



**IOTWeek**

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# **IOT DEPLOYMENT & BUSINESS CHALLENGES**

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WHAT LIES AHEAD IN THE AGRIFOOD SECTOR?



**BERLIN THINKING**  
DIGITAL FUTURE CONSULTING



| AUDIENCE INVOLVEMENT

# JOIN THE DISCUSSION



Go to  
[www.menti.com](https://www.menti.com)

Use this code  
**13 79 40**

A black and white portrait of a man with a full beard and mustache, looking directly at the camera. The image is partially obscured by a dark grey vertical bar on the right side, which contains the text.

**IoTWeek**

**GRIGORIS  
CHATZIKOSTAS**

Use-case Lead at IoF2020

Head of Business Development at BioSense Institute

A grayscale portrait of Harald Sundmaeker, a man with glasses, wearing a suit and tie. The image is slightly blurred and has a dark, moody tone. The text is overlaid on the right side of the image.

**IOTWeek**

**HARALD  
SUNDMAEKER**

Technology Lead of IoF2020  
Senior Researcher at ATB Bremen



# **CLAUS GRØN SØRENSEN**

Co-Lead of IoF2020 Use-case on Interoperability  
Head of Research Unit at Aarhus University



A black and white portrait of a middle-aged man with short, dark hair, wearing a light-colored dress shirt and a dark tie. He is looking slightly to his right with a faint smile. The background is a blurred outdoor scene with trees and a building.

**IOTWeek**

**KLAUS-HERBERT  
ROLF**

Communication partner at 365FarmNet  
Network Manager bei CLAAS KGaA



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# VISION OF THE POTENTIAL DISRUPTIVE IMPACT OF IoT SOLUTIONS ON THE AGRI-FOOD SECTOR

IoT deployment and business challenges for the Agri-Food sector

GRIGORIS CHATZIKOSTAS

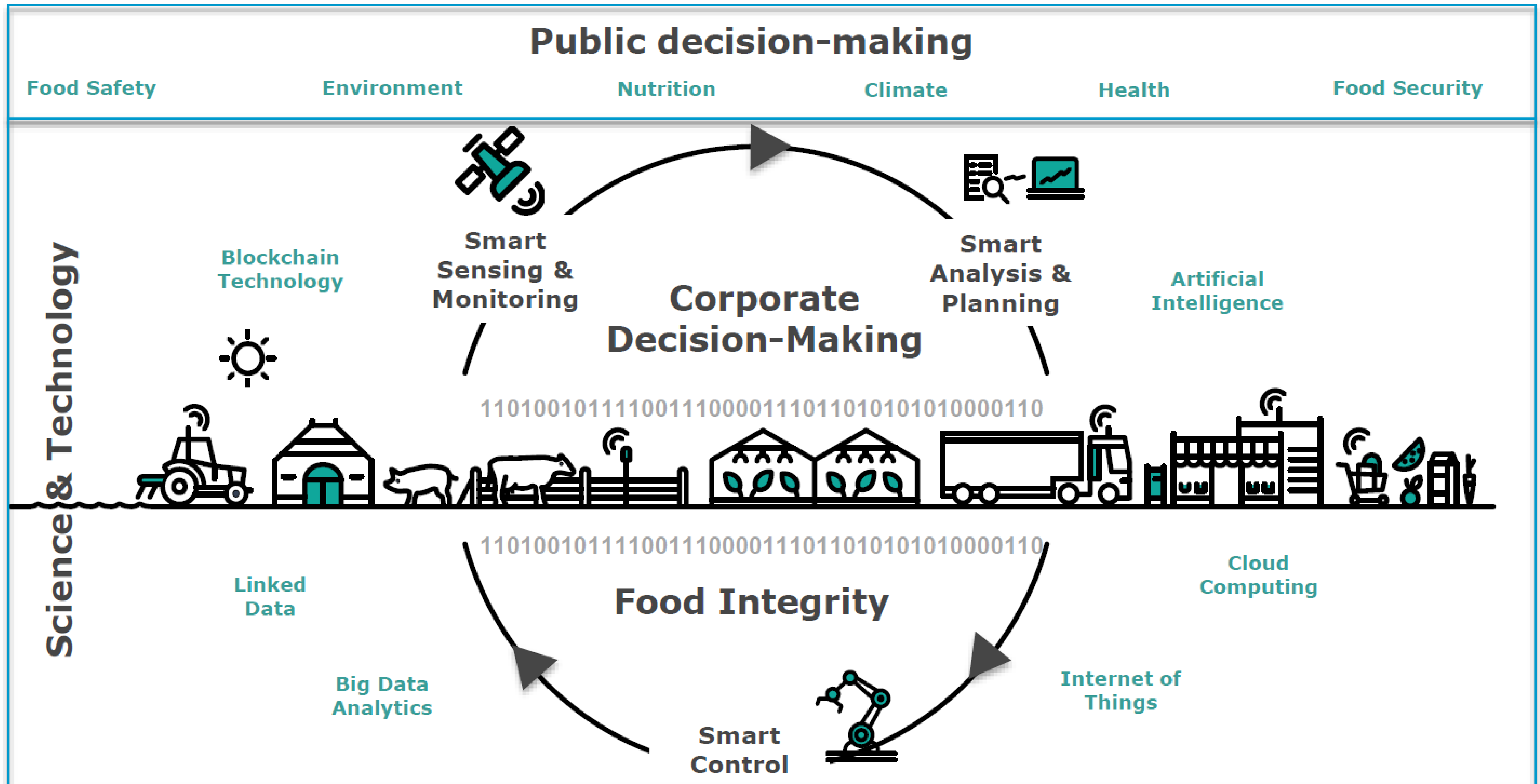
*June 19, 2019*





# **A VISION OF THE AGRI-FOOD SECTOR IN 2050 THROUGHOUT THE FULL VALUE CHAIN**

# The Digital Transformation of Agri-Food



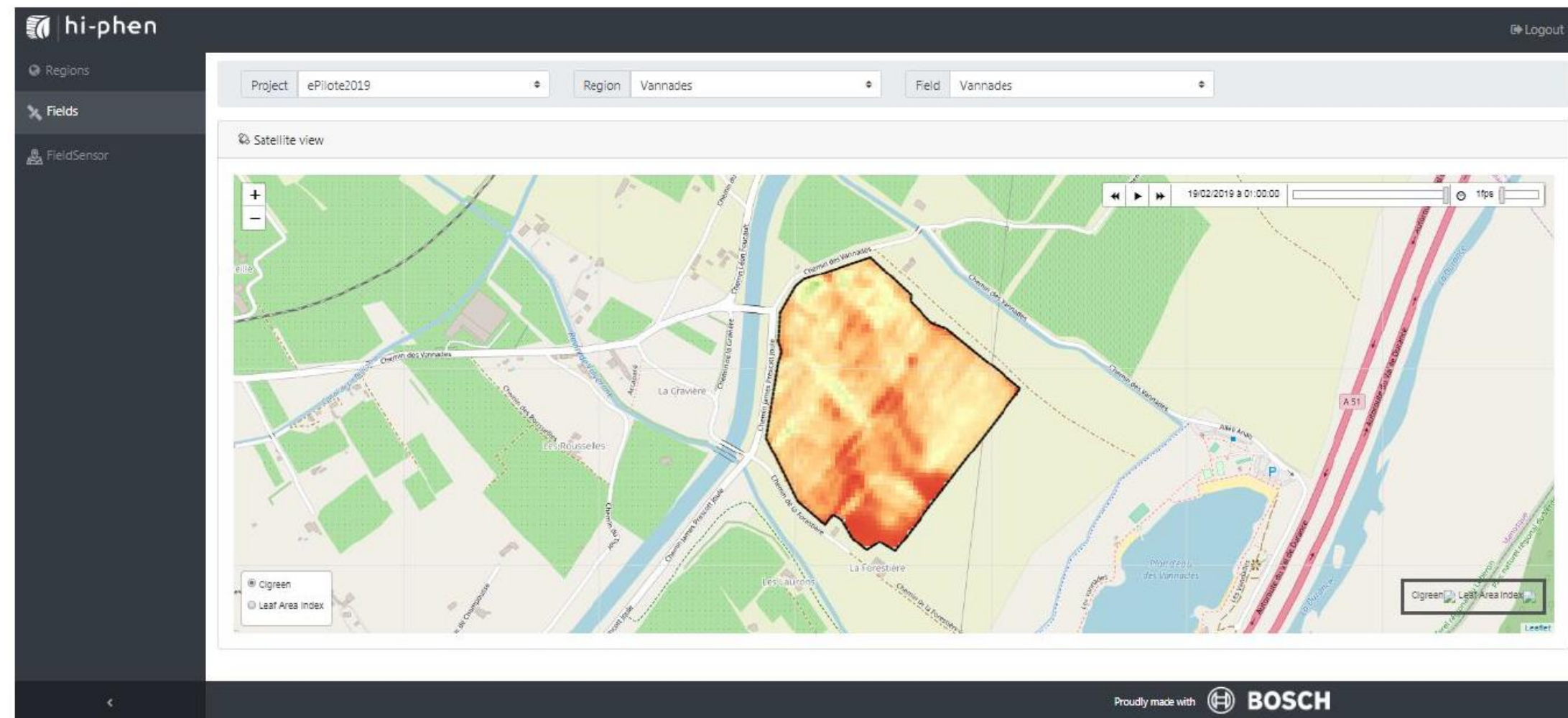


# **IoF2020 SOLUTIONS AND THEIR CURRENT POSITION IN THE DEVELOPMENT CYCLE**

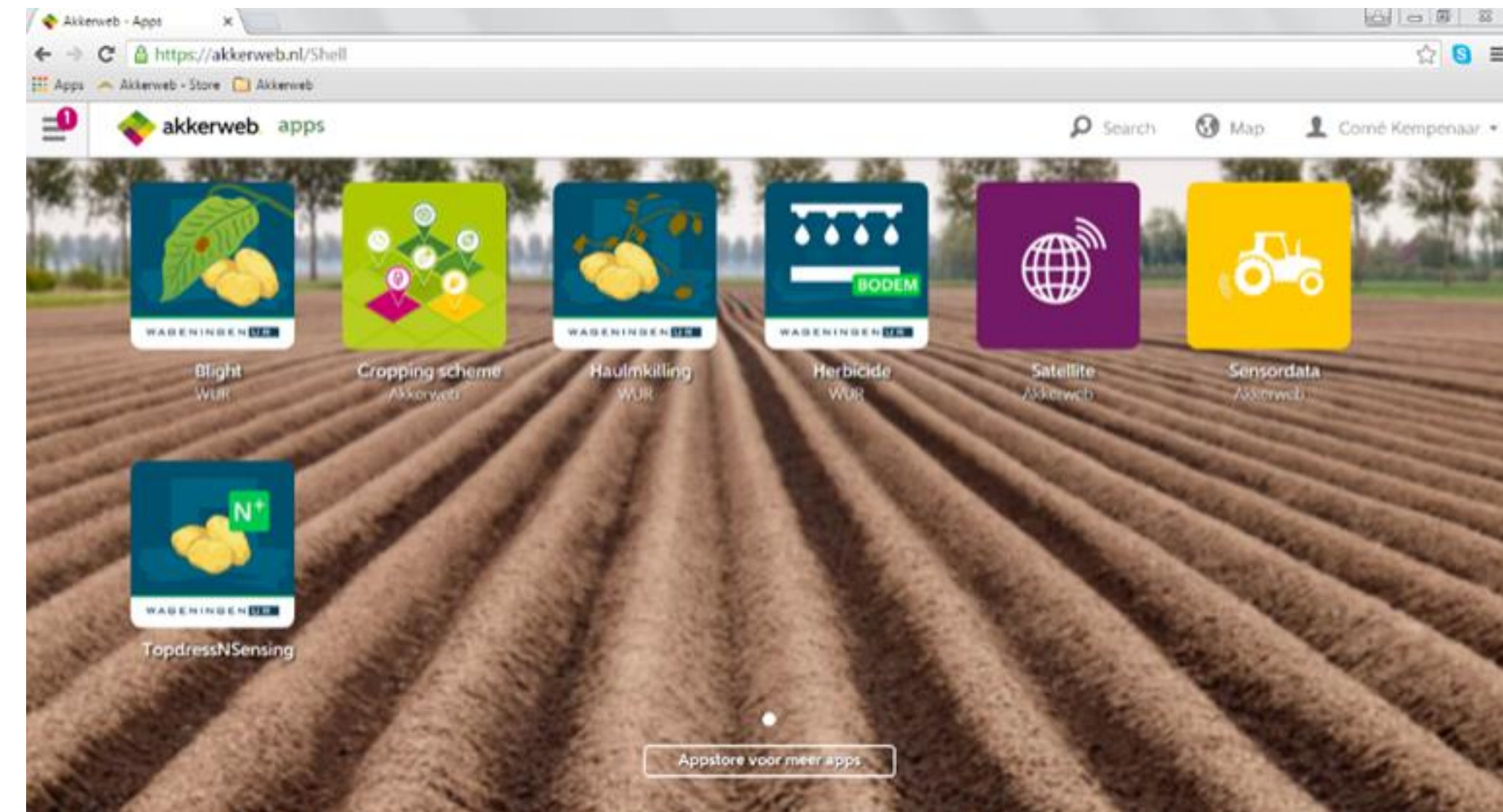




# IoT SOLUTIONS FOR ARABLE FARMING



Crop monitoring dashboard



Akkerweb platform dashboard for soil mapping



Electrical conductivity scanner detecting clay content and organic matter for conductivity zoning

- Arable farming has 44 deployment sites
- Interoperability between farm machines and software is bridged





# IoT SOLUTIONS FOR DAIRY FARMING

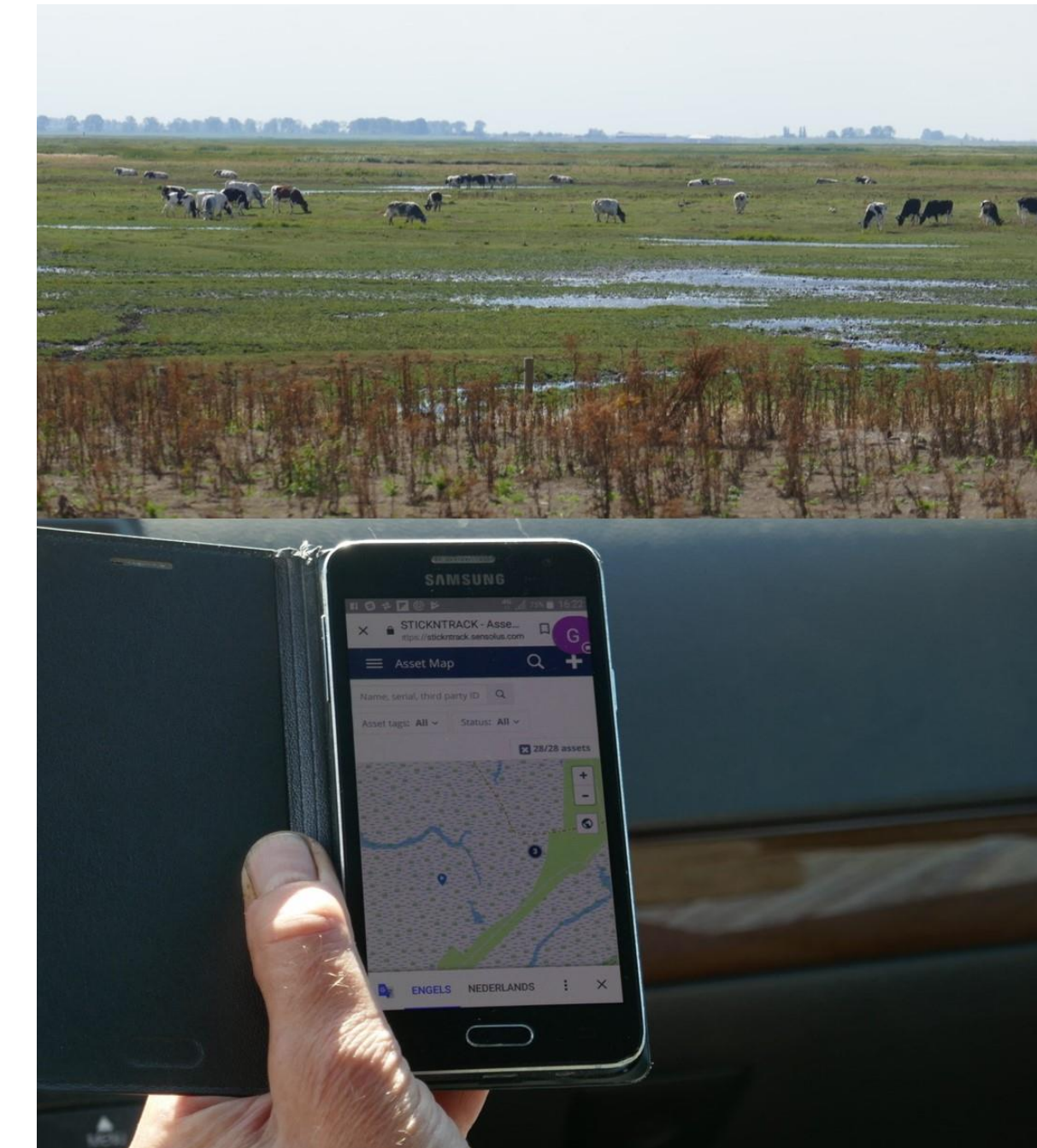


IoT for remote calibration support of milk samples to guarantee milk safety and quality

- Connecterra raised additional €4.2m for dairy tech
- Dairy farming has 30 deployment sites around Europe



Radio and TV feature of artificial intelligence in dairy farming



Outdoor beef cattle tracking has rescued a trapped cow in a nature reserve area

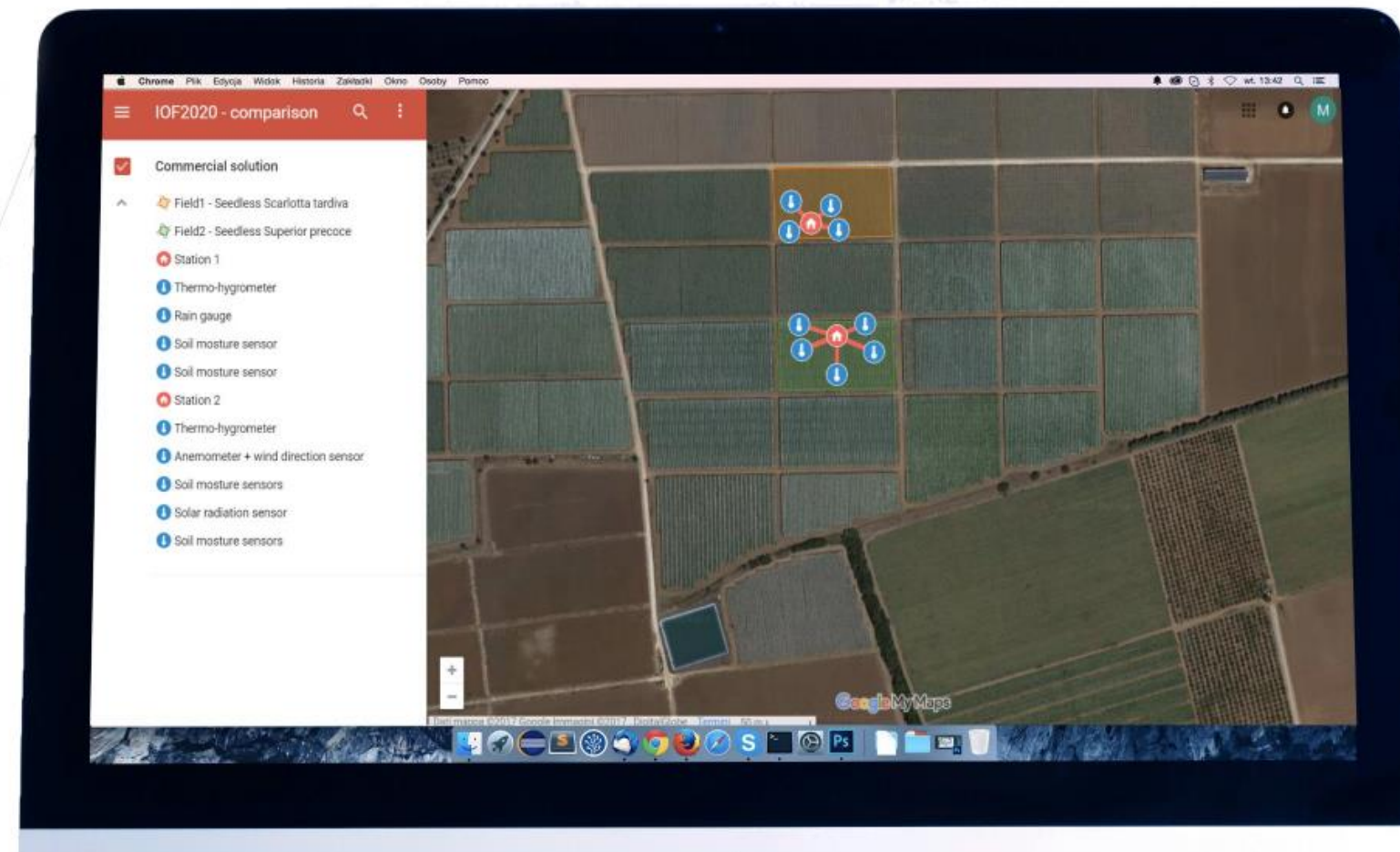




# IoT SOLUTIONS FOR FRUIT



NFC tags for crop monitoring



IoT sensors

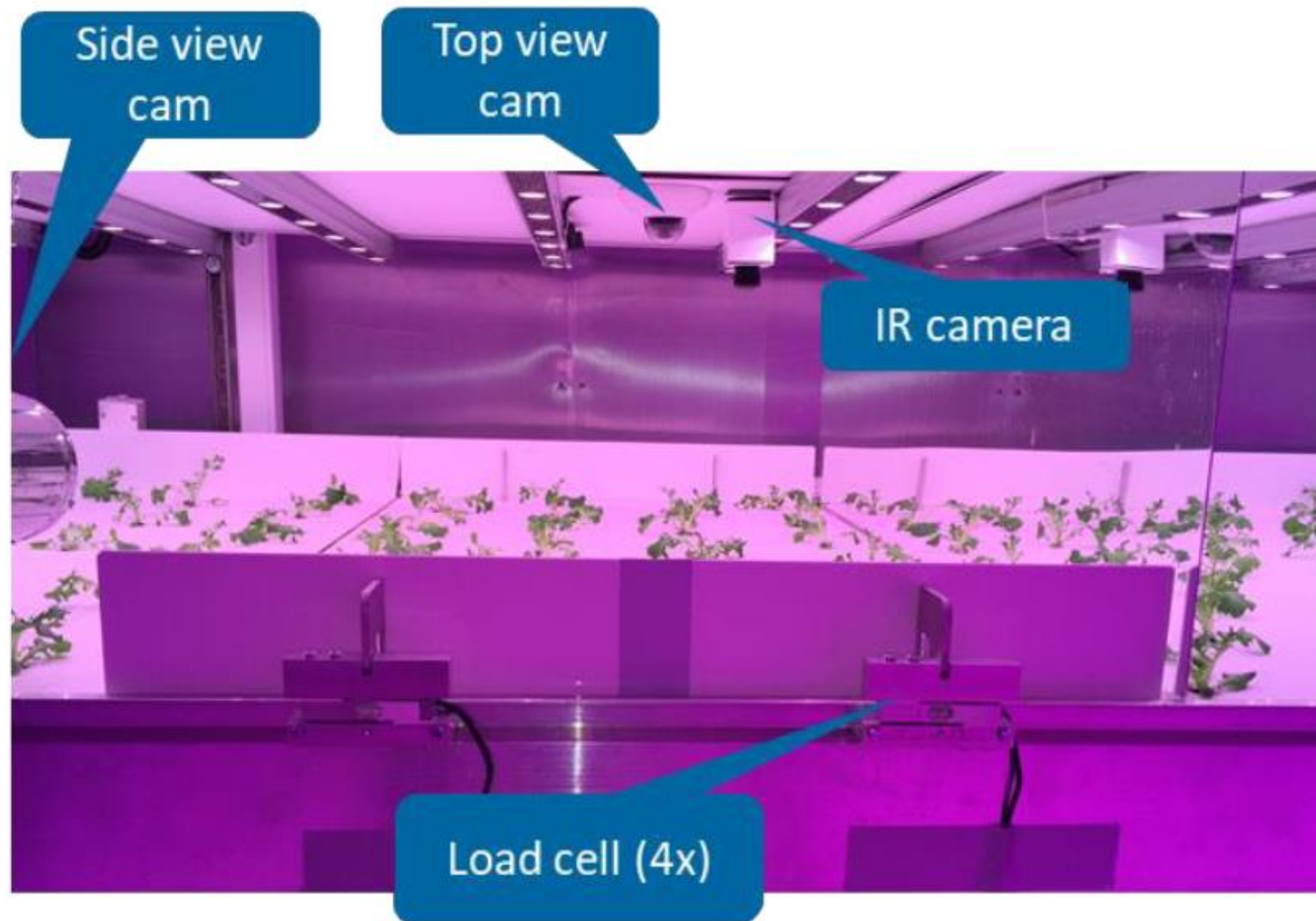


Installations in Romanazzi farm – weather station under the vineyard canopy

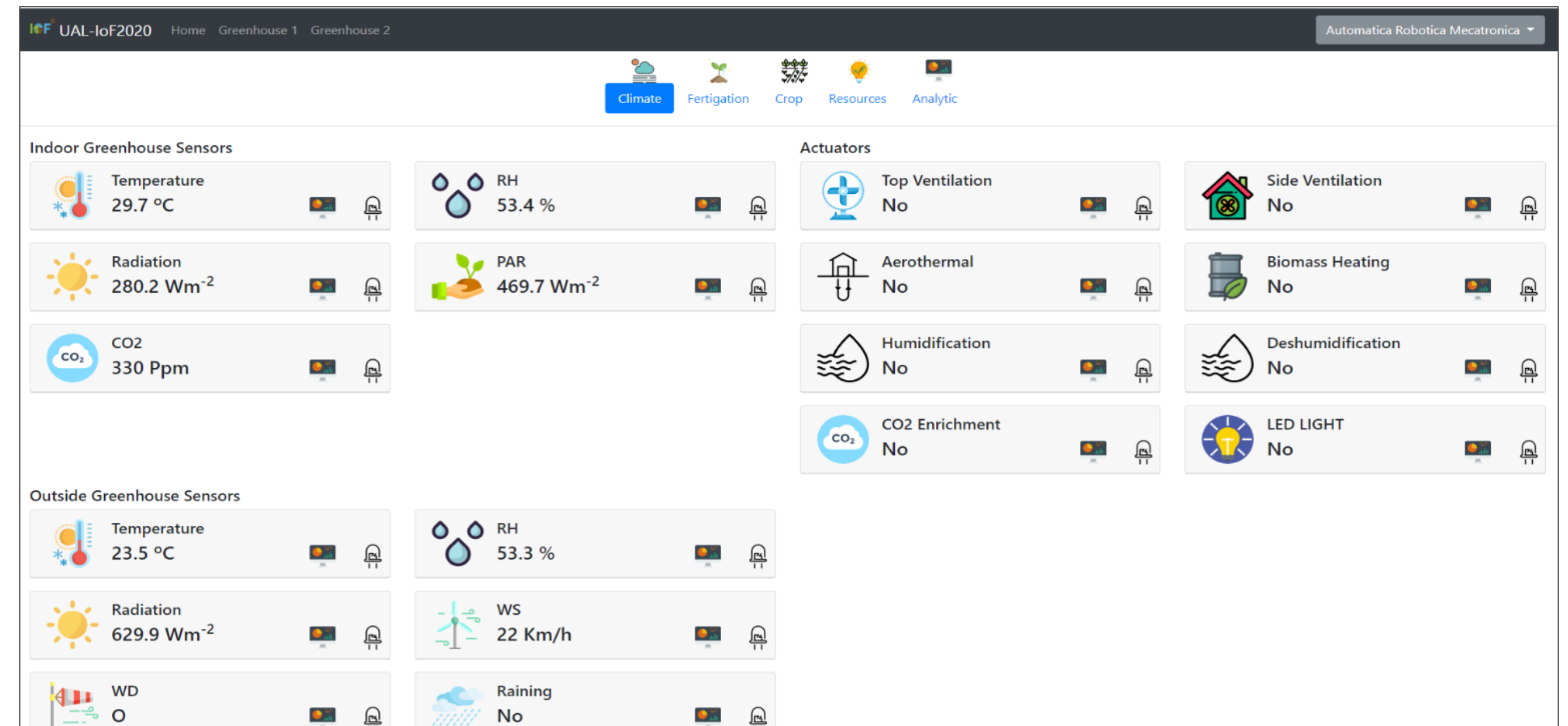
- Fruit Trial has more than 50 deployment sites around Europe
- Wine shipping device (Jodyn Live) test extension to USA & China
- Strong Fruit Trial synergies and collaboration
- EuroPool performs large-scale experimentation in real supply chains



# IoT SOLUTIONS FOR VEGETABLES



Sensors located in a growth layer in one of the climate cells at Signify



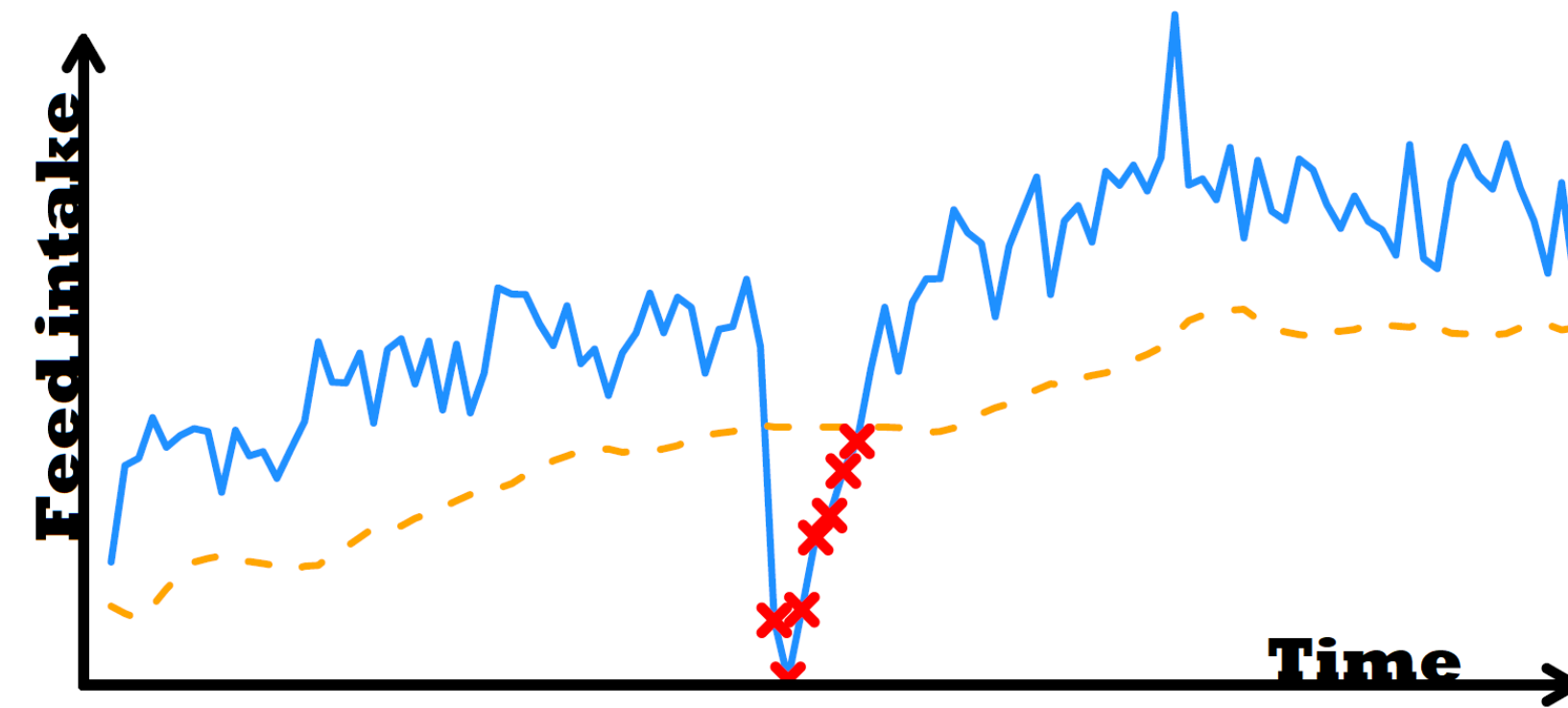
Software tool interface showing greenhouse climate monitored parameters

- Vegetables Trial has 29 deployment sites around Europe
- Full-controlled farming is operating under regulated conditions
- New crops introduced for weeding machines testing

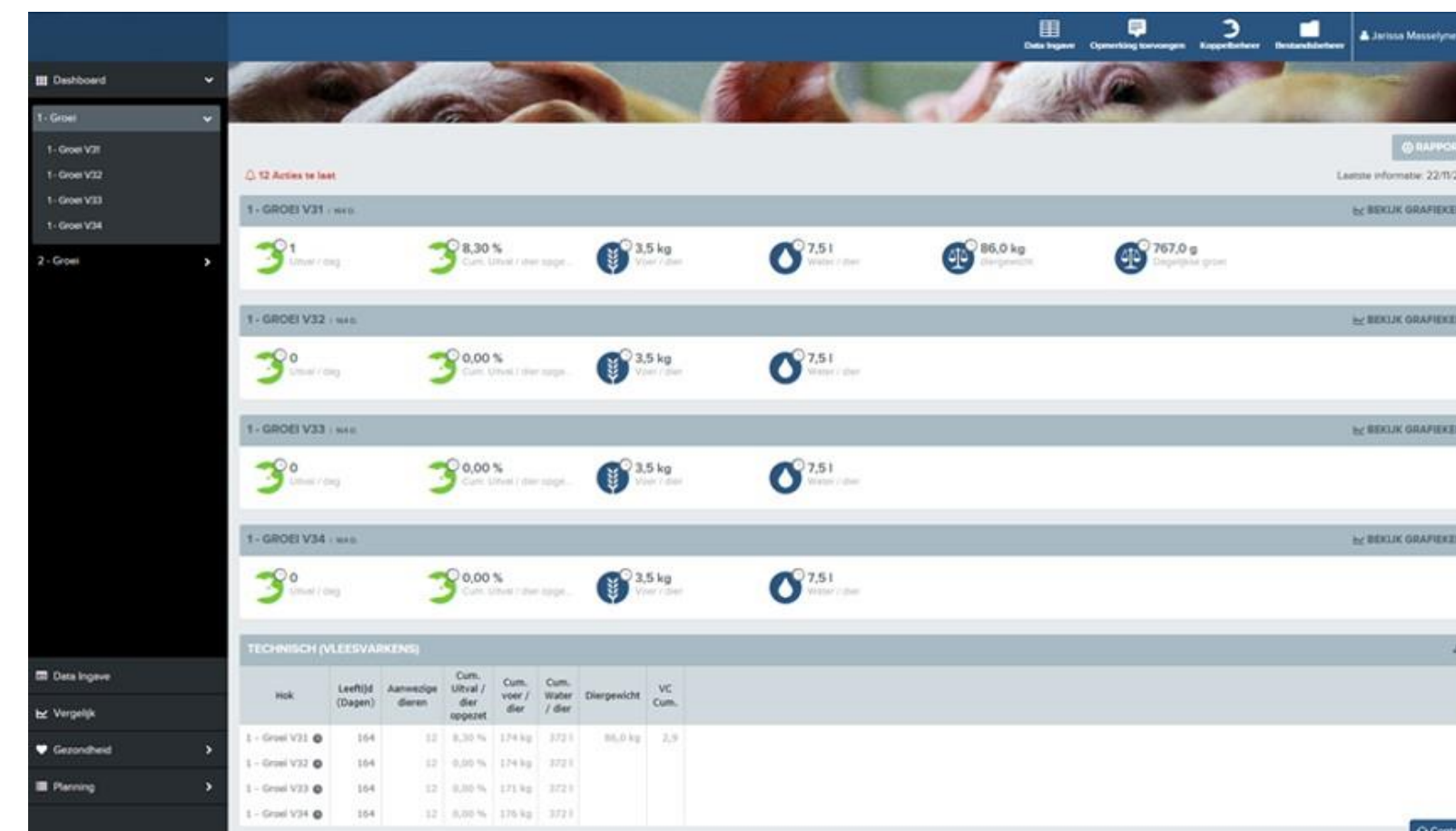




# IoT SOLUTIONS FOR MEAT



- Managed to optimize production, transport & processing of poultry meat
- IK4-TEKNIKER has launched novel transport sensor
- Meat Trial has more than 20 deployment sites



Alerts when the feed intake has dropped under the threshold

# **IoF2020 DEPLOYMENT SITES OVERVIEW**



# 5 TRIALS - 33 USE CASES



ARABLE



FRUITS



DAIRY



VEGETABLES

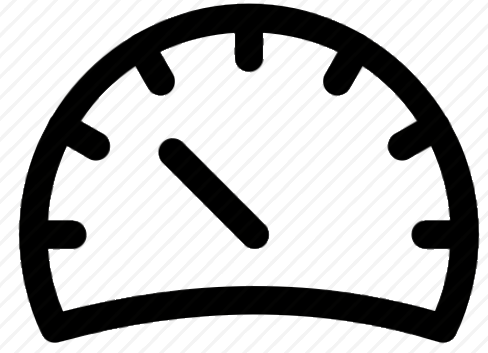


MEAT



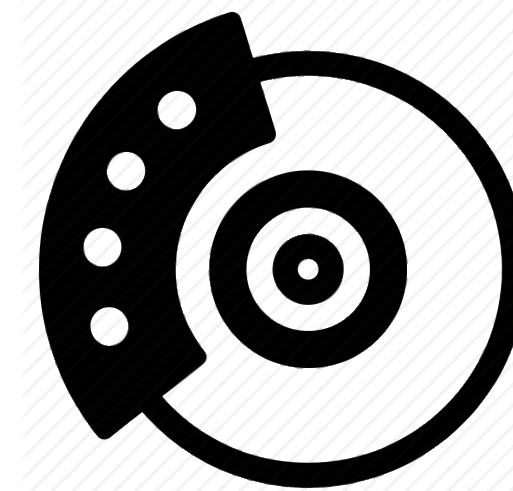
# **BREAKS AND ACCELERATORS FOR DEVELOPMENT**





# ACCELERATORS

- Increased awareness for food safety & transparency
- Ease of use and affordability, value-for-money, ROI, novel business models
- Vertical and horizontal integration across value chains, fear-of-missing-out
- Traction with investors

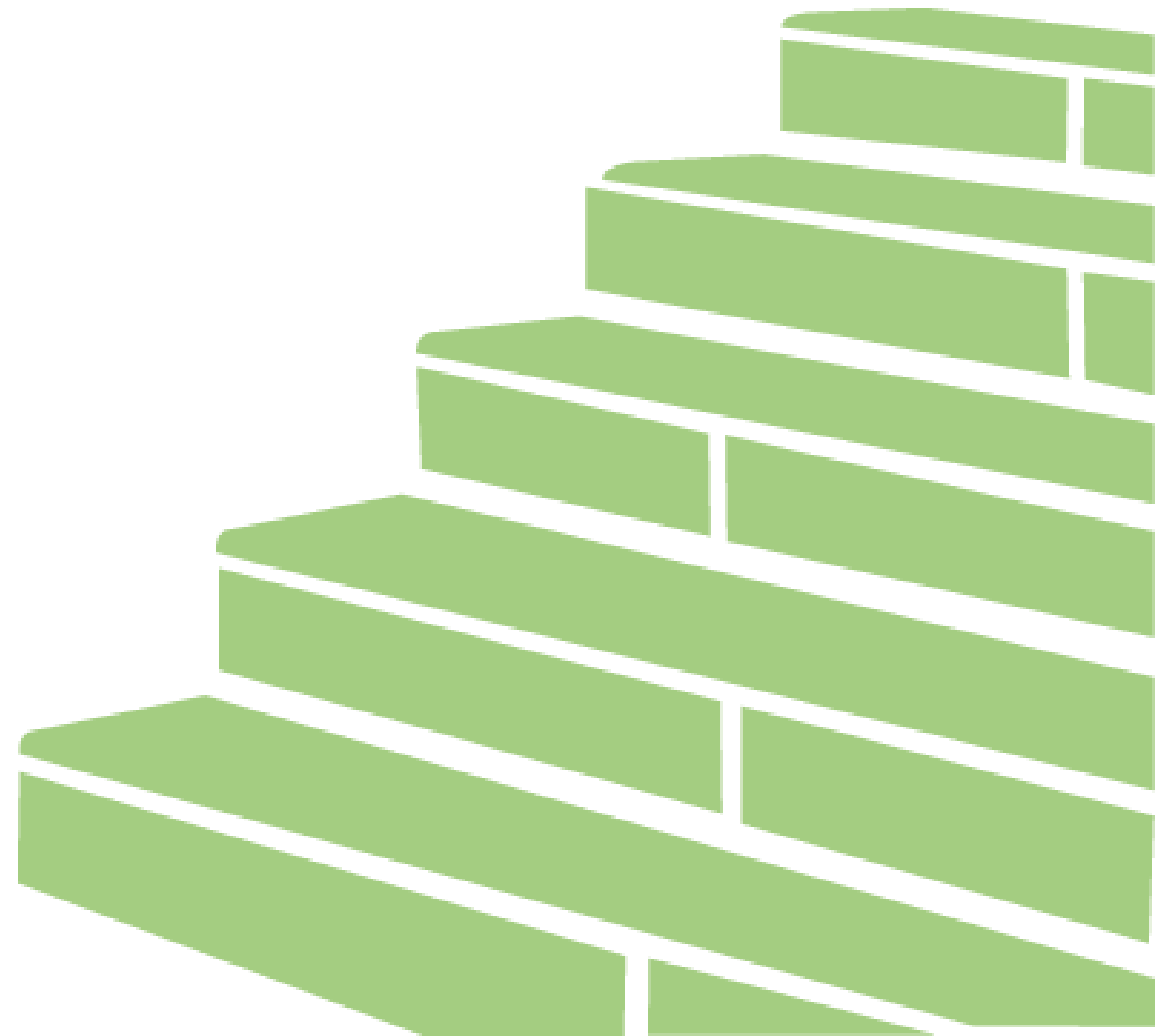


# BREAKS

- Interoperability challenges
- Perceived security and privacy risks
- Data ownership issues
- Barriers on global trade of agri-food products
- Rural wireless and broadband coverage

# NEXT STEPS

- Exploitation & monetization,
- Actively engaging with end-users,
- Scaling up,
- Global expansion.





# THANK YOU

Any questions?

Grigoris Chatzikostas  
chatzikostas@biosense.rs







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# Technical Challenges of IoT Deployment in the Agri-food Sector



IoT Week 2019

IoT Deployment and Business Challenges for the  
Agri-Food sector: What lies ahead ?

Aarhus, 19.06.2019 – Harald Sundmaeker – ATB, IoF2020 Large Scale Pilot Project



Institut für angewandte  
Systemtechnik Bremen  
GmbH



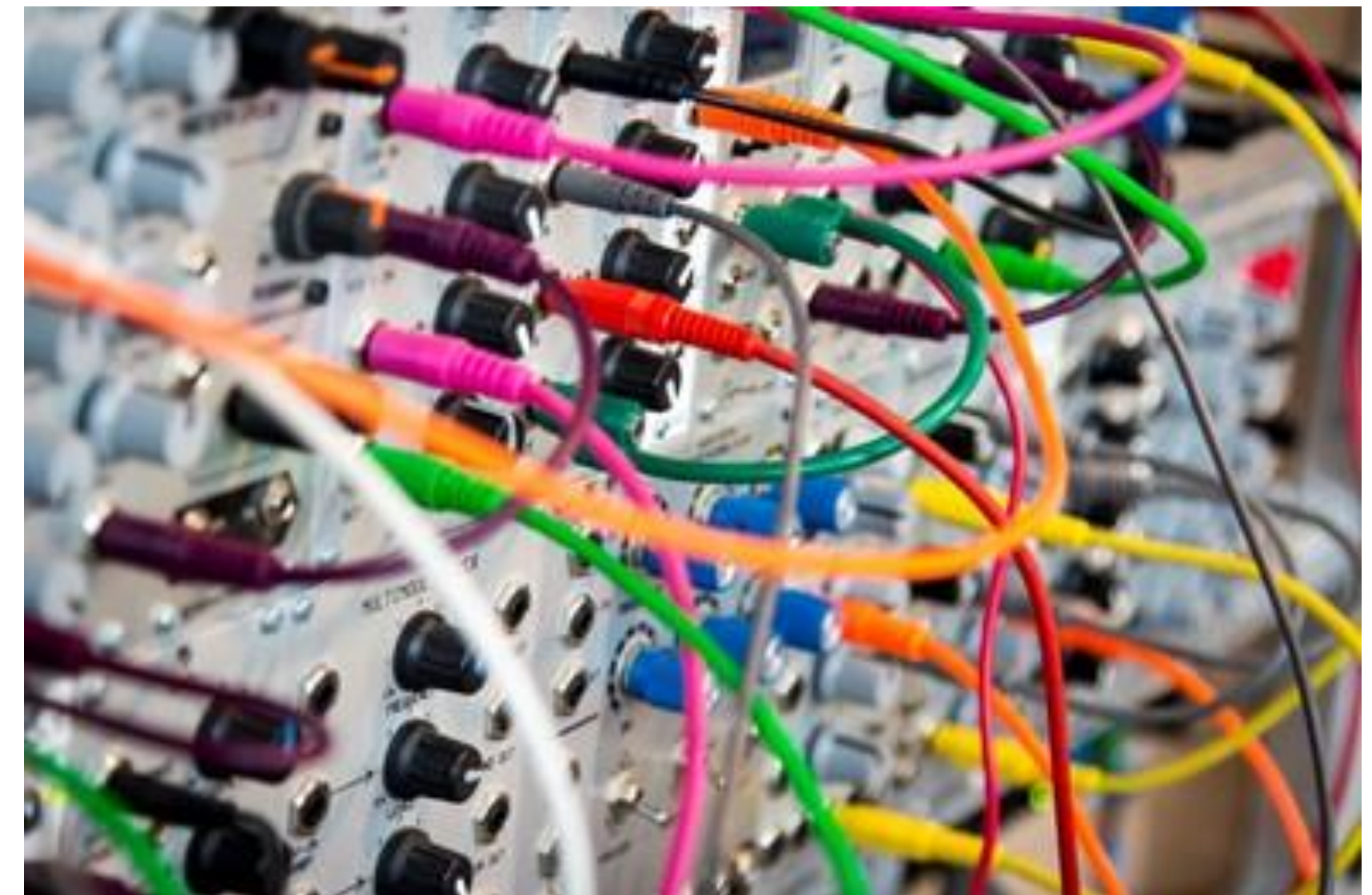
# IoF2020 – What does it mean?





