Future Farming Experience Tour

The technology challenges of future farming

ProAgrica – Global Future Farmering Summit - Wageningen November 7th 2018, Rick van de Zedde

Introduction

- Rick van de Zedde, 14 years at Wageningen University & Research.
  Senior scientist/ business developer Phenomics and Automation.
  Project coordinator NPEC @ WUR, plus: BD at program AgroFoodRobotics. Involved in: EPPN2020, IPPN and EMPHASIS-PREP.

- Background: Artificial Intelligence.
  Focus: computer vision/ robotics

- Aim of this presentation:
  To give insights and exchange ideas on future projects
Phenotypic plasticity

Mishra et al. BMC Plant Biology 2012, 12:6
Phenotyping – a multi-disciplinary domain

Data science
- Bioinformatics
- Statistics
- Big data
- Deep learning

Biology
- Physiology
- Breeding
- Botany
- Genetics

Phenotyping

Technology
- Artificial Intelligence
- High-tech infrastructure
- Computer vision
- Robotics
The need for the next green revolution

Discussion points:

- What are the driving forces to consider automation in agriculture? [link](#)
Autonomous Greenhouse Challenge

- www.autonomousgreenhouses.com
- To put in your agenda; Dec 12th in Den Bosch (NL) - outcome of the Autonomous Greenhouse challenge at the AgriFoodTech Fair.
Genotype ≠ phenotype

Genotype + Environment = Phenotype
**Strong industrial network**

**Breeding companies**
- Royal Van Zanten
- Eminent
- Limagrain
- Döhmen Orange
- Anthura
- Averis Seeds
- Takii
- Plantum

**Agro Tech companies**
- FME
- Ecostyle
- incotec
- Koppert
- PHC
- SOILTECH

**Wageningen University & Research**
NPEC climate room building (HTP)
Phenovator: Improved photosynthesis

Access offered by:
Mark Aarts (WUR)

Natural variation of YELLOW SEEDLING affects photosynthetic acclimation of Arabidopsis thaliana

Mark Aarts, Jeremy Harbinson, Fred van Eeuwijk
Impression NPEC greenhouse

Image by: Francois Tardieu (INRA)

EU-project Sweeper – pepper harvesting
Discussion point:

- World-wide increase of people?  
  [Link]
Wageningen – Way of working

Fundamental research
Applied Research
Prototypes/demonstrators
Value generation/spin-offs

National Science Organisation (NWO)/EU funding
Public-private partnerships
Bilateral contract research

Knowledge Push
Market Pull

Industry
Wageningen Research: Contract research organisation
Wageningen University

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PlantSampler robot for DNA analysis

Franck Golbach, Lydia Meesters, Rick van de Zedde, Gerwoud Otten
Discussion point:

- Wizards together with prophets. More with less?  
  Link

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**Punching above its weight**

The tiny Netherlands has become an agricultural powerhouse—the second largest global exporter of food by dollar value after the U.S.—with only a fraction of the land available to other countries. How has it achieved this? By using the world’s most efficient agricultural technologies.
More with less

Growing under glass
Dutch horticulture relies heavily on greenhouses, allowing farmers to closely control growing conditions and use fewer resources like water and fertilizer.

Change from 2003-2014
Vegetable production \( \uparrow \) 28%
Energy used* \( \downarrow \) 6%
Pesticides \( \downarrow \) 9%
Fertilizer \( \downarrow \) 20%

*Latest available data (2012)

Greenhouses in Netherlands
36 square miles

Area of Manhattan
23 square miles

JASON TREAT, NGM STAFF: KELSEY NOWAKOWSKI. SOURCES: FAOSTAT; ARJEN HOEKSTRA, UNIVERSITY OF TWENTE; STATISTICS NETHERLANDS (CBS)
Impression NPEC Field
Summing up / future work

Our mission:
To measure, understand and predict plant quality developments in climate rooms, greenhouses and on fields!

- Ultra fast indoor phenotyping applications
- Vision-guided robotics (sampling/ harvesting)
- Mobile field phenotyping systems
- Link phenotyping and precision agriculture tools

NB: Our different backgrounds:
let’s explore collaboration!

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- Corne Kempenaar – Akkerweb
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- Henk Kramer – UAVs / GIS

Plus industrial partners:
- WPK (E vd Arend)
- IsoGroup (W. vd Meyden)
- Agrifirm (A. Venhuizen)

And many others!

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Thank you!

Questions?

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www.phenomics.nl