Farming technologies in Europe – Overview, their adoption and impact, and future perspectives

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2018 EU Agricultural Outlook Conference

Agriculture is facing some challenges

- Growing world population
  - Food (quantity, quality), fuel, fibres, chemical components, ...
- Growing scarcity of resources
  - Fertilizers (phosphate), fossil fuels, water, human labour, ...
- Growing impact on environment
  - Greenhouse gasses, acidification, chemicals, waste, eutrophication, diseases, ...

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Role of technology in agriculture

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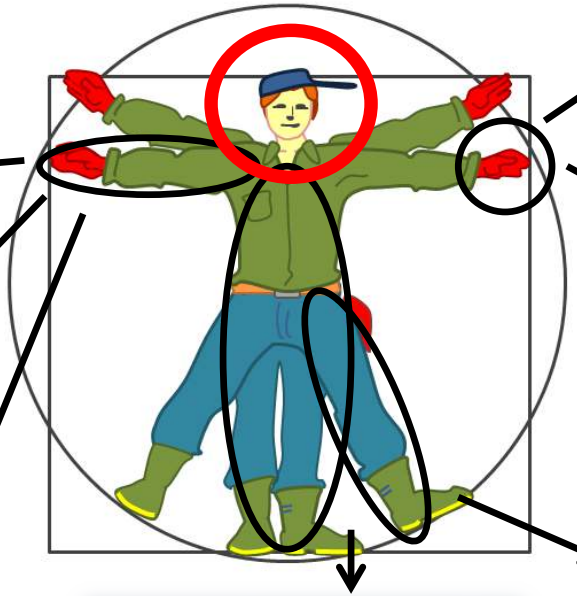
Current technology



Van Tuijl (2013) based on Da Vinci (ca. 1490)

Pedigree of (Precision) Agriculture Technologies

- Global Navigation Satellite Systems
- Guidance technologies
- Recording technologies
- Reacting technologies

Balafoutis, A., Beck, B., Fountas, S., Vangeyte, J., Wal, T. van der, Soto, I., Gomez-Barbero M., Barnes A. & Eory, V. (2017). Precision Agriculture Technologies Positively Contributing to GHG Emissions Mitigation, Farm Productivity and Economics. Sustainability, 9(8), 1339.

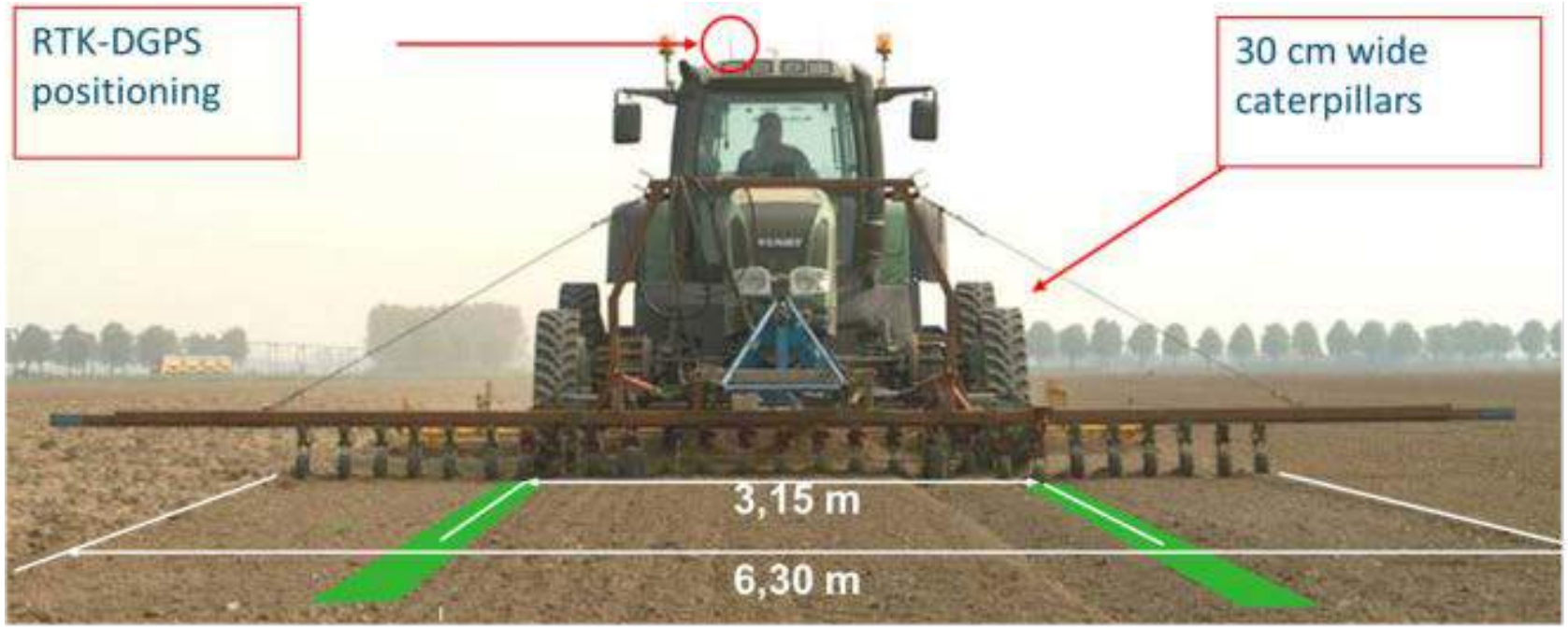
Intelligence in Agriculture Technologies

