Data driven Agriculture and Connected Machines

Technical, Legislation and Liability Challenges

Presenter: Peter van der Vlugt, AEF Chairman, GM of Kubota’s Innovation Center Europe

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About the Presenter

- General Manager of *Kubota* Innovation Center Europe
- Founding member and current Chairman of *AEF*
- Grown up on a farm with contracting business
- Electronics- and Software Engineering background
- 25+ years of experience in Smart Farming and Precision Agriculture
Content

- Introduction to Kubota and AEF
- Interoperability in Data Communication
- Precision Agriculture
- Digitalization in the Ag Industry
- Challenges in Data driven Agriculture
- Summary
Company Key Figures and Kubota’s Food, Water, Environment loop

- **Europe**
  - Consolidated companies: 42
  - Employees: 3,958

- **Japan**
  - Consolidated companies: 59
  - Employees: 22,726

- **North America**
  - Consolidated companies: 35
  - Employees: 5,542

- **Asia**
  - Consolidated companies: 41
  - Employees: 8,417

- **Other**
  - Consolidated companies: 10
  - Employees: 384

**Total number of consolidated companies**: 188

**Total number of employees**: 41,605

**Overseas revenue ratio**: 67.9% (as of December 31, 2020)

- **Food**
  - Contributing to the abundant and stable production of food by streamlining of agriculture.

- **Water**
  - Contributing to supply and to restore reliable water by enhancing water infrastructures.

- **Environment**
  - Contributing to create and preserve a comfortable living environment by enhancing social infrastructures.
Kubota Introduction

- Portfolio at a glance

**Farm & Industrial Machinery**
- Agriculture
- Construction Machinery
- Engines
- Weighing & Measuring Control Systems

**Water & Environment**
- Ductile Iron Pipes
- Environmental Equipment & Plant Engineering
- Materials
Industry collaboration through AEF

- **Agricultural Industry Electronics Foundation**
  - Founded in 2008, as German e.V.
  - Worldwide agreements on the implementation of Data Standards and Data Exchange
  - 8 Core Members, 3 associations, and more than 220 General Members
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An interoperable environment facilitates the correct data transfer and optimizes the working process
Typical Multi-Brand System

OEM’s interest in data;
• Machine performance data
• Diagnostics data (troubleshooting)
• **Fleet Management data**

Farmer’s interest in data;
• OEM’s/Dealer support
• Farm/Field related data
• **Fleet Management data**
Data exchange standards are key to manage Data Interoperability

- ISOBUS Data Model ISOXML (ISO11783-10)
- AEF developed data transmission system EFDI (Extended FMIS Data Interface)
- Key factor: Manufacturers to support the standard (too many proprietary usage still)
- AEF as organization plays a coordinating and driving role
AEF Conformance Test & AEF Database

www.aef-isobus-database.org
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Precision Agriculture

➔ In the field, we can achieve a precision of ~2-3 centimeter
➔ Sensors, Actuators and RTK-GPS systems play a crucial role in the accuracy
Kubota’s Precision Farming portfolio

- ‘Digitalized’ Smart Agriculture equipment contributing to sustainable Precision Agriculture
What if Multi branded sensor, data, AI algorithms and machines or robots are combined as one eco-system?
Ag Equipment as part of the Digital Eco-System

Source: CEMA - 2017

* FMIS = Farm Management Information System
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“DIGITALIZATION TRANSFORMS HOW WE DO BUSINESS NOW”
Sources:
PA Consulting 2015

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Independent IoT/Sensor platforms

Equipment Manufacturer platforms

Equipment Manufacturer platforms

Equipment Manufacturer platforms

FMIS Software

Robotic platforms

Advisors, Agronomy services

Satellite or Drone images

Weather forecast

External services; Legislation, Authorities, Reporting……

Seeds, Chemicals, Fertilizers etc

Data Banks?

API X

API A, B, C……

Web service

Web service
Complexity due to many players

- Farmers/growers
- Software developers
- Agronomists
- Ag-Machinery manufacturers
- Dealers, warehouses
- Consulting companies
- Governments
- Producers of ag-products
- Financial companies, investors
- Service-, cloud-, security-, database providers
- Organizations like AEF or AgGateway
- Big digital platforms like Google or Amazon

Digital transformation of Agri-Food in 4 areas

3. Public decision-making

4. Science & Technology

Blockchain Technology

Linked Data

Big Data Analytics

Smart Sensing & monitoring

Cloud Computing

Internet of Things

Artificial Intelligence

1. Decision-Making

Business/Consumers

2. Food Integrity

Smart Control

3. Public decision-making

Food Safety

Environment

Nutrition

Climate

Health

Food Security

Smart Analysis & Planning

Smart Sensing & monitoring

Smart Control

Digital transformation of Agri-Food in 4 areas

Different areas have/require different data-platforms

1. Business Decision-Making
2. Food Integrity
3. Public Decision-making
4. Science & Technology
5. Farmer’s Platform?

- Big + Small AgTech providers
- Big Food Companies
- Public Administrations
- Research Organizations

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For OEM’s: Safety, Security and Liability comes first!

The Challenge of a Multi-brand Automation system

Every manufacturer is responsible for safety of operators and bystanders!

Ensure that only “trusted” equipment works together in a Secure Architecture

Who is responsible for injuries caused by a Multi-brand Automated system?

Functional Safety  Security  Liability

Every manufacturer is responsible for safety of operators and bystanders!

Who is responsible for injuries caused by a Multi-brand Automated system?

Ensure that only “trusted” equipment works together in a Secure Architecture

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OEM’s create their own “Firewall”

- So we create Secure and Safely Connected machines to own Portal

  - A global OEM ‘Firewall’ around own connected machines
  - Secure and safe communication due to possible Liability

→ Manufacturer is the first responsible
→ No 3rd party connections directly into machines
→ External connections only through Cloud API’s

(API=Application Programming Interface)
Many Challenges still to be tackled, just some thoughts

- Digital Business models versus traditional sales/distribution of OEM
- Business models and Monetization for the Growers?
- From an OEM perspective only validated/certified input controls to our machines will be accepted
- Who is liable when there is Crop Loss? Usually claimed to the OEM, that’s the machine executing the work ‘visibly’…
- What is the overall quality of Data used?
- Who is the originator of the Data used?
- How old is the Data used?
- Who certifies or checks AI Algorithms?
- The Data eco-system is as weak as the weakest data source!

➔ Do we need a ‘Data Black Box’ so everything can be traced back from the data eco-system?
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- The Ag Machinery Industry has Standards and Data Models in place and will continue to push the legacy of **Safe** and **Secure** connected Ag Machines
- **Interoperability** and Data **standards** are key to optimize field and machine operations in order to perform Precision Agriculture through Digitalization
- Multi vendor/manufacturer driven **Data eco-systems** challenge all manufacturers Technically, Legally, and through Interoperability and Legislations. **But what if something goes wrong?**
Thank you for your attention