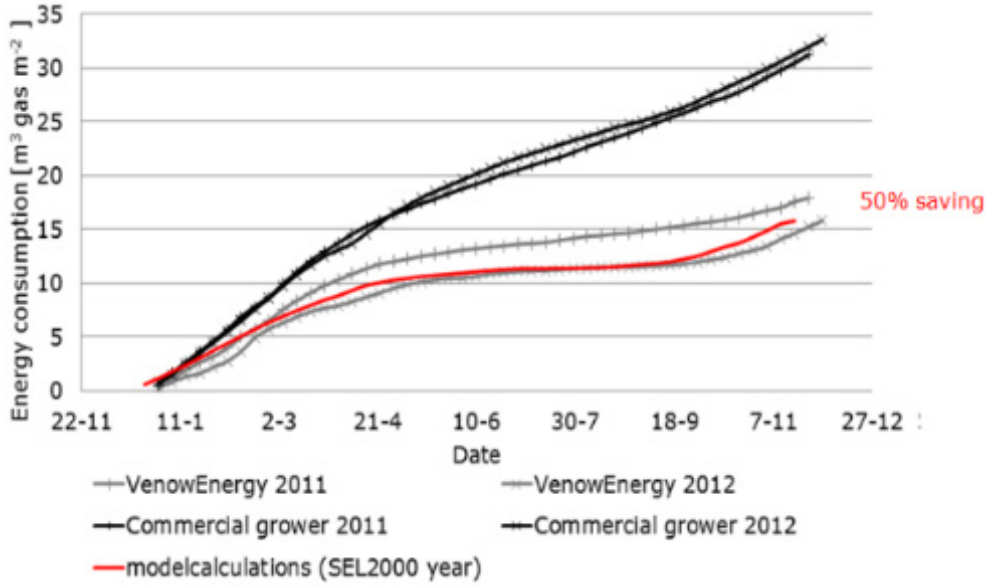
Greenhouse: 15 times better resource efficiency



Research project WUR: VenLowEnergykas

Greenhouse concept with highest energy saving and good tomato production.

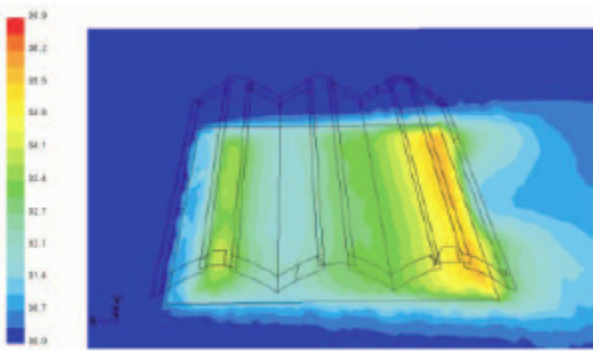
- Double glass with low u-value and high light transmission.
- Mechanical dehumidification with heat-regain.
- "Next Generation Cultivation Strategies" (climate control).
- Result: 50% energy saving.



maurice KASSENBOUW BV · BOAL SYSTEMEN · Climeco · solar glass · Scheuten · VenLowKas

Advanced ICT and Soft Sensors

- Wageningen University & Research is developing new generation intelligent sensors: soft sensors.
- Combine physiological measuring methods with model calculations.
- Reduce energy consumption and optimize plant production, reduce risk for pests and diseases.
- Help growers to optimize climate management.