Decision making ⇢ Data & signal processing

Prediction ⇠ ‘World’ modelling

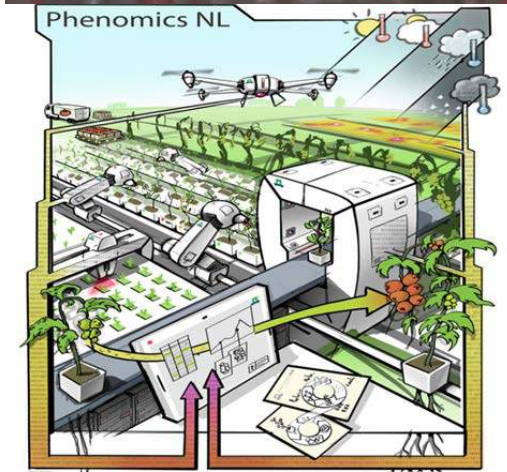
Van Henten & Van Mourik, 2018.

Guidance & navigation technologies (GNSS & CTF)

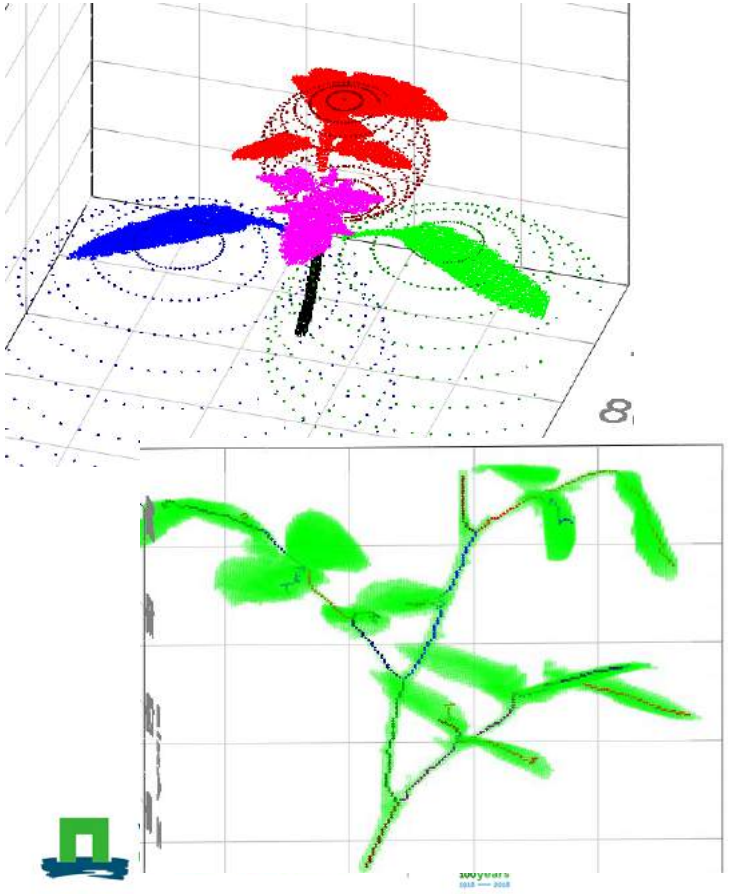


Recording technologies – wide array of sensors

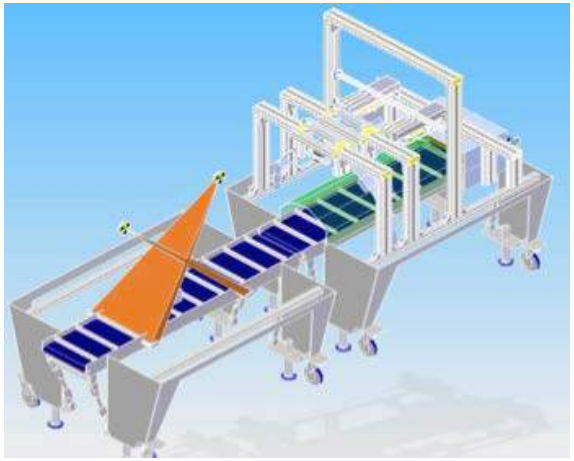
Animals, product, soil, crop/biomass, phenotyping

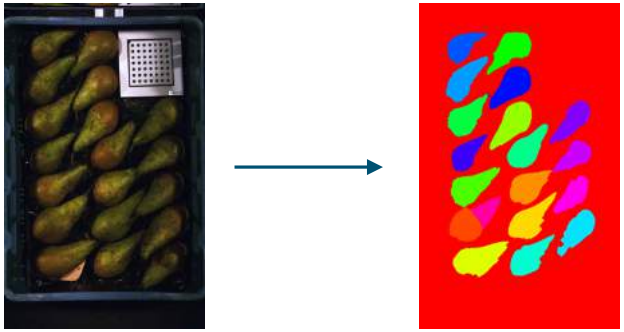


3D plant architecture



Food quality inspection

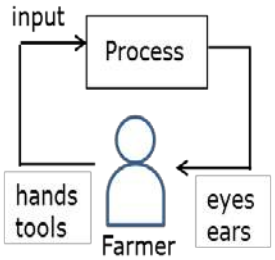




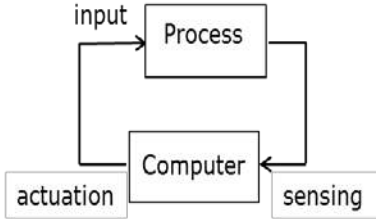
Models & decision support systems (DSS)

