The Internet of Food and Farm

Sjaak Wolfert (Wageningen University & Research), Harald Sundmaeker (ATB Bremen)

Extracting Value from Next General Digital Infrastructure, IoT week, Bilbao, 6 June 2018
Advancements in Farming

SMART SENSING & MONITORING

BIG DATA

SMART ANALYSIS & PLANNING

SMART CONTROL
Involving entire supply chain and beyond

Smart Farming
Tracking & Tracing
Smart Logistics

Consumer trends
Fitness/Well-being
Personalized
Domotics
Health
The battlefield of data in Farm & Food

Current issues and challenges

- Governance
  - privacy, security, trust, ...

- Business models
  - fair share, new opportunities

- Infrastructure
  - open versus closed

- Ecosystems
  - establishing critical mass, avoid lock-ins

...which are often intertwined!
A PUBLIC PRIVATE PARTNERSHIP IN IOT & AGRI-FOOD

SJAAK WOLFERT, SCIENTIFIC PROJECT COORDINATOR
**Internet of Food and Farm 2020**

Innovation Action: 2017 - 2020

30 M€ funding by DG-CNCT/AGRI

**Objective:**

Large-scale uptake of IoT in the European farming and food sector

- Business case of IoT
- Integrate and reuse available IoT technologies
- User acceptability of IoT
- Sustainability of IoT solutions
Conclusion – IoF2020 Architectural Process

- Ensure replicability, reuse and interoperability of IoT based ‘systems of systems’ validated in the 19+ IoF2020 UCs
Potential Functional view of an IoT Architectural Reference Model for identifying functional components

Hierarchical Layers

1 - Physical
2 - Network Communication
3 - Processing
4 - Storage
5 - Abstraction
6 - Service
7 - Application
8 - Collaboration & Process

IoT Architecture – Functional View

Physical Device Layer
Connectivity Layer
IoT Service Layer
Mediation Layer
Information Management Layer
Application Layer
AgriFood related Collaboration and Domain specific Processes

Management Capabilities

Privacy & Security
UC1.1. WITHIN-FIELD MANAGEMENT ZONING

Soil map based variable rate applications and machine automation in potato production

Coordinators: Peter Paree (ZLTO) & Corné Kempenaar (WUR)
Product Impressions

SOIL MAP SERVICE

VARIABLE RATE APPLICATION MAP

AUTOMATION & MACHINE COMMUNICATION
IoF2020 - Trial: The internet of Arable Farming

Use case 1.1: Within-field management zoning

Domain application areas addressed
Management zoning of arable fields; Crop protection; Yield prediction.
(Farming, Logistics)

Short description and location
Sensing and actuating devices are used to gather data, mainly related to potatoes, predict yields, define management zones, monitor and optimize growing potatoes' behaviour, optimize use of herbicides, and optimize farm management. (NL, DE)

IoT Applications
Weather forecast service, Growing crops, Akkerweb agro-eco algorithms; GIS, zoning and T&T modules; Control fertilize machines; Control irrigation systems; Measure soil temperature and water potential

IoT Platforms and Software
Initiatives and platforms: FIWARE, FIspace, EPCIS, AgroSense, Apache Cassandra, Apache Flink, Apache Spark

IoT Technologies and Standards
Lora Network, 365FarmNet, Zoner, Crop-R and Akkerweb platforms, Cloudfarm FMIS, ISOBUS.

IoT Devices
30 sensors for soil moisture, Veris soil scanner, machine control, yield sensors, indoor climate, crop quality, 4 weather stations, 3 GEO-localization units, NDVI Sensor

Partners
ZLTO (NL); Kverneland Group (NL); KPN (NL); Bayer CropScience AG (DE); Van den Borne Aardappelen (NL); Grimme Landmaschinen-fabrik GmbH & Co (DE); Wageningen University & Research (NL).

Architecture View

SW/HW Infrastructure
Cropfield sensors platform, Agriculture combination (e.g., tracktor), Manufacturer Cloud with cloud storage, FMIS Cloud, Prediction Model Cloud
UC2.2.
HAPPY COW

Keep your herd healthy with an artificial intelligence monitoring system

Coordinators: Niels Molenaar, Connecterra
Product Impressions
How IDA looks like in practice

Estrus insights
Health insights
Value chain integration
IoF2020 - Trial: The Internet of Dairy Farming
Use case 2.2: Happy Cow

Domain application areas addressed
Real-time 3D monitoring of dairy cow activity; Animal Health Management; Cow Fertility Management.
(Farming)

Short description and location
Improving dairy farm productivity through 3D cow activity sensing and cloud machine learning technologies.
(NL)

IoT Platforms and Software
Base Station Device oData, Connecterra IoT platform, connection to 365FarmNet.

IoT Applications
Cloud-based decision support system, analytics cow centric behaviour, prediction algorithm; Control transport; Control cow daily growth; control health conditions; environmental sensing

IoT Technologies and Standards
XMPP-IoT, HTTP, Sub-1GHz, BLE, 6LoWPAN

IoT Devices
500-700 neck/leg transmitters with accelerometer RF sensors for dairy cow activity in 3D space 50-60 intelligent routers; 1 Accelerometer per animal; MEMS Temperature, Humidity, and Pressure sensor per animal and farm; BLE sensor per animal

SW/HW Infrastructure
Cloud Service Platform (Data Storage, Business Intelligent dashboard, Fusion Service Engine), Farm Server (IoT Dashboard, IoT adapters, local data storage, IoT Middleware); Sensor platform; Climate Control Platform

Partners
Connecterra (NL); Wageningen University & Research (NL); ZLTO (NL); VetEffect (FI), 365 Farmnet (DE)
OPEN CALL ‘NEW INNOVATIVE IOT USE CASES’

Challenges

1. New regions
   - Eastern and Northern Europe
   - Re-use existing use cases

2. Post-farm and other sectors
   - From farm → supply chain (logistics, processing, retail, consumption)
   - Other crops, animals, etc.

Important Information

- **Multi-actor** use cases (no single-parties!)
- **IoT value chain** (tech providers, service integrators, end-users)
- Business/organizational aspects
- Total budget: 6 M€; per use case 300-500 k€
- See: www.iоф2020.eu/opencall
Thank you for your attention!

More information:

sjaak.wolfert@wur.nl

nl.linkedin.com/in/sjaakwolfert/

Twitter: @sjaakwolfert

http://www.slideshare.net/SjaakWolfert