# IoF2020 – what does it mean?

- Diverse agri-food sectors addressed for IoT validation
- Heterogeneity of IoT based solutions
- From large industry to small farmers
- From small scale experimentation to large scale deployment
- Complexity!

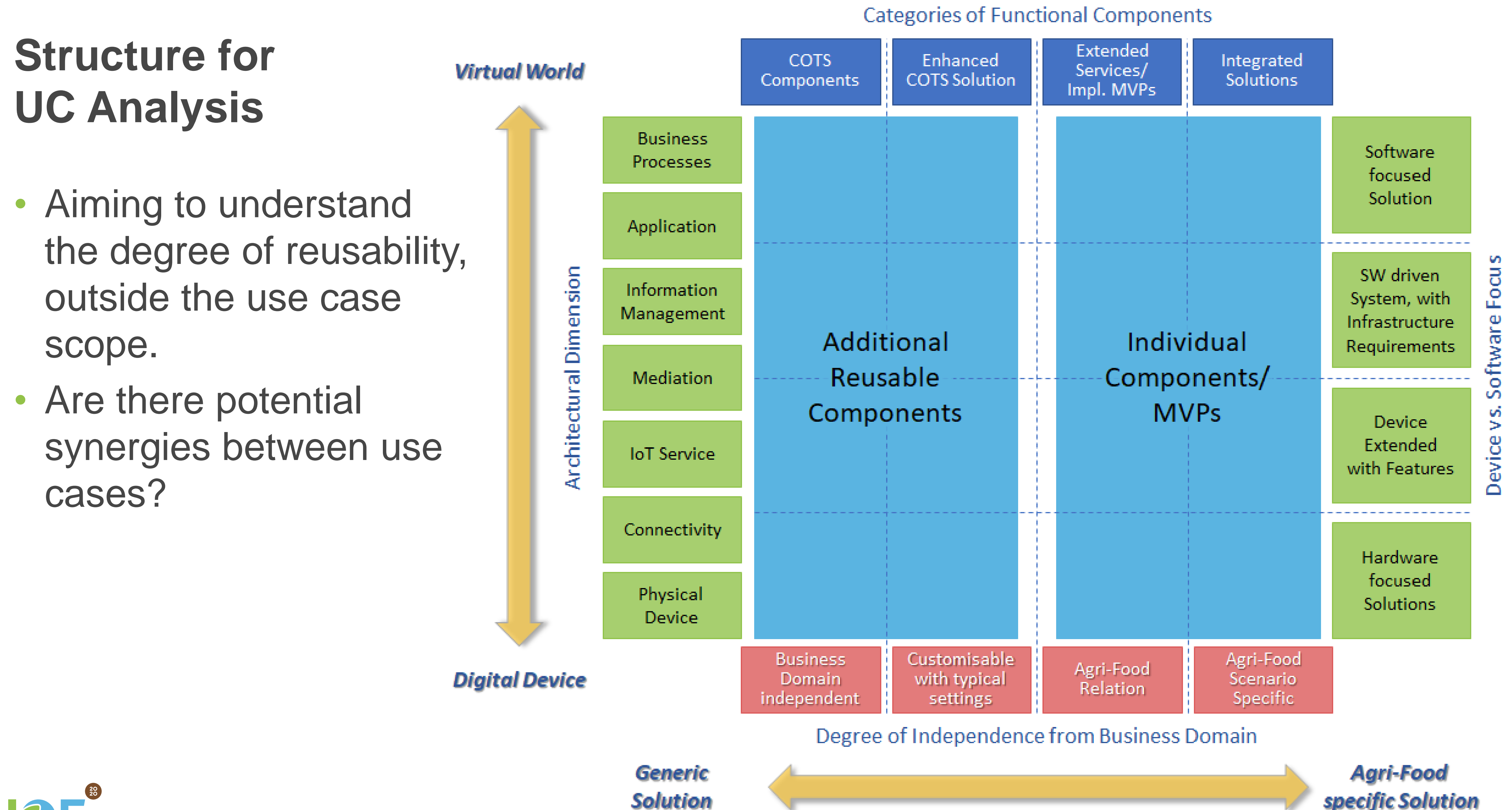


<b>UC1.1</b> <b>Within-field Management Zoning</b> Sensors for precise field management <b>NL, DE, BE, FR, UK, PL</b>	<b>UC1.2</b> <b>Precision Crop Management</b> Precision of satellite images by sensors <b>FR</b>	<b>UC1.3</b> <b>Soya Protein Management</b> Production DSS for higher protein levels <b>AT, IT</b>	<b>UC1.4</b> <b>Farm Machine Interoperability</b> Data exchange btwn machinery & FMIS <b>NL, DE, DK, BE, FR, AT, RS, RO, UA, IT</b>	<b>UC1.5</b> <b>Potato Data Processing Exchange</b> Data exchange btwn field & processing <b>NL, BE, PL</b>	<b>UC1.6</b> <b>Data-Driven Potato Production</b> Smart farming using telemetric stations <b>CY, PL, UA, EL</b>
<b>UC1.7</b> <b>Traceability for Food and Feed Logistics</b> Secure transport of bulk goods <b>BE, NL, PL, FR, BG, RO, ES, SI</b>	<b>UC1.8</b> <b>Solar-powered Field Sensors</b> Sensor-based farm management <b>DE, RO, HU</b>	<b>UC1.9</b> <b>Within-field Management Zone Baltics</b> Macro- and micro-nutrient analysis <b>LT, LV, NL</b>	<b>UC2.1</b> <b>Cow Grazing Monitor</b> Roaming herd tracking, grazing manager <b>BE, NL</b>	<b>UC2.2</b> <b>Happy Cow</b> Improve dairy farm productivity <b>NL, BE, DE, IE</b>	<b>UC2.3</b> <b>SilentHerdsman+</b> Health monitoring of dairy cows <b>UK</b>
<b>UC2.4</b> <b>Remote Milk Quality</b> Remote sensor calibration for dairy labs <b>NL</b>	<b>UC2.5</b> <b>Lameness Detection through Machine Learning</b> Early lameness detection in cattle <b>IE, PT, IL, ZA, UK</b>	<b>UC2.6</b> <b>Precision Mineral Supplementation</b> Precision livestock farming at dairy farms <b>DK, LT, LV, DE</b>	<b>UC2.7</b> <b>Smart Precision Cow and Cattle Monitoring</b> Animal welfare monitoring <b>HU, PL, CZ, SK</b>	<b>UC3.1</b> <b>Fresh Table Grapes Chain</b> Precision farming, shelf-life extension <b>IT, EL</b>	<b>UC3.2</b> <b>Big Wine Optimization</b> Sustainable high quality wine production <b>FR, IT</b>
<b>UC3.3</b> <b>Automated Olive Chain</b> DSS and quality tool for olive oil <b>ES, EL</b>	<b>UC3.4</b> <b>Intelligent Fruit Logistics</b> Smart sensing in whole logistic chain <b>DE, NL</b>	<b>UC3.5</b> <b>Smart Orchard Spray Application</b> Optimize plant protection spraying <b>ES, HU, PL, PT</b>	<b>UC3.6</b> <b>Beverage Integrity Tracking</b> Monitor whole distribution channel <b>IT, PT, RO</b>	<b>UC4.1</b> <b>City Farming of Leafy Vegetables</b> Full automated vertical farming <b>NL</b>	<b>UC4.2</b> <b>Chain-Integrated Greenhouse Production</b> Data integration in greenhouses <b>ES, IT, NL, EL, TR</b>
<b>UC4.3</b> <b>Added-value Weeding Data</b> Edge-computed plant sensing on video <b>NL, AT</b>	<b>UC4.4</b> <b>Enhanced Quality Certification System</b> Sensing as data sources for certification <b>IT, ES</b>	<b>UC4.5</b> <b>Digital Ecosystem Utilization</b> DSS with data sharing farm-to-fork <b>EL, SI, CY</b>	<b>UC5.1</b> <b>Pig Farm Management</b> Feed conversion & health optimization <b>BE, NL</b>	<b>UC5.2</b> <b>Poultry Chain Management</b> Flock uniformity, feed conversion, health <b>ES, BE</b>	<b>UC5.3</b> <b>Meat Transparency and Traceability</b> Trustful event tracking <b>NL, DE</b>
	<b>UC5.4</b> <b>Decision Making Optimization in Beef Supply</b> Data exchange across value chain <b>BG, HR, IE, IT, ES, PT</b>	<b>UC5.5</b> <b>Feed Supply Chain Management</b> Integral feedstock management <b>ES, UK, DE</b>	<b>UC5.6</b> <b>Interoperable Pig Tracking</b> Livestock health monitoring for pigs <b>SE, ES, CH</b>	<div> <div>IoF2020 use-cases</div> <div>Here is an overview of the use-cases</div> </div>	

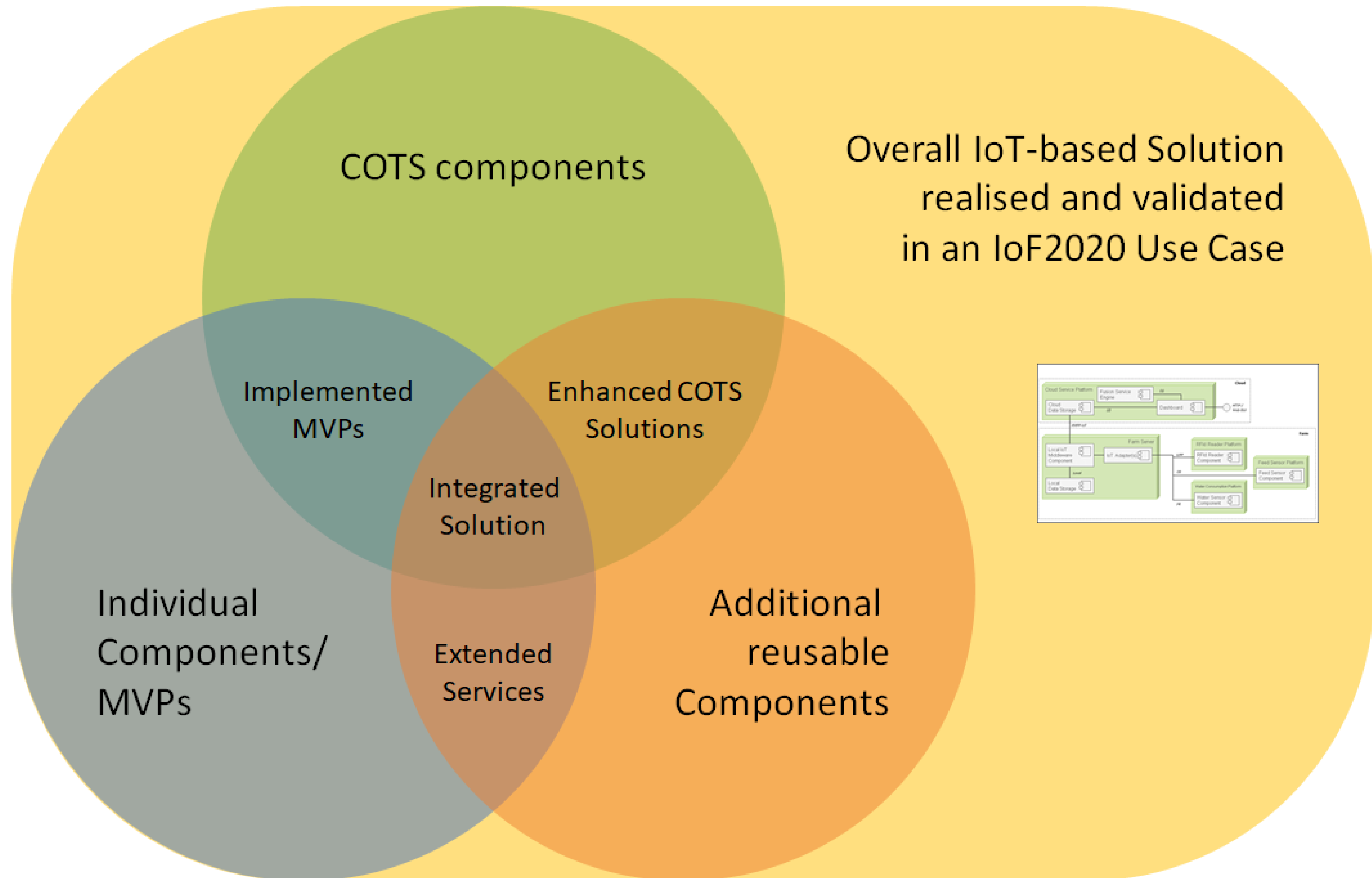


# Structure for UC Analysis

- Aiming to understand the degree of reusability, outside the use case scope.
- Are there potential synergies between use cases?