Utilize DNA information

Traditional farming system



Precision farming system



Big Data

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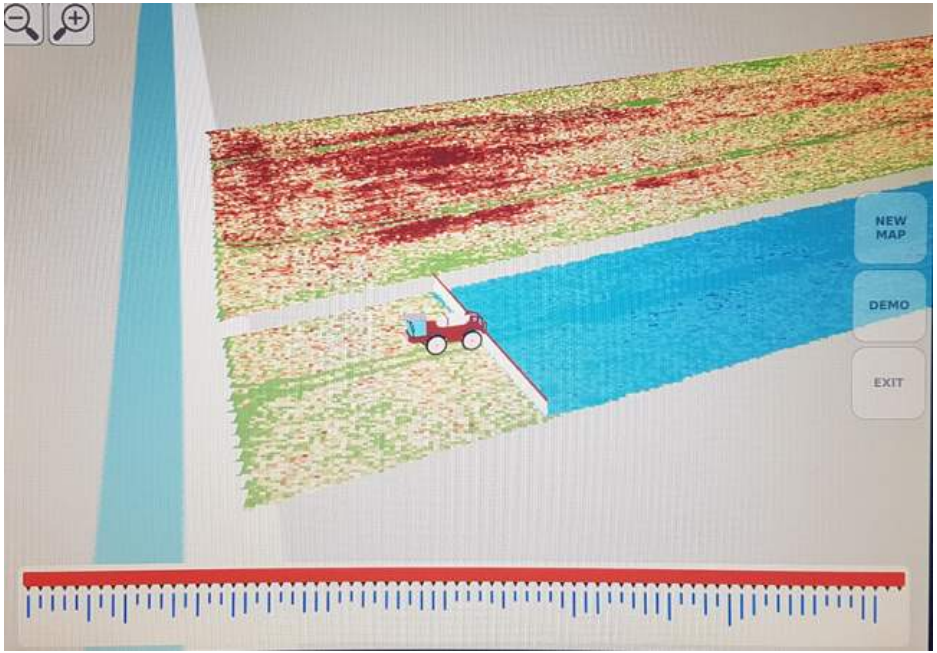
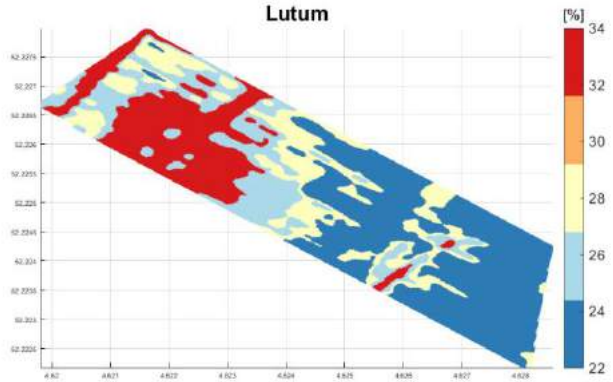
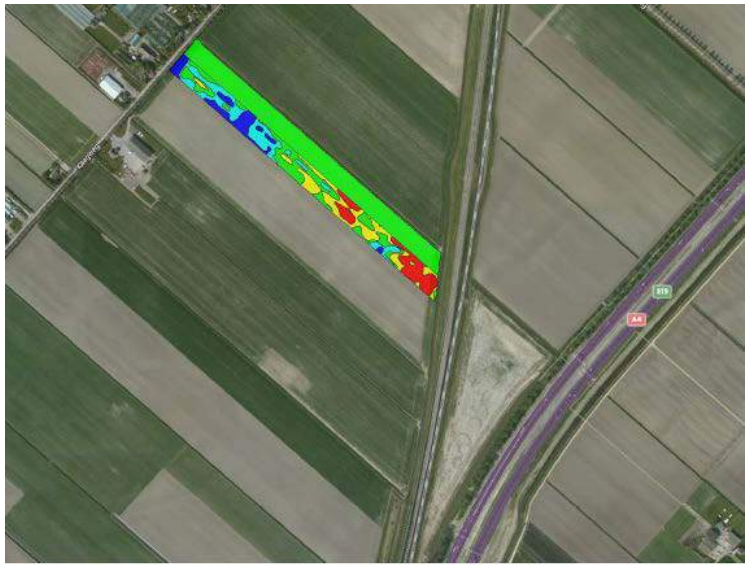
Reacting technologies
Dynamic Pulse system sprayer (by Agrifac)



Variable rate planting (density) of potatoes





Bayer - 2017 Aardappelen

planting distance mm

Client: < Unassigned Client >
Field: Bayer
Crop: 2017 Aardappelen
Name: VRA plant map
Date: 6-4-2017
Min: 240 mm
Max: 290 mm
Avg: 264 mm

290 mm
275 mm
260 mm
250 mm
240 mm

Full autonomous sweet peper harvesting robot

www.sweeper-robot.eu

Vision based precision weed control (Steketee)

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100years

AGRO FOOD ROBOTICS

Sweeper

European Commission

Impact of farming technologies: benefits

Farm economy

- Productivity (yield per ha/animal) & Product quality & Animal health
- Improved resource use, farm management & reporting
- Reduced costs (labour, management time)

Environment

- Losses & emissions - application of agrochemicals and nutrients
- Food chain traceability – information – license to produce
- Link plant and animal phenotypic expressions in practice to breeding