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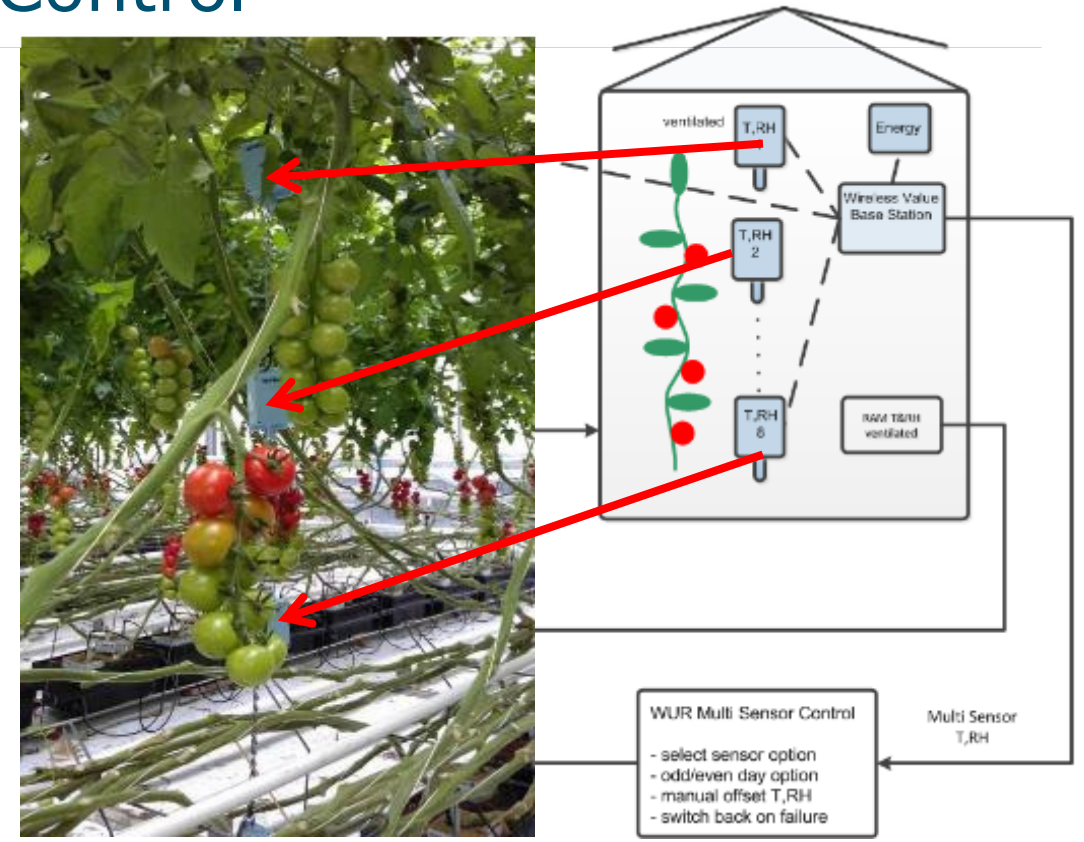
Wireless Dense Multi Sensor Networks in Greenhouse Climate Control

Measurement of environmental factors that can influence pests and diseases:

- Soil water content
- EC and pH in the soil
- Temperature
- Relative humidity



Balendonck and Janssen (2015)

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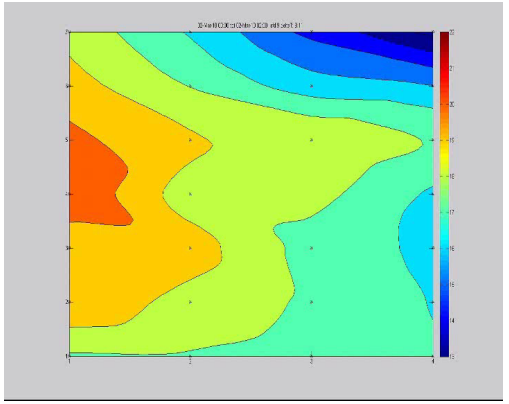
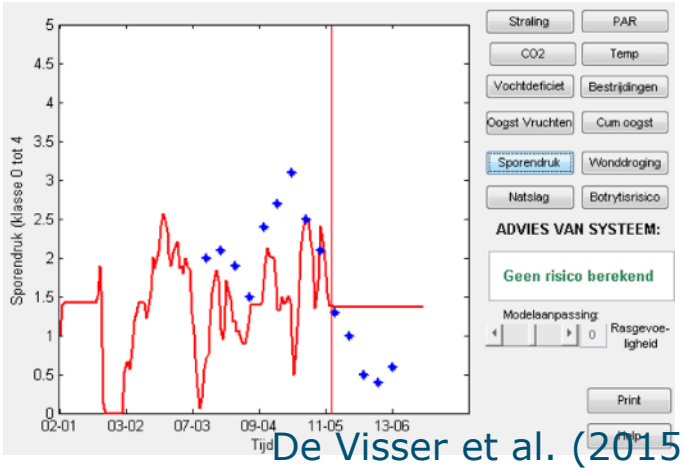
Results Sensor Networks and Real Time Models

