Agriculture Data Space
Event 6 September 2022
SAVE THE DATE
REGISTER NOW
Fair data economy in agriculture

Marko Turpeinen – 1001 Lakes
Smart Farming 2030 Roadmap for Finland

Technical means for data usage control

Fair rules for data ecosystems
Implementing Fair Data Economy in Agriculture

- Develop tools that promote the digitalisation of farms and agriculture towards a fair data economy.
- Project funded by the Finnish Ministry of Agriculture and Forestry.
- Create a fair data economy rulebook model for the agricultural sector, which will also be applied to the use cases addressed in the project.
- Co-development with stakeholders.

**Data utilization**

**Farming processes**
- Biological processes
- Operational practices
- