Smart automation smart farming: the challenges of Digitalization and Big Data from the John Deere Perspective

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Content

- Challenges for Agriculture
- The Journey of Integrated Solutions
- How did we succeed?
- Cloud-based Connectivity / Farming 4.0
- Summary
Challenges for Agriculture
Challenges for Farming Industry

- Limited Resources
  - Land
  - Water
  - Nutrients
  - People
- Population
  - Growth
  - Diet

Digitalization (Smart Farming)
Guiding Principles for Agricultural Technology

More with less

Independence
Agricultural Technologies

Megatrends?

- Sustainability
- Automation and autonomous operation
- Reliability
Digitalization / Smart Farming

Use of modern automation and information technology to increase the productivity and efficiency of modern farming in a sustainable way with minimal impact on the environment.
The Journey of Integrated Solutions
The Journey of Integrated Solutions

1. Product
2. Smart Product
3. Smart, Connected Product
4. Product System
5. System of Systems

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Telemetry as Basis for Smart Digital Farming
• Sustainability
• Automation and autonomous operation
• Reliability
• Electrification?
Why Electrification?

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

John Deere High-power electric tractor (SESAM)
Agricultural Technologies

Megatrends?

- Sustainability
- Automation and autonomous operation
- Reliability
- Electrification
- Internet of (almost every)thing(s) and services
How did we succeed?
Adaptive Agricultural Production Systems providing
• technical intelligence (such as self optimisation)
• self reconfiguration
• defect compensation / zero defect operation
Dispatcher is informed about approaching thunderstorm and can trigger new optimization criteria.

Central system calculates routing on field and road.

Vehicles “order” fuel, spare parts, transfer trailers.

Source: Hahn (modified)
Operation Center

User Interfaces

Farmer / Contractor

Messages, proposes execution plans

Adjust & select new plans

Farm Management System Services in the Cloud

Event

Service 1

Service 2

Service 3

...

External or Distributed Services

Event System

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Current framework for IoT as a standardization point of view

- There are already more than 600 closely related standards in the IoT area

- It is essential to first clearly map all relevant standards to help manufacturers of agriculture equipment and innovators and standard setters navigate this complexity

⇒ The agriculture sector has already done this effort
IoT SDOs and Alliances Landscape (Vertical and Horizontal Domains)

Source: AIOTI WG3 (IoT Standardisation) – Release 2.5
Welcome to AEF

The AEF wishes to provide the necessary resources and appropriate know-how so that important technical challenges concerning electronic and electrical systems in agricultural technology and farming can be jointly addressed by the industry. Initially, a succession of important tasks associated with ISOBUS formed the main focus of their work.

But now the agricultural industry no longer sees the potential of AEF as limited only to ISOBUS. Their work is therefore being expanded to include other important areas such as electric drives and camera systems.

http://www.aef-online.org
Example of inter-connectivity

- https://www.youtube.com/watch?v=oRHsJQElpys

“Plug and play”- implement connectivity
Cloud-based Connectivity

Farming 4.0
Cloud-based Connectivity

MTG in base machine since 2012
> > 100,000 Ag machines with cellular modem

6030 & 6R Tractors
7050, 7080 Forage Harvesters
R4030, R4038, 4630, 4730, 4830 Sprayers

7030 & 7R Tractors
8030 & 8R/RT Tractors
4940

S, T, W Series Combines
7050, 7080 Forage Harvesters
9030 & 9R/RT Tractors
7760 Cotton Picker
W235 Windrower
MyJohnDeere Operation Center

MyMachineConnect
Machine & Fleet Monitoring

MyJobConnect
Operator & Job Management

MyFieldConnect
Plan/Analyze/Interpret

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Cloud-based Connectivity Through API Standardization

Value Chain Partners

- Seed
- Chemicals
- Weather
- Consultants
- Food
- Processors
- Food Retailers

John Deere Dealers

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Precision farming mottos for John Deere

• Precision Farming and, in particular, Smart Farming, requires compelling multidisciplinary cooperation between different disciplines

• John Deere will be a successful player in Precision Farming-based agricultural production systems in the future

• **Precision Farming** not only contributes to efficiency and efficiency, but also to *increasing social acceptance of agricultural production*

• Technology within in precision farming must not be self-sufficient in precision farming, but **technical possibilities** must be aligned with human needs and heterogeneous process requirements
Summary

• Digitalization in agriculture will play a key role to address the needs for food of our growing population in a sustainable way

• We are already in the middle of the digitalization of Agricultural machinery

• Safety and security have to be properly addressed

• More and more players provide services and offer big data based prescriptions. This will foster the adoption of smart farming

• Smart Farming can only be successful with cloud-based seamless data exchange and partnering of the companies in the value chain
Questions?