Godwin et al., 2003; Silva et al., 2011; Kindred et al., 2015; Smith et al., 2013; Eory et al., 2015; Schimmelpfennig, 2016

Main challenges in adoption of technologies

smartAKIS
Smart Farming Thematic Network

- Knowledge exchange & networking
- Reducing complexity in data presentation
- Turning data into useable information
- Access to finance
- Data-ownership & sharing

- www.smart-akis.com

EIP-AGRI thematic network SMART-AKIS
Dr. Spyros Fountas, Agricultural University of Athens
David Tinker, Tinker associates

Future farming?

Development of technologies & Precision Agriculture towards PA 3.0 & 4.0:

- More ‘on the go’ applications
- More and better sensing at high resolution
- Better decision making based on site specific data and models
- More robotics & autonomous machines
- Data sharing between farmers and chain partners

Future farming systems?

Redesign of systems –
Technologies that enable and cooperate with ecological principles

Roundel house for laying hens
- undisputed animal welfare

Mixed cropping systems -
diverse intensive agriculture

Thank you!

And thanks to contributors for this presentation:

Kees Lokhorst, Jos Balendonck Corné Kempenaar, Agro-Food robotics network, Eldert van Henten, Tamme van der Wal, Krijn Poppe, Yvette de Haas, David Tinker, Spyros Fountas

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