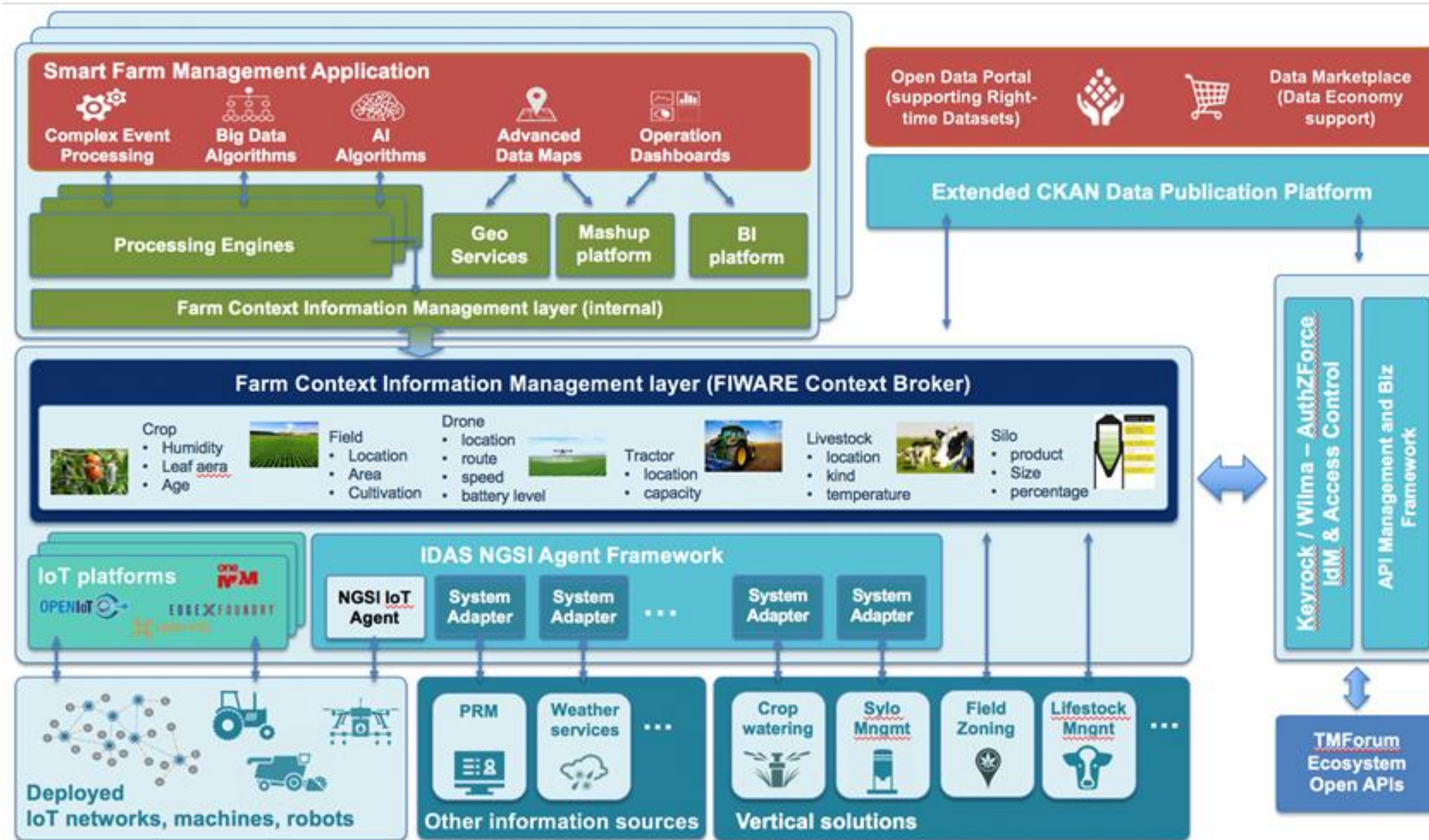


# Type of Results vs. Realistic Possibility for Reuse!?





# Smart Farm Management Systems: an open approach



- FIWARE Orion Context Broker technology as open, neutral and standard-based data integration technology
  - Easy integration in architecture of Farm Management systems
  - “only once” integration of farm vertical solutions
- Common Information Models easing interoperability and replaceability of solutions:
  - Farm Management systems
  - Vertical solutions
- Integration with data publication and marketplace platforms based on open standards

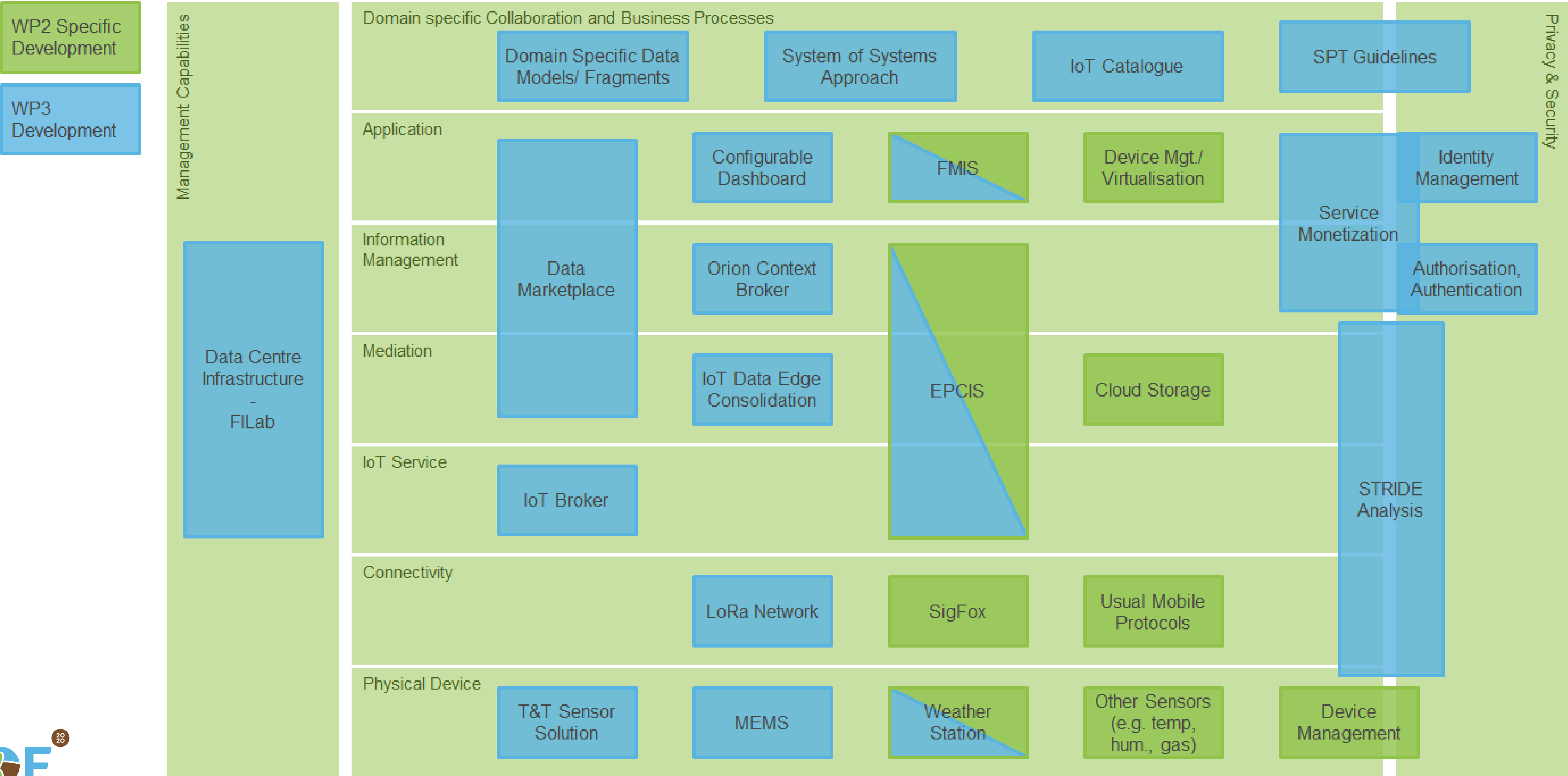


# Key Technical Challenges for IoT Deployment

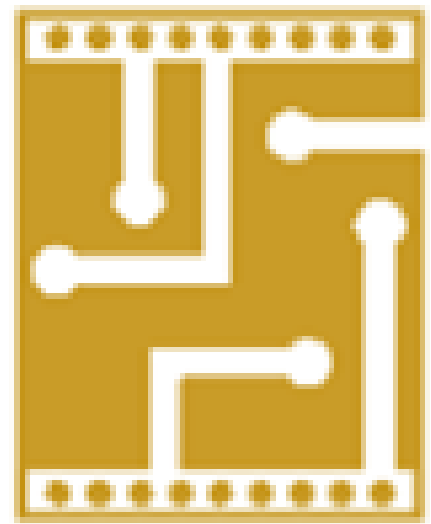
- Interoperability and granting/limiting access to data
- Costs vs. quality
- Accuracy of sensors & Battery lifetime
- Availability of communication networks
- Communication bandwidth
- Size of components
- Harsh environment (e.g. impact of vibration, humidity, temperature)



# Reusable components relevant in the IoF2020 use cases





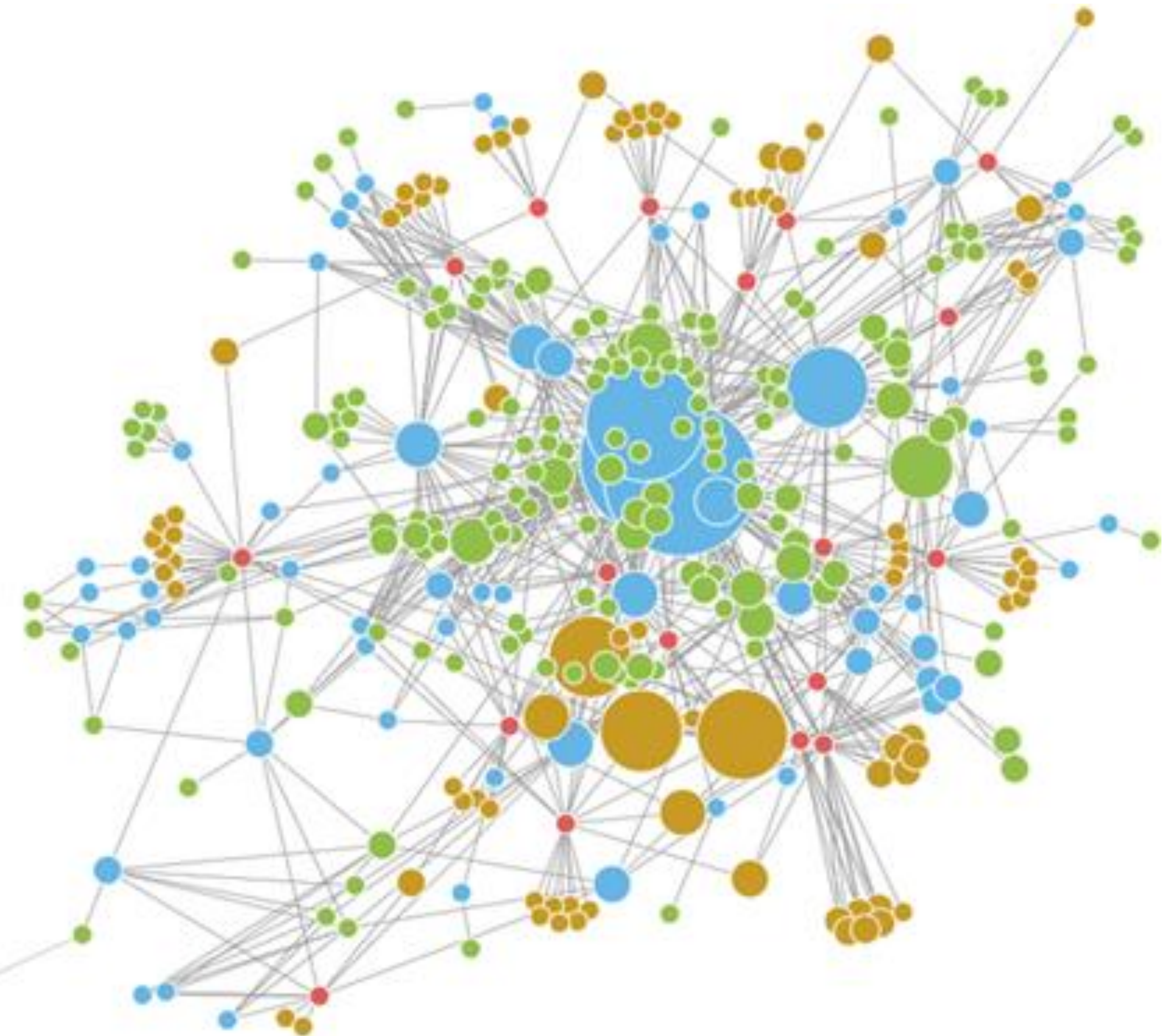


IoT  
CATALOGUE



IOF2020 | NOW  
CASE STUDIES | AVAILABLE  
IN IOT CATALOGUE

This diagram represents all the actual relations that IoT Catalogue currently has. The proportion of the bubble represents the number of relationships that every element have.



• ICT Problems • Products • Value Proposition • Use Cases



# Sustainable IoT Catalogue presenting components & lessons learnt that facilitate realisation of IoT based solutions



[www.iot-catalogue.com](http://www.iot-catalogue.com)





# Different ways to access information

- Listing the IoF2020 use cases
- Enabling search by components
- Mapping of solutions with value propositions, ICT problems, functions and target scenario
- Identifying the team behind

[www.iot-catalogue.com](http://www.iot-catalogue.com)



The screenshot displays the IoT Catalogue website interface. At the top, there is a navigation bar with icons for home, IoT, lightbulb, bar chart, puzzle, and user profile. Below this is a category filter bar with tabs for Arable, Dairy, Fruit, Vegetables, and Meat, along with a 'Hide all' option. The main content area is titled 'IoF2020 Project Case Studies' and lists 15 case studies in a grid format. Each case study includes a title, a brief description, and a color-coded header. The case studies are: Added-Value Weeding Data, Automated Olive Chain, City Farming Leafy Vegetables, Enhanced Quality Certification System, Farm Machine Interoperability, Grazing Cow Monitor, Herdsman+, Intelligent Fruit Logistics, Meat Transparency and Traceability, Pig Farm Management, Poultry Chain Management, Precision Crop Management, Remote Milk Quality, Soya Protein Management, and Within-field Management Zoning. Below the case studies is a 'Statistics' section with six bars representing different metrics: Solutions (131), Validations (39), Places (52), Value Propositions (89), ICT Problems (64), and Components (144). At the bottom, there is a 'Component by use case' section showing 144 components.