- Higher humidity setpoint possible without risk on condensation.
- Energy reduction due to higher humidity setpoint.
- The climate can become more homogeneous.
- Real time models for risk analysis on fungi (e.g. the WUR Botrytis model) further improve the system.





De Visser et al. (2015)

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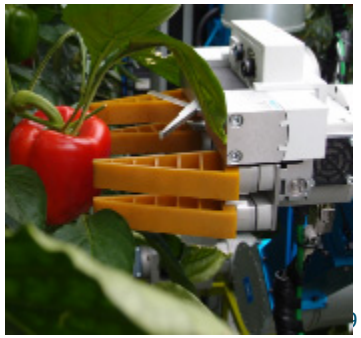
High demand for automation in agro & food

- Increasing labour costs.
- Shortage of skilled labour.
- Expanding production scale.
- Production chain shortens.
- Consumer demands guaranteed and constant quality.
- Increased hygiene, food safety, traceability demands.



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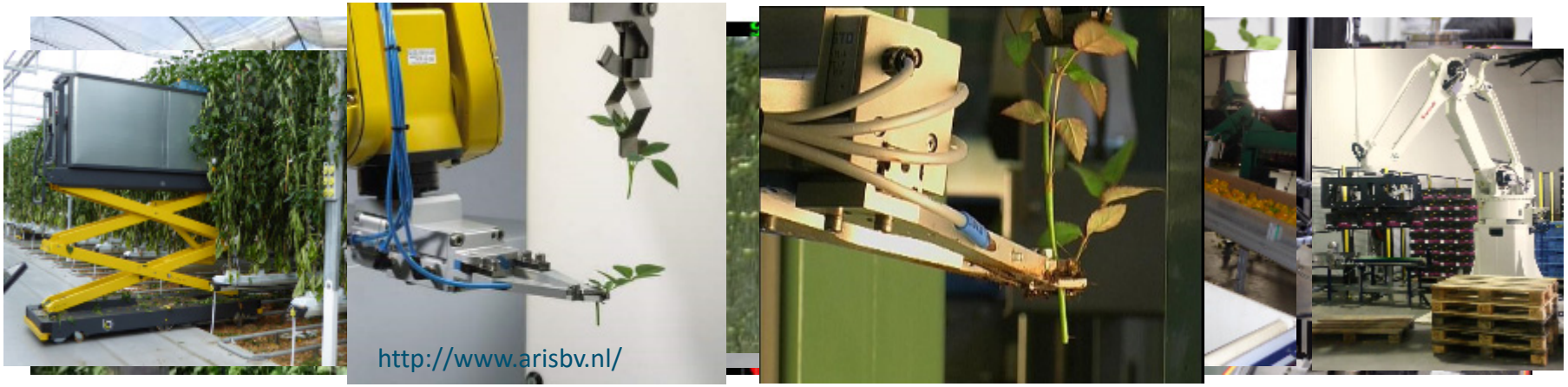
What is applied in practice already?

- Advanced logistics and autonomous transport in the greenhouse.
- Spraying robots.
- Machine vision based sorting systems.
- Cutting robots for the floriculture industry.
- Robotic harvesting of strawberries.
- Machine vision based intra-row weeding (outdoors).



