



Insights from the corporate world

## Innovation Trend “Smart Farming”

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**Innovationstrend „Smart-Farming“  
aus Sicht von Landtechnikherstellern**



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# Our Grand Challenges

**Food (protein)  
security**

**Climate action  
& environment  
(GHG)**

**Sustainability**

**Technology  
needs**

**Precise Automation  
& Autonomy**

**Producing more  
with less**

**Derived  
Guiding  
Principles**

**Independence**



# Automated Driving



# Why don't we have autonomous machines?



**Change of paradigm to be expected**

⇒ **Because of safety/legal issues**

- But driverless machines are the safest machines on the road. The driver is the most serious safety hazard.

⇒ **Because of a lack of functional stability**

- Example: So long as there might be a pick-up (trailer) plugging a (service) person will be needed

*Automation will have to „attack“ that gap  
zero defect operation / disturbance management*



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# Electrification - Key Enabling Technology

- Efficiency
- Controllability and dynamic response behaviour

# John Deere ExactEmerge

## Electric system characteristics

- 2 servo-motors per row unit

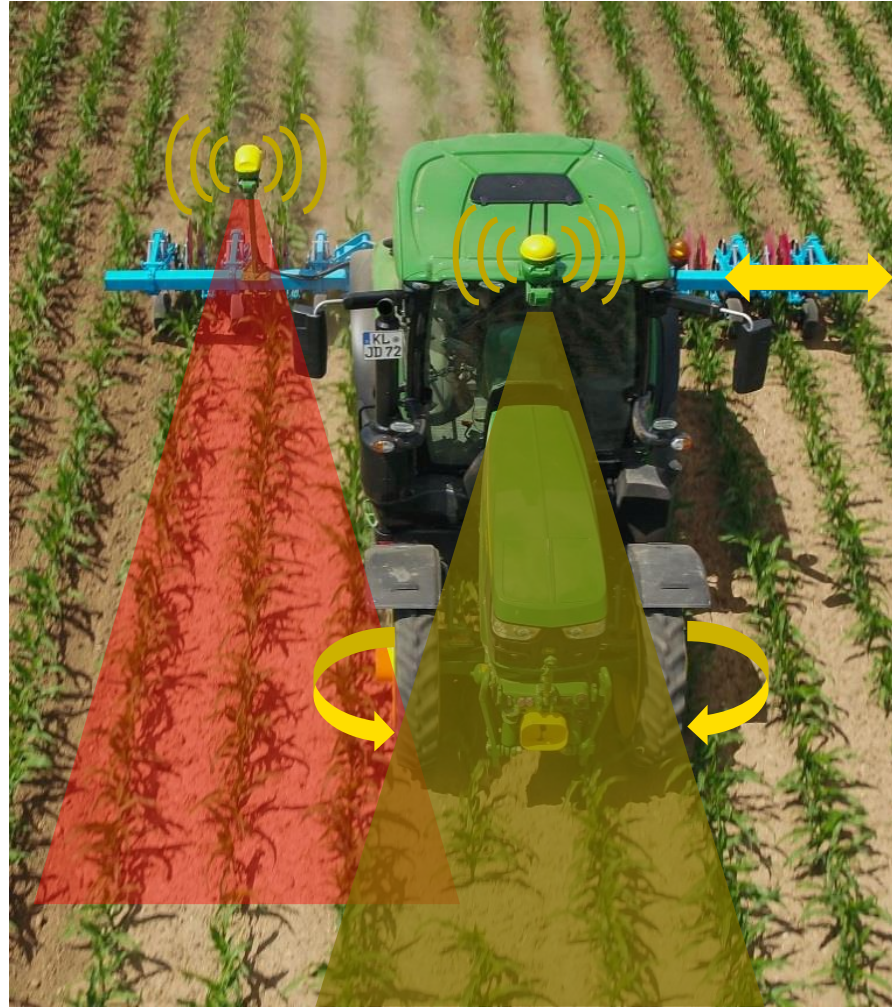
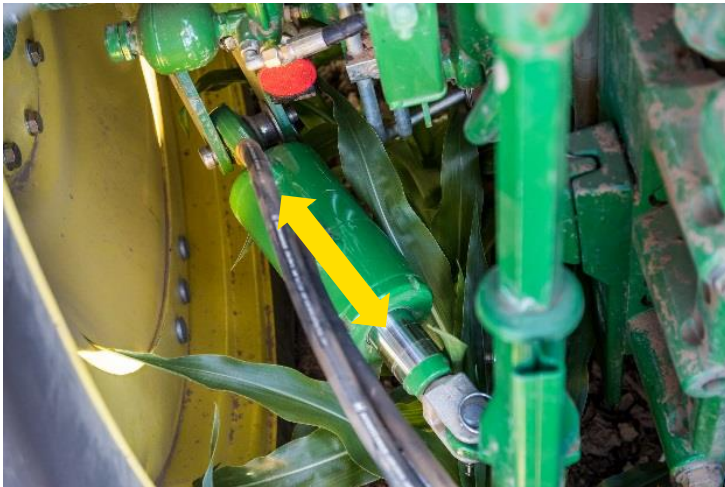




# Tractor Integrated Active Implement Guidance

## Steering Tractor & Cultivator precisely

Detecting Crop Rows  
Calculating Offset to Plants  
Guiding Tractor & Cultivator



Required Sensor

Optional Sensor

Maximize Weeding Success  
Minimize Plant Losses





- Precise Seed Placement
- GNSS receiver development
- Satellite communication



# Electrification - Key Enabling Technology

- Efficiency
- Controllability and dynamic response behaviour
- Using Renewable Energy



# Vision

## Decentralized Energy Supply in Rural Areas



2009



?

**LIB-Off Road**  
intern  
12kWh

**eTour/econnect**  
extern  
50kWh

**BatteryBoost**  
extern  
105kW el. power  
35kWh

**SESAM Tractor**  
full electric  
130kW el. power  
130kWh





# SESAM-Tractor



# Sowjet Tractors until 1950s





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**Smart IoT integration**

**Producing more  
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# Current Automation Story

Crop Protection  
with

## Pesticide Application Manager (PAM)

Funded by



Federal Ministry  
of Education  
and Research

Based on a decision of the  
German Parliament

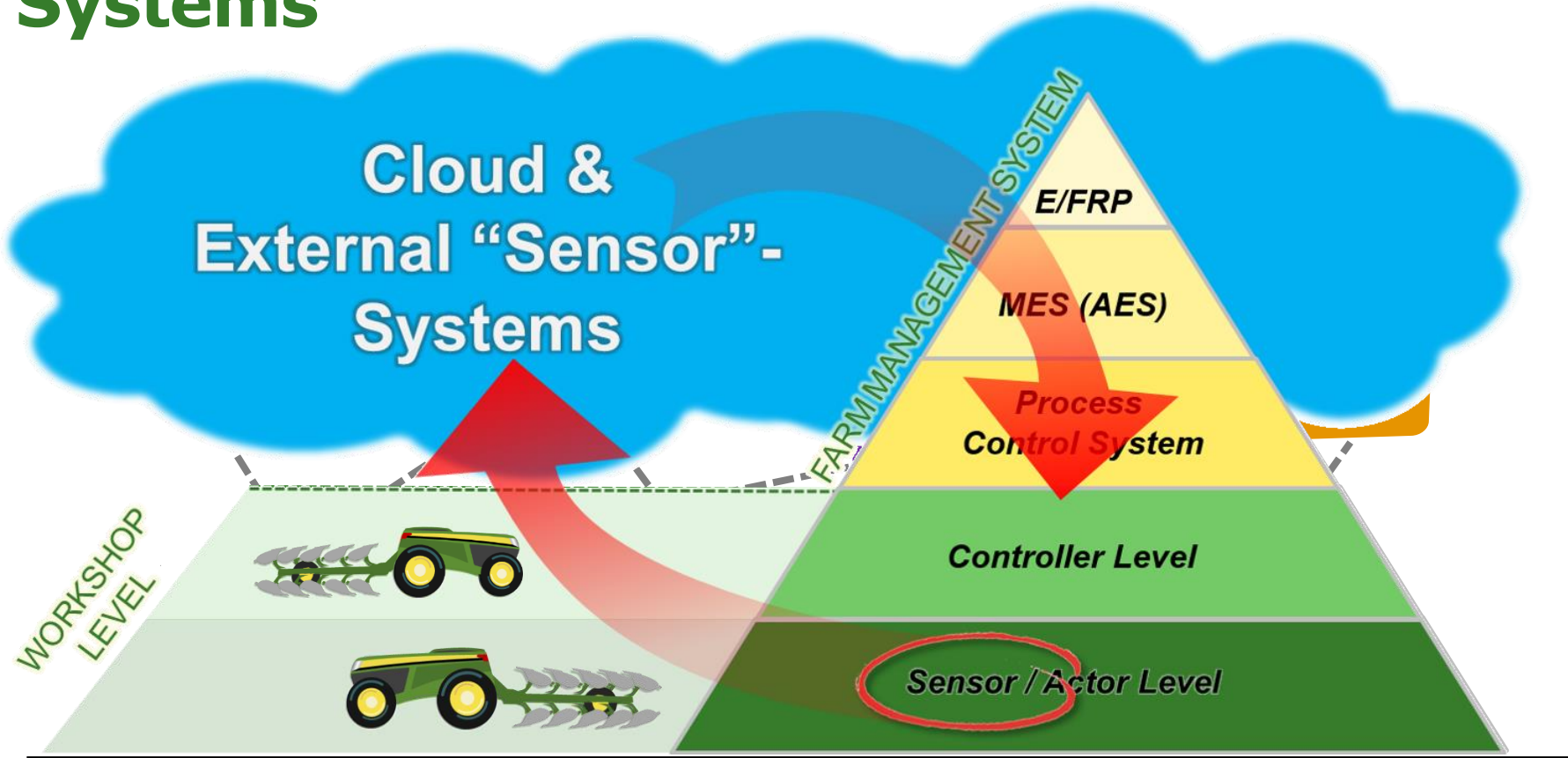




# MyFieldConnect



# Future Systems



## Adaptive Agricultural Production Systems becoming part of

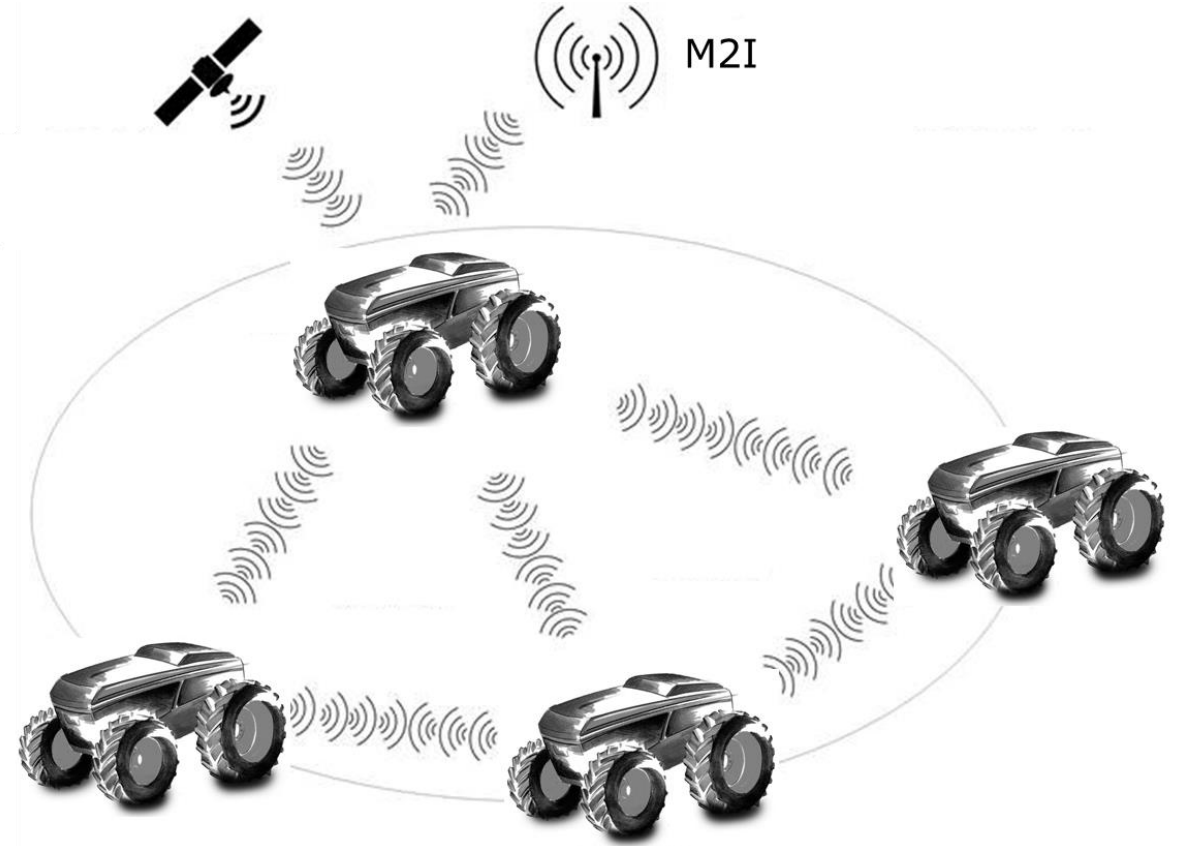
- Technical intelligence (self-optimization)
- Self-organizing dynamic networks
- Distributed Mesh-Adaptive Service Architecture



# Automation enabler

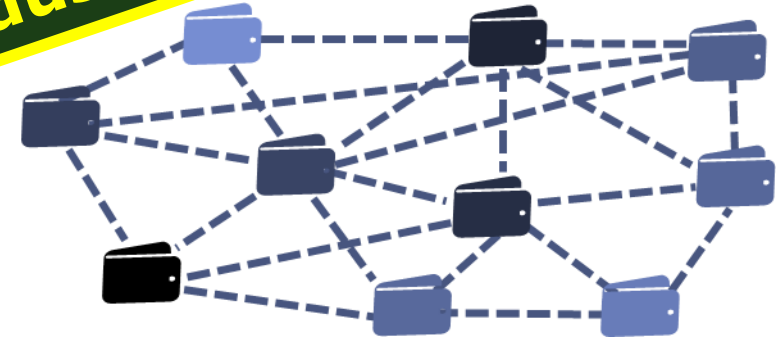
## Connectivity

- Internet of things, communication between everything
- Introduction 5G standards
- Extended positioning services
- Digital villages
- Secure farming



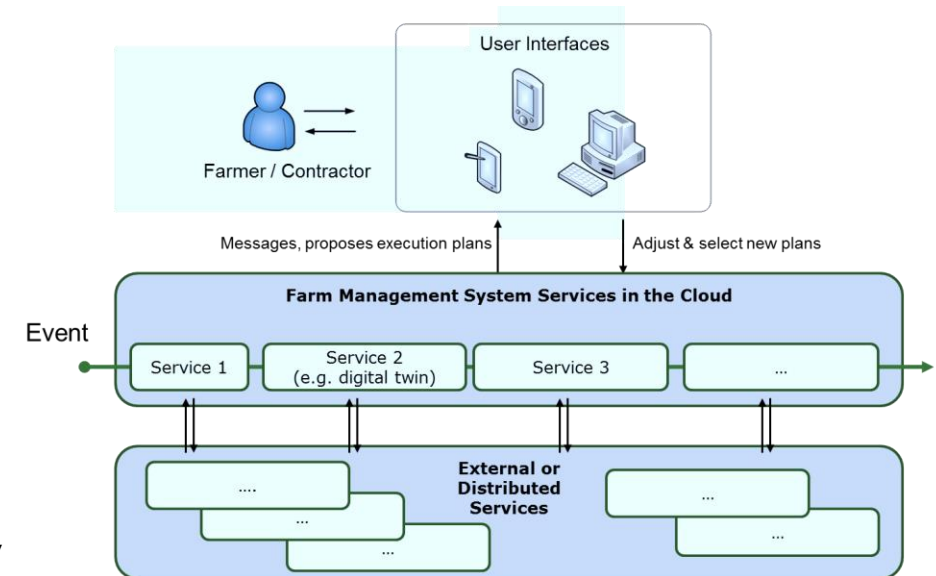
# Trends

**These are visions comparable to Industry 4.0**



## Digital Transformation in farming – deliverables:

- Traceability (agricultural product information in blockchains)
- Decision support systems will be replaced by Farm Management Information Systems
- Robotics in agricultural production chains
- Holistic farm models (e.g. digital farm twins), process information and evaluation including AI for imagery and sensors





# Quotation of a Grandfather of Agricultural Engineering

**Albrecht D. Thaer wollte, ...**

**dass man die „die Landwirtschaft als eine Fabrik, aber als eine sehr verwickelte Fabrik [betrachtet] und bei ihrer Betreibung alle Regeln [unterlegt], worauf der glückliche Erfolg der Fabriken beruhet.“**

**Qutotation from 1801 / Zitat von 1801**

*Agriculture shall be done in a way as if being an industrial manufacturing system, considering the processes of complex industrial production which have to be applied similarly to achieve the same fruitful success as the healthy manufacturing enterprises have*



Bild: Humboldt-Universität zu Berlin,  
Universitätsbibliothek



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