**IoF2020 Project Case Studies** 15 Case Studies ^

- Added-Value Weeding Data**  
When growing organic vegetables, weeding represents one of the most important and frequent activities to control both the quality of
- Automated Olive Chain**  
The EU is the largest producer (accounting for almost three quarters) and consumer (accounting for almost two thirds) of olive oil in the world. In
- City Farming Leafy Vegetables**  
Consumer tolerance for dirt, insects and other unwanted ingredients is almost zero. This is especially true for leafy vegetables used in
- Enhanced Quality Certification System**  
The EU quality certification system and protected designation of origin (PDO) is a powerful tool to protect the quality of EU products, especially in
- Farm Machine Interoperability**  
One of the biggest problems farmers face is the interoperability of farming equipment due to different digital standards. This lack of
- Grazing Cow Monitor**  
The awareness of the potential negative impact of livestock farming on both the environment and animal welfare is rising in Europe. Dairy
- Herdsman+**  
Precision Livestock Farming (PLF) has the potential to address societal concerns related to animal welfare, lower the environmental burden
- Intelligent Fruit Logistics**  
Returnable Transport Items (RTI) for packaging and transporting fresh produce play a crucial role in getting fruit from the farm to the consumer's
- Meat Transparency and Traceability**  
Today food is all about communication. Consumers want to know what they are eating: is it healthy, safe, fresh, organic and locally
- Pig Farm Management**  
The demands for sustainable production in the competitive pig farming industry can only be met when the whole production chain from farm to
- Poultry Chain Management**  
This use-case intends to improve the performance of poultry production chain processes through IoT driven technologies. The
- Precision Crop Management**  
Nitrogen and water availability are the two main limiting factors in wheat production. By utilizing sensor data embedded in a low-power, long-
- Remote Milk Quality**  
Central milk and dairy testing laboratories use InfraRed (IR) analyses instruments to analyse milk composition and quality. However, it is a
- Soya Protein Management**  
Most plant based proteins are derived from the soya bean. Currently, the EU imports around 32 million tons of soya (mainly as processed soya
- Within-field Management Zoning**  
In Europe, arable farming faces increasing requirements and challenges when it comes to resource efficiency, environmental protection,

**Statistics** ^

131	39	52	89	64	144
Solutions	Validations	Places	Value Propositions	ICT Problems	Components

**Component by use case** 144 Components ^

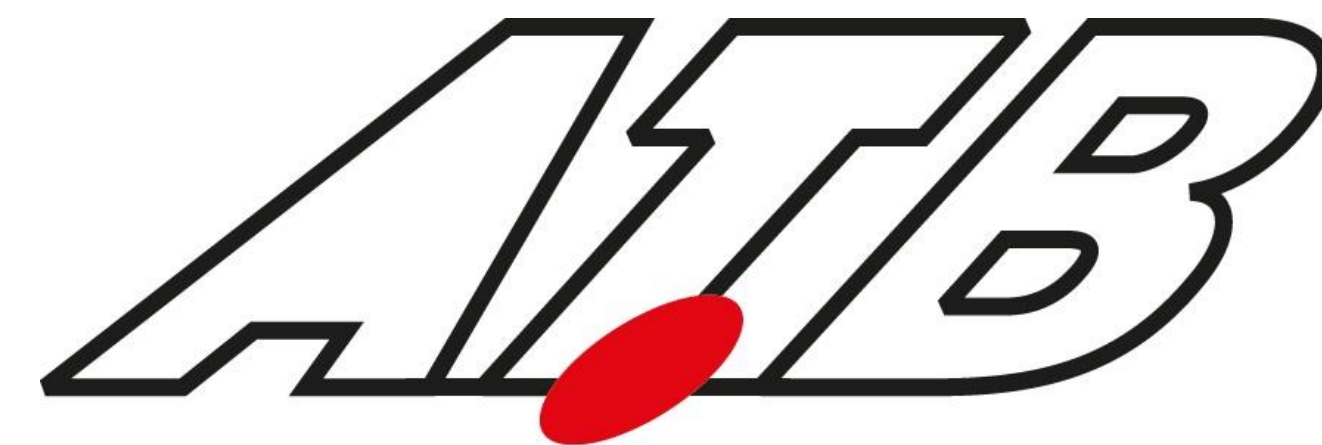




## Let's also discuss detailed questions directly

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IoF2020 is funded by the Horizon 2020 Framework Programme of the European Union.  
Grant Agreement no. 731884. Visit [iof2020.eu](https://iof2020.eu) for more information about the project.





# **CLAUS GRØN SØRENSEN**

Co-Lead of IoF2020 Use-case on Interoperability

Head of Research Unit at Aarhus University



20  
20



# THE IMPLICATIONS OF IOT FOR THE AGRICULTURAL MACHINERY SECTOR

CLAUS GRØN SØRENSEN

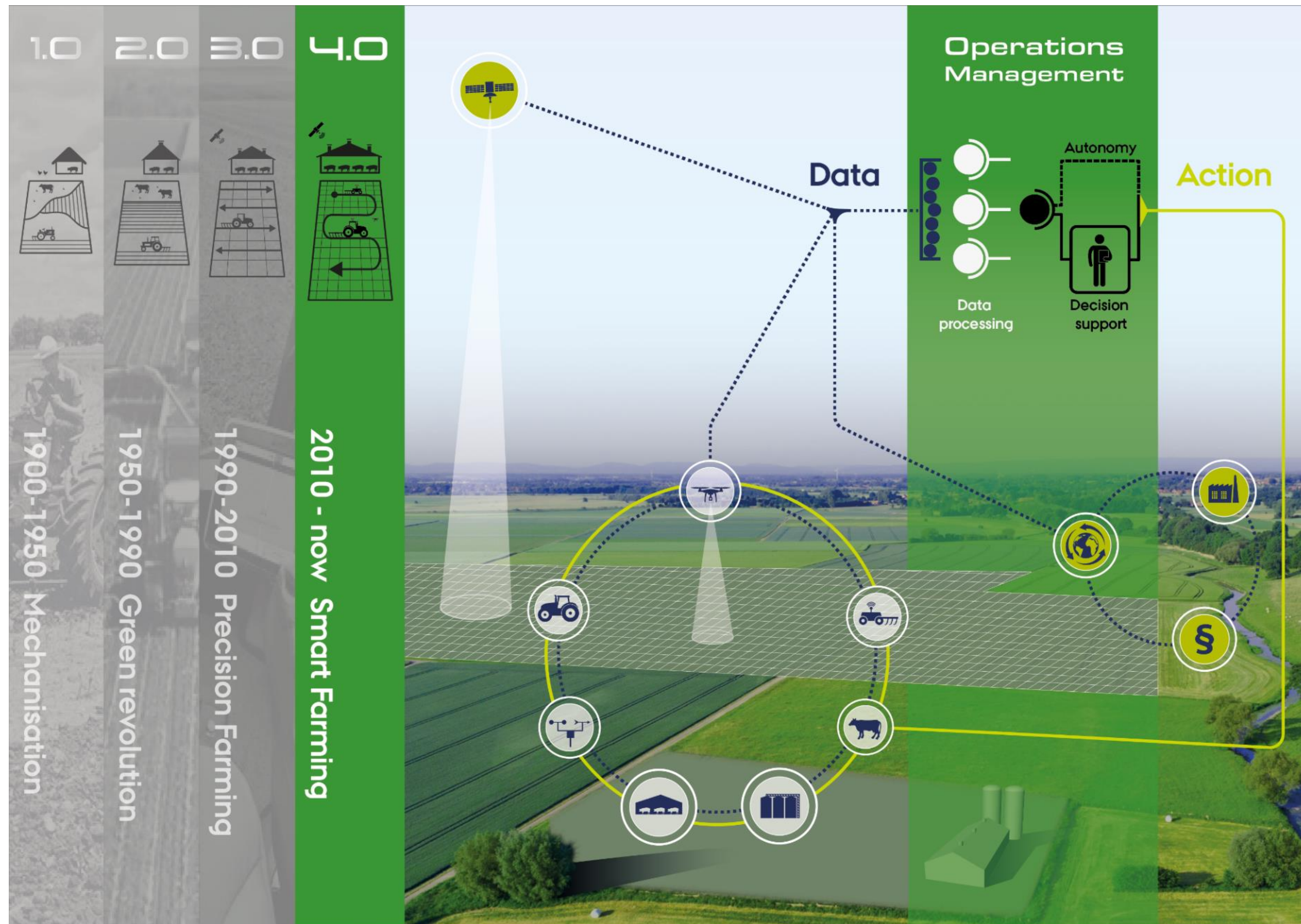
MICHAEL NØRREMATK

AARHUS UNIVERSITY

*June 19, 2019*



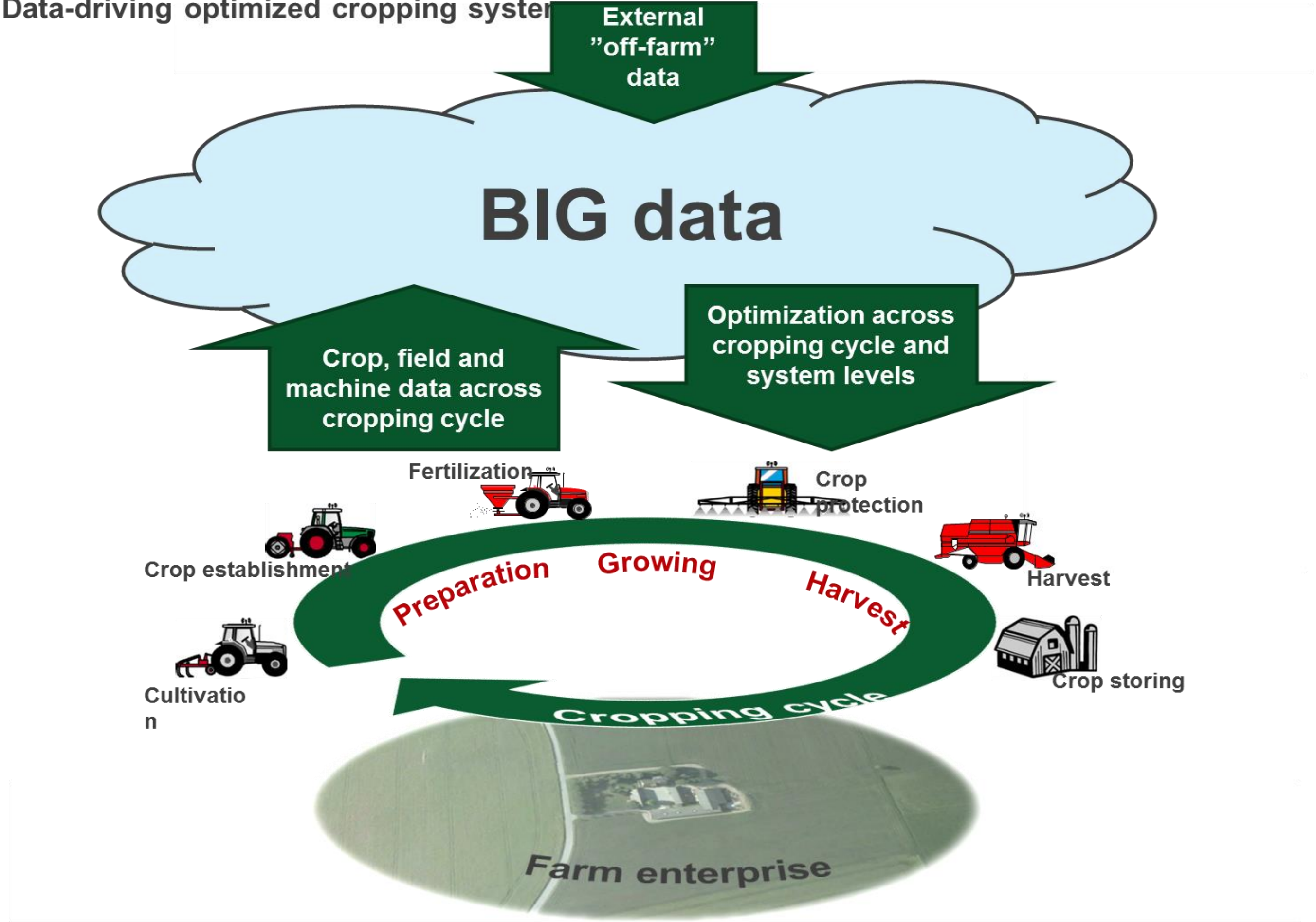




This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement №731884

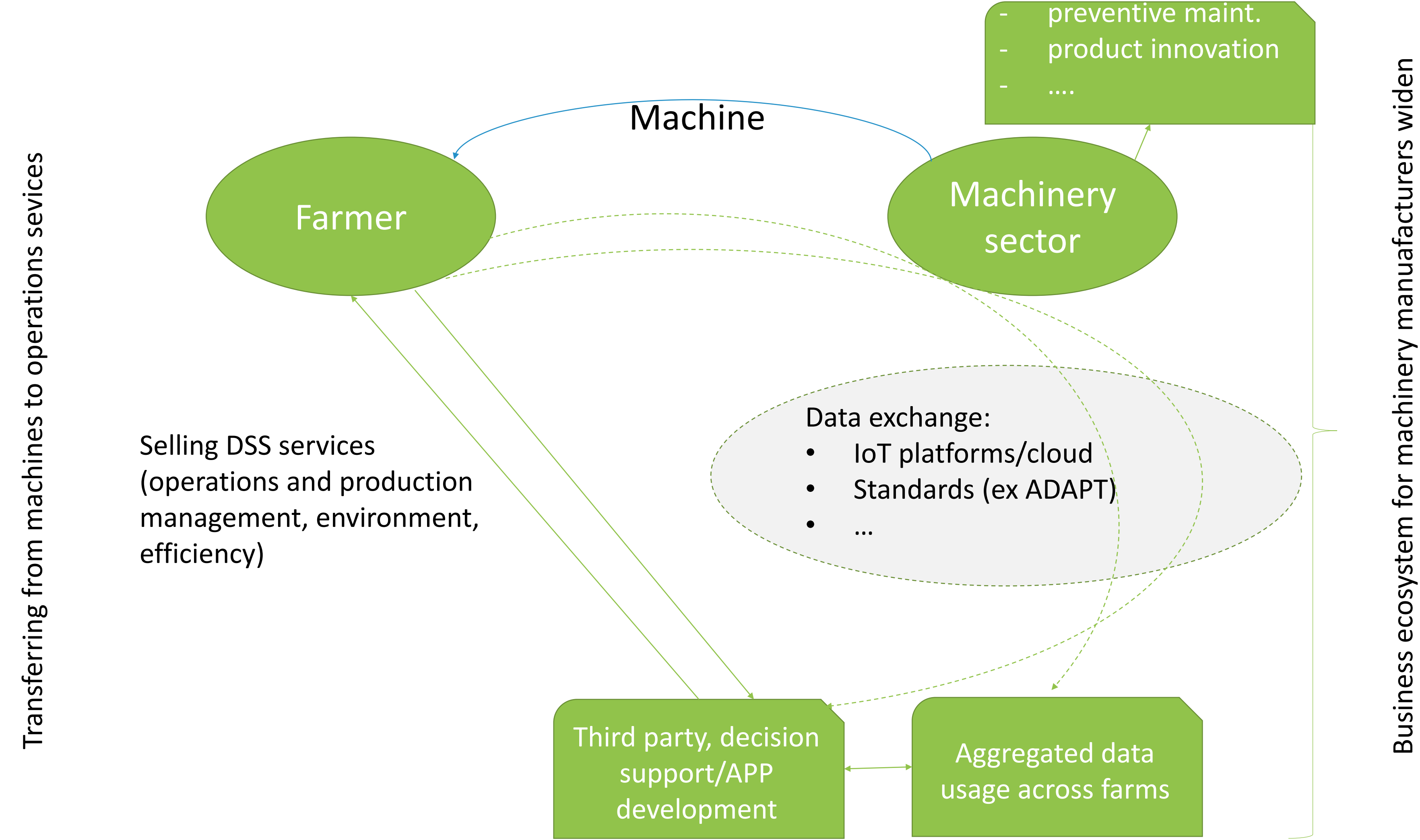






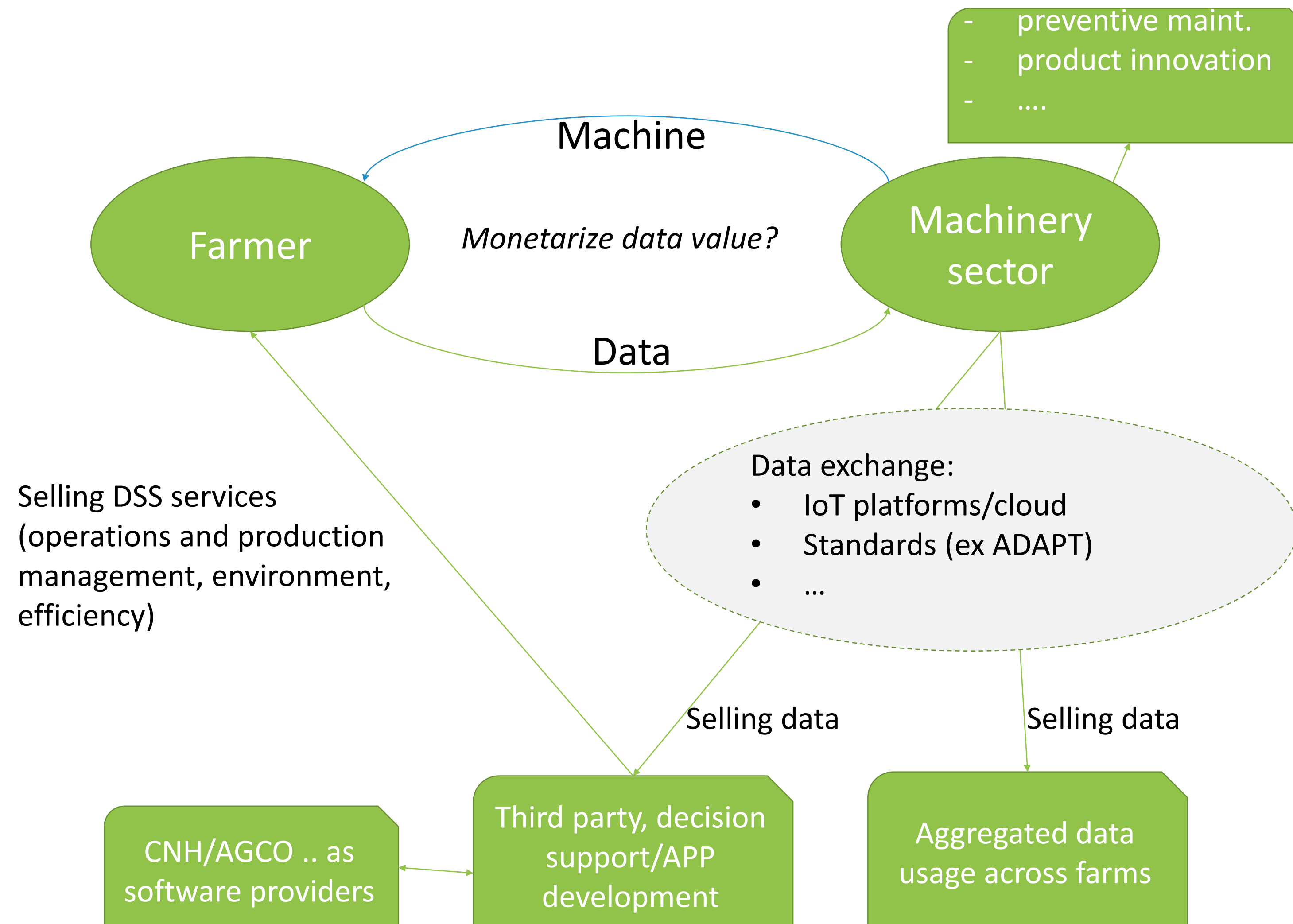


# Popular business models



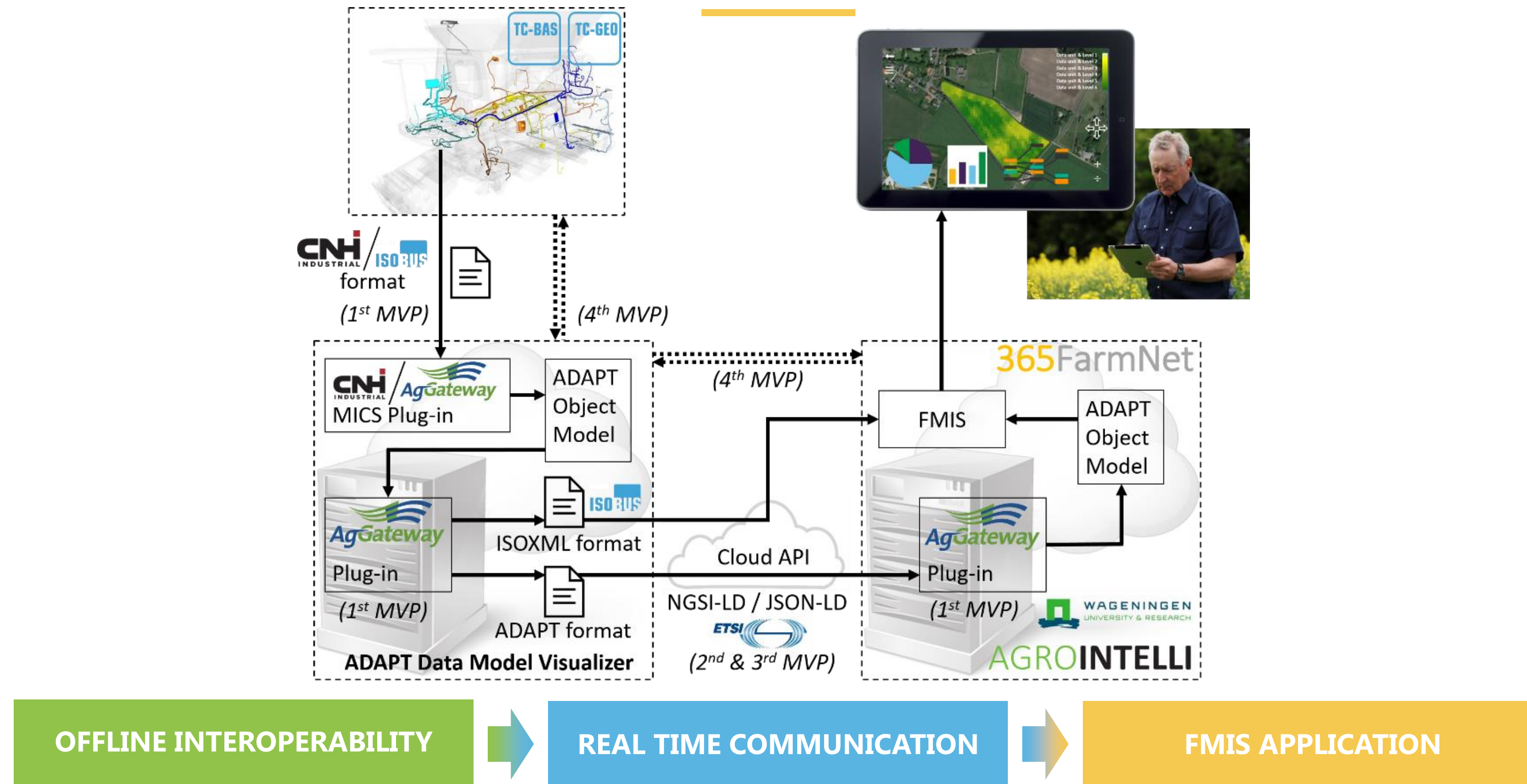


# Vision business models and ecosystems!





# IoT Product/Solution Impressions



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°731884





# New prospective benefits/business models

- collect data and measurement about the production -> agronomic input for management and promoting sustainability
- connecting agricultural data with their manufacturers -> predictive maintenance, guarantee claims..
- smart farming technologies will pave the way for autonomous systems (robots, self awareness, supportive IT systems, etc.)
- basic data sales - on-farm tests, product innovation, etc.
- vehicle data sent on-line valuable both for the vehicle value chain (dealers, insurance, complaint issues, etc.) and for external actors
- "Power/functionalities on demand" - on-line via apps and factory or dealer updates

# Key takeaway points

- Extending from electro/mechanics to ICT/IoT
- Extending from product focus to IoT platform business/services
- Change of company culture/mindset
- Technical challenges/connectivity
- Current workforce re-education/re-training
- Privacy/security
- Monetarization of data value/data ownership
- Multi-branded fleets/cross-domain scenarios
- Damage to the brand from IoT system failures
- Initial business failure due to initial small data samples



A black and white portrait of a middle-aged man with short, dark hair, wearing a light-colored dress shirt and a dark tie. He is looking slightly to his right with a faint smile. The background is a blurred outdoor scene with trees and a building.

**IOTWeek**

**KLAUS-HERBERT  
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Communication partner at 365FarmNet  
Network Manager bei CLAAS KGaA

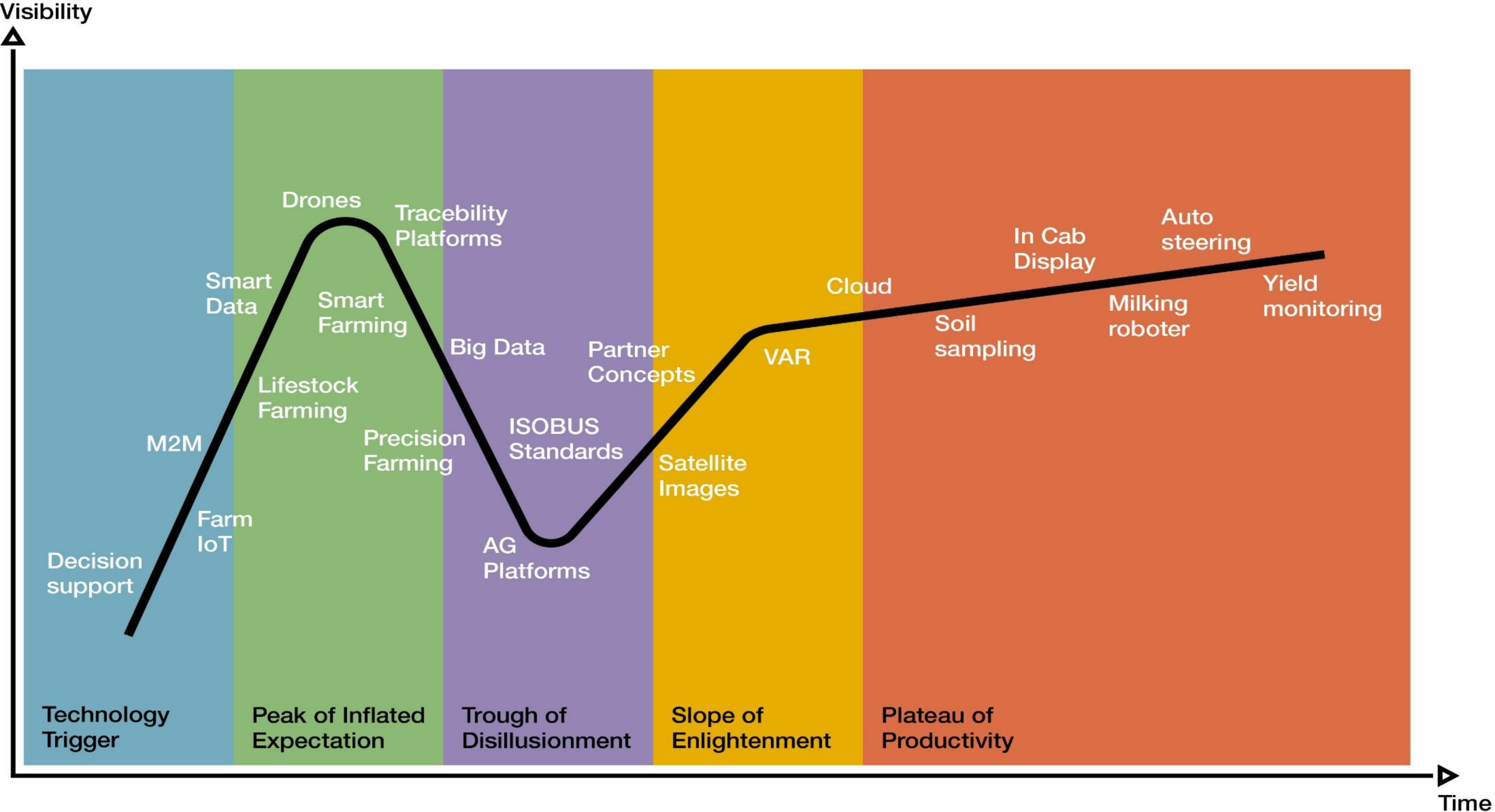
# IoT Deployment and Business Challenges for the Agri-Food sector

- what lies ahead?