Video high-throughput 3D seedling sorter

Video PicknPack project

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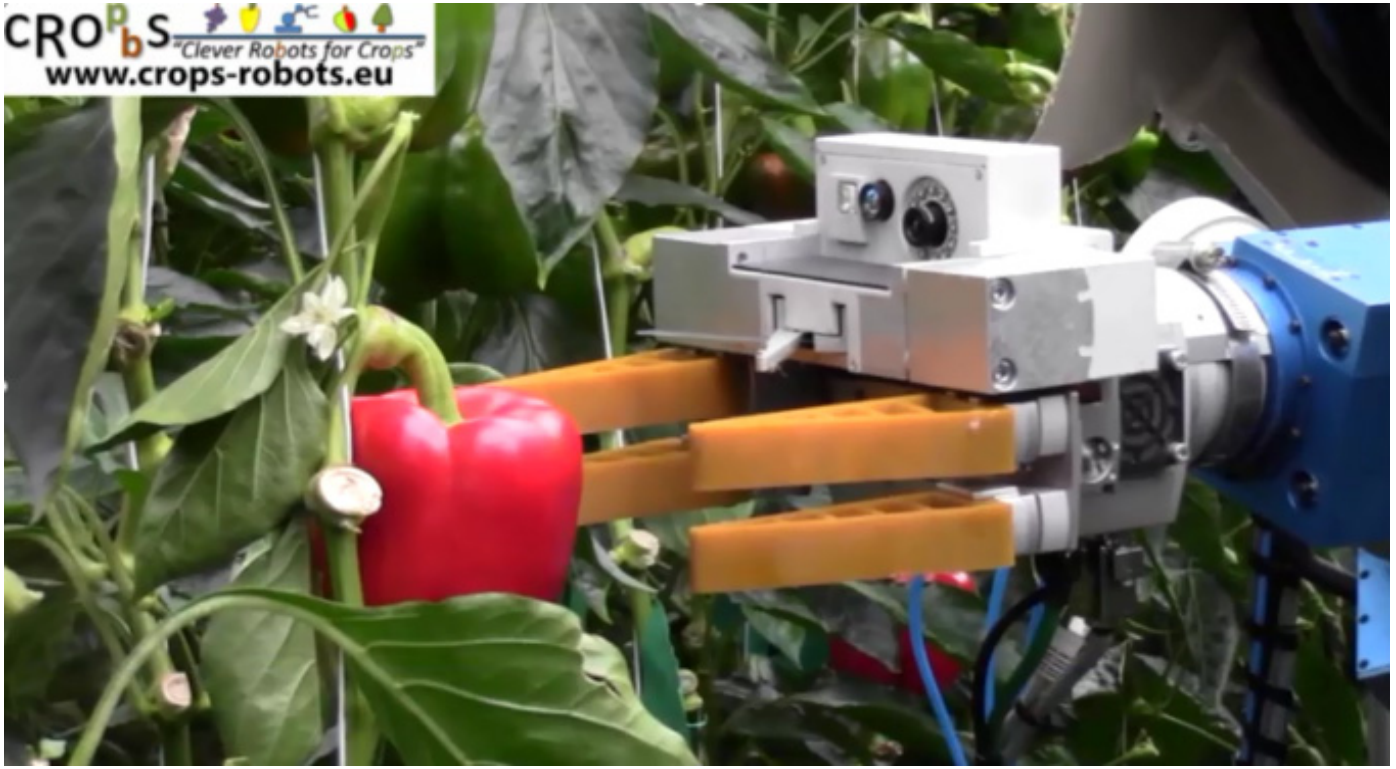
Video Clever Robots for Crops project



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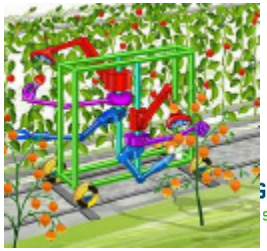
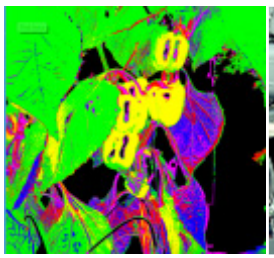
Conclusions

- The use of more technology results in more yield, better product quality, and much higher resource efficiency.
- With high-tech, greenhouse business is more profitable.
- Still more research is needed to make robots performing fast, simple and safe to use in horticultural practice.
- Rapid development in hardware, software and artificial intelligence will continue and even intensify in the future.
- Big players like Google and Facebook are pushing the development on relevant topics (autonomous navigation, big-data and AI).





Thank you for your attention

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