Klaus-Herbert Rolf









# Technical challenge – Limitations





# Social challenges – Transparency





# 365 days a year from anywhere



**Automated documentation**



**Data entry and information by mobile device**



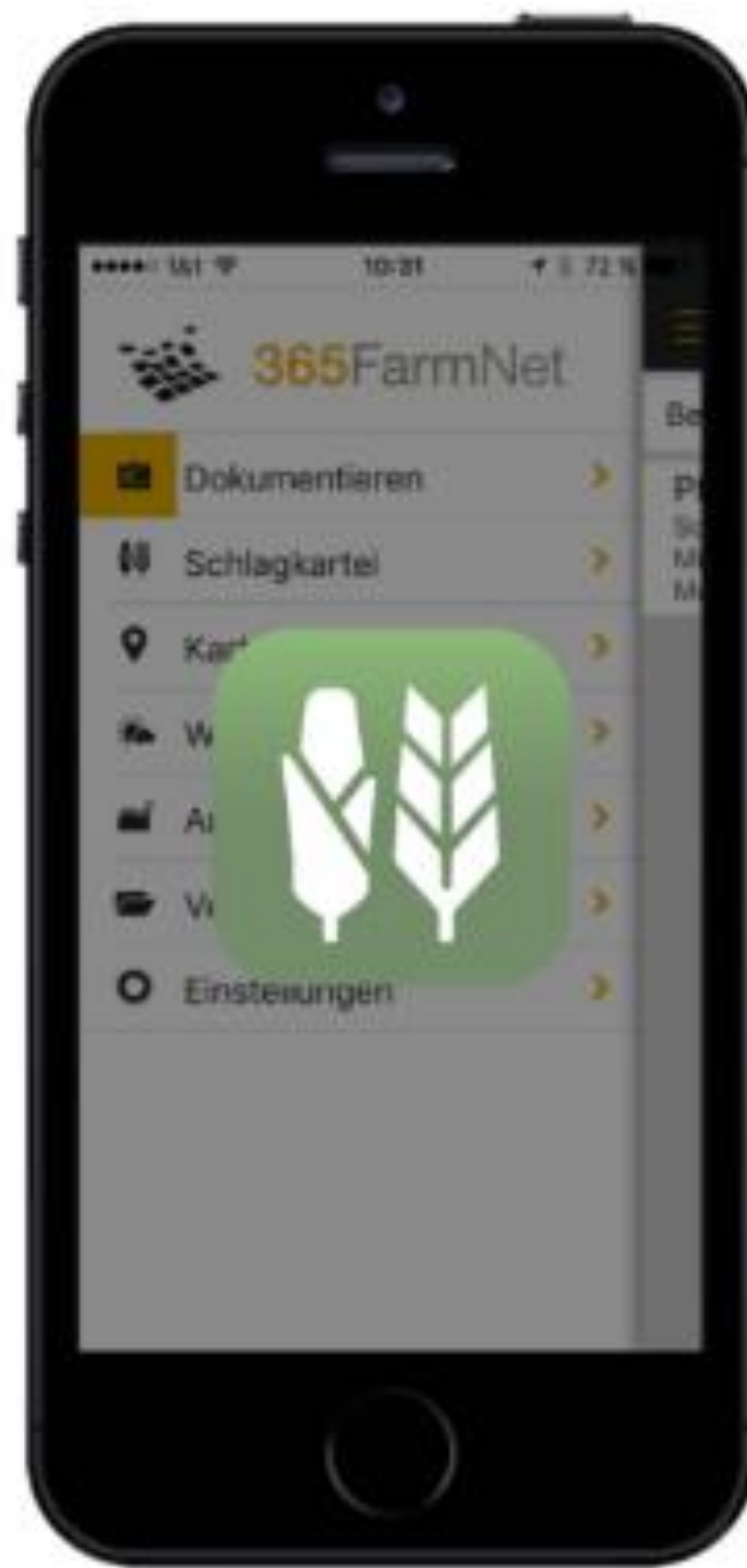
**Cross Compliance**



**Visualizing evaluations**



Data entry and information by mobile device –  
> 365FarmNet always at hand



365Crop App



365Cattle App



365Active App

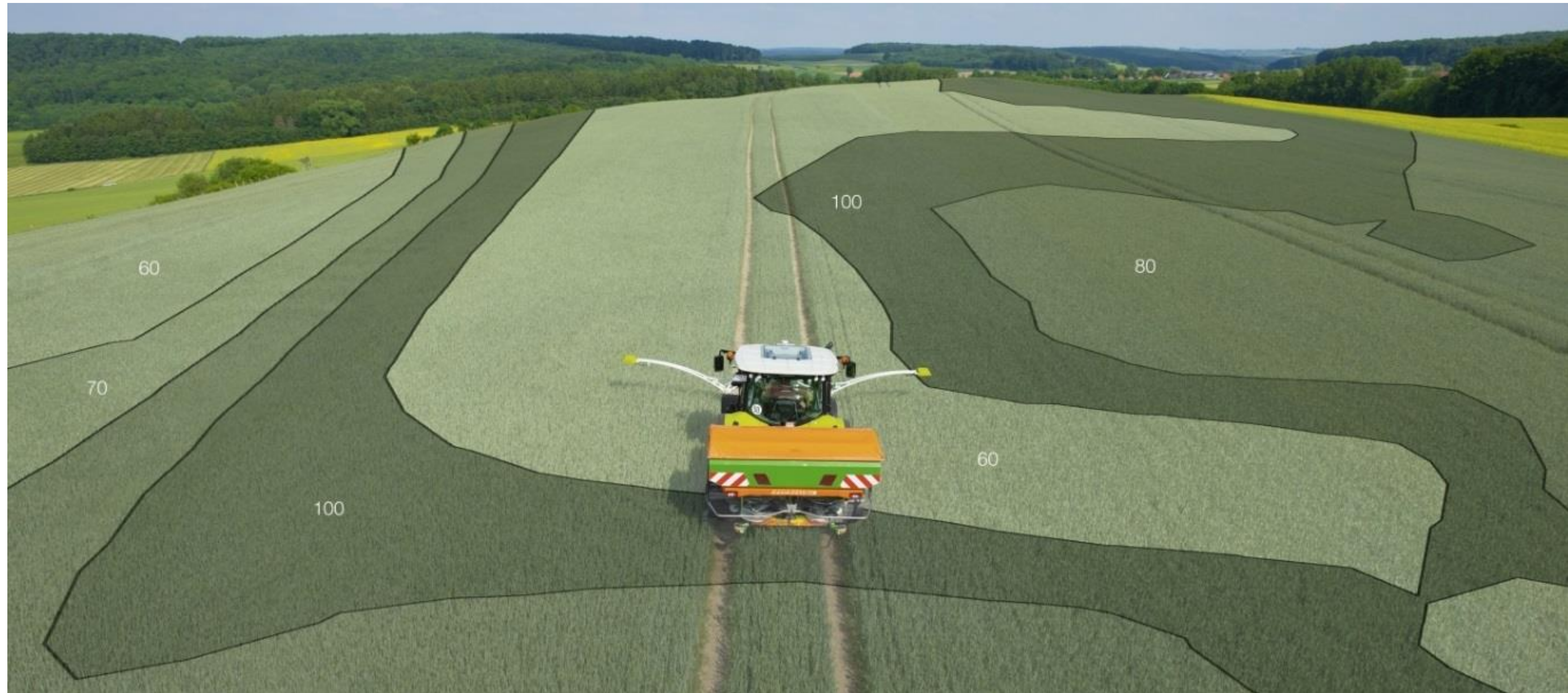


Visualizing evaluations –  
> Change the perspective





Visualizing evaluations –  
> Sensors – Reduce and optimize the input





# Component: Field optimization



365FarmNet [Register with 365Farmnet now](#) [Demo User](#) [Help](#)

[Manage](#) [Plan](#) [Document](#) [Analyze](#) [Shop](#) [Maps](#) [Calendar](#)

[My Farm](#) [Crops](#)

[Machines](#) [Fieldroute optimisation](#) [Precision Farming](#)

**Fields**

no.	Name	Area (ha)
<input type="checkbox"/> 13-01	Katzbachwieden-03	6.85
<input type="checkbox"/> 14-01	Brunnen-links	0.80
<input type="checkbox"/> 14-02	Brunnen-rechts	0.61
<input type="checkbox"/> 15-00	Hinterm Wald	1.00
<input type="checkbox"/> 54-00	Elisenhöhe	4.95
<input type="checkbox"/> 57-00	Husemann	4.74
<input checked="" type="checkbox"/> 58-00	East Field	12.00

Machine:

Headland width:

Working width:

Headland speed:

Working speed:

Create partfields: ☒

Display tracks: ☒

**CLAAS**

- Track
- AB line
- Field
- Partfield
- Headland

Kartendaten © 2017 GeoBasis-DE/BKG (©2009), Google Grafiken © 2017, DigitalGlobe, GeoBasis-DE/BKG, GeoContent Nutzungsbedingungen Ferner bei Google Maps melden

365FarmNet Version 12.0.7.9419.12.2016 - Copyright © 2013-2016. All rights reserved. Terms of service and privacy policy. Legal notice



# Result of a machine with a working width of 15 Meters



365FarmNet

Register with 365Farmnet now Demo User Help

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Maps Calendar

My Farm Crops

Machines Fieldroute optimisation Precision Farming

Fields

no.	Name	Area (ha)
13-01	Katzbachwieden-03	6.85
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14-02	Brunnen-rechts	0.61
15-00	Hinterm Wald	1.00
54-00	Elisenhöhe	4.95
57-00	Husemann	4.74
58-00	East Field	12.00

Machine: Slurry Tanker

Headland width: 15.00 m

Working width: 15.00 m

Headland speed: 8.00 km/h

Working speed: 8.00 km/h

Create partfields: ☒

Display tracks: ☒

Route results

Working time	1.12 h
Time in the field	0.71 h
Time in the headland	0.41 h
Area	11.11 ha
Number of turns	18
Route length	8.93 km

CLAAS

Track

AB line

Field

Partfield

Headland

Westenholzer Str.

Westenholzer Str.

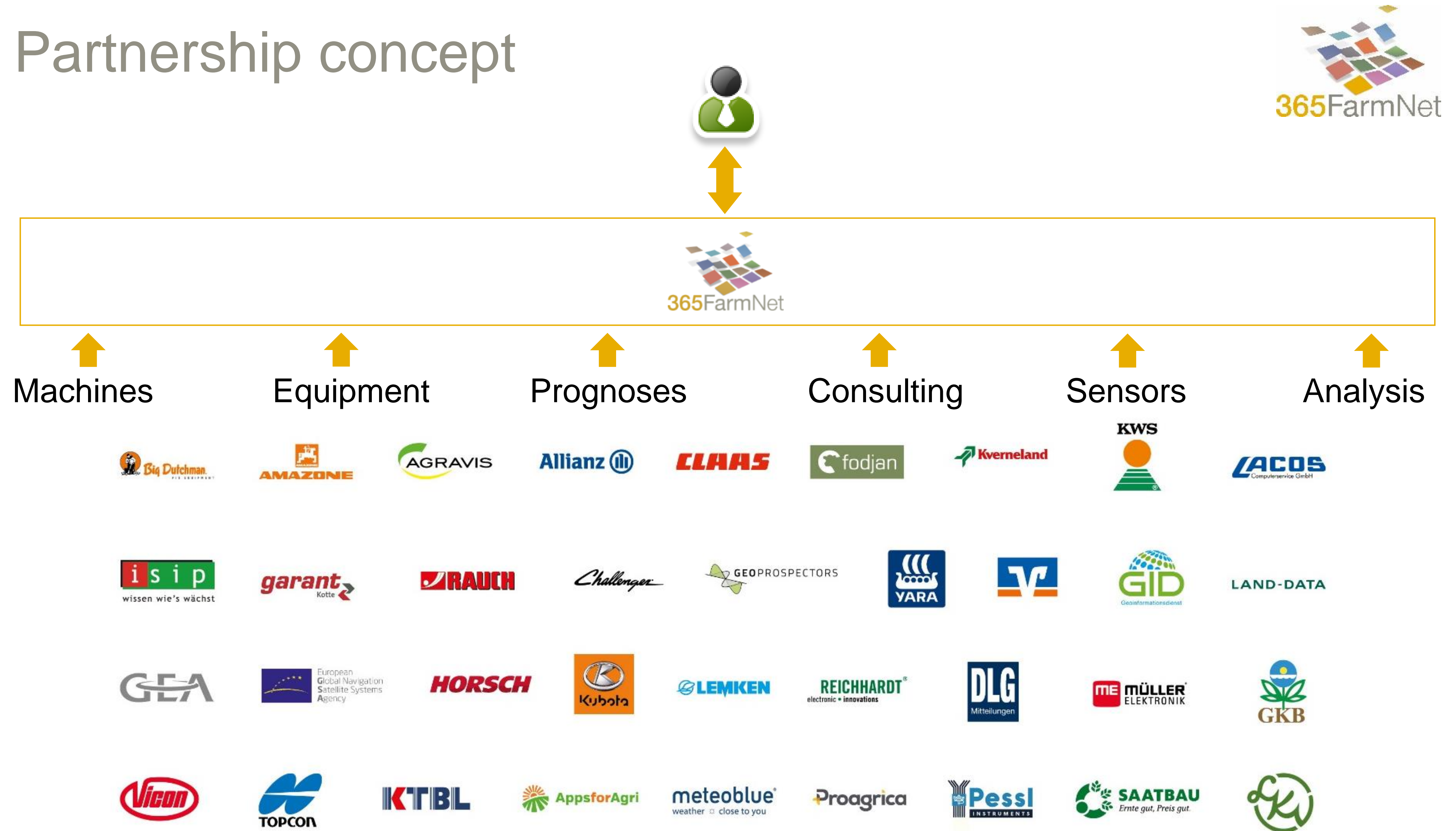
Westenholzer Str.

Kartendaten © 2017 GeoBasis-DE/BKG (©2009), Google Grafiken © 2017, DigitalGlobe, GeoBasis-DE/BKG, GeoContent Nutzungsbedingungen Fehler bei Google Maps melden

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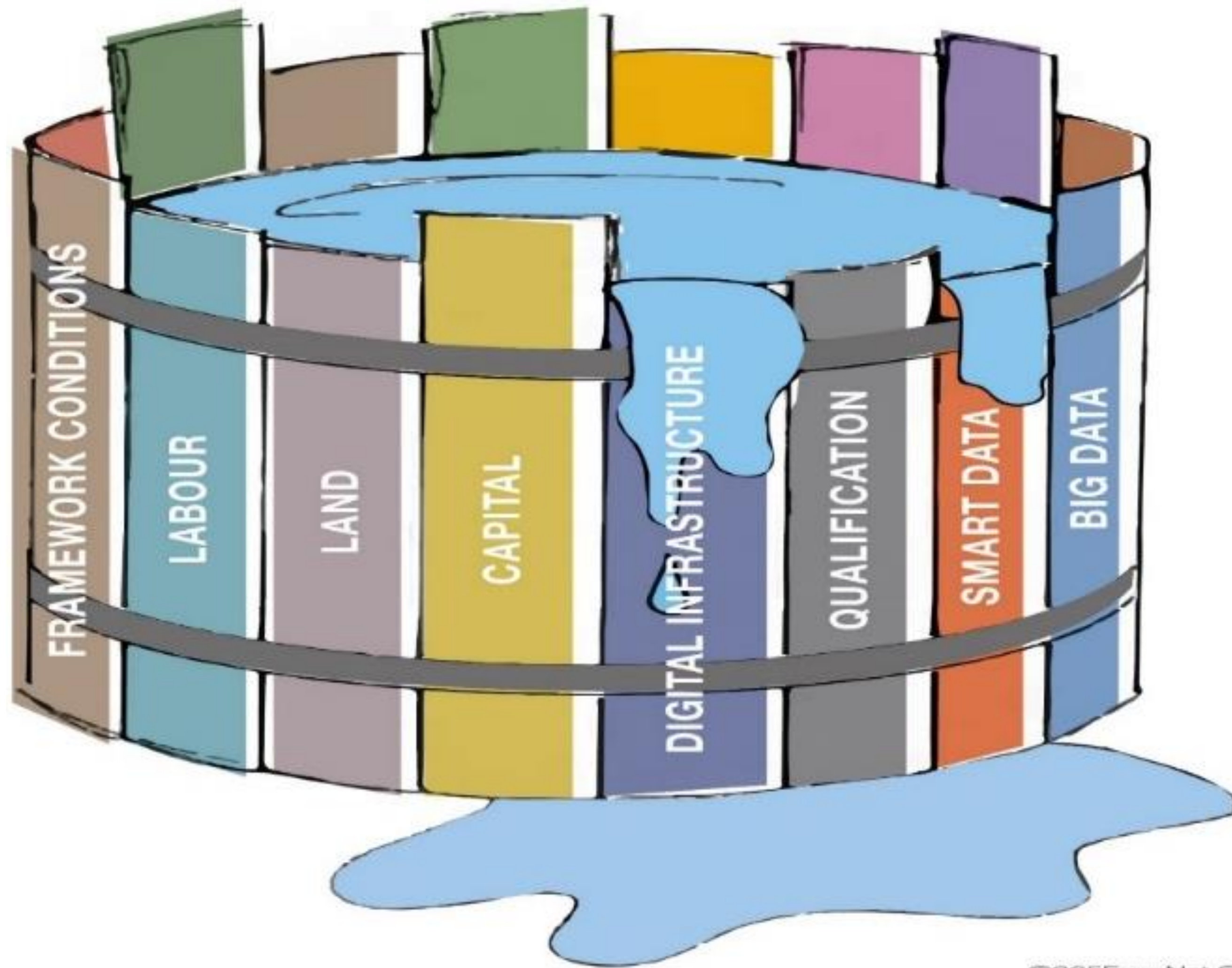


# Partnership concept





# Conclusion and future prospects



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# The challenge of the future: more intelligence on the m2











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# PANEL DISCUSSION



| LAST SLIDE

# THANK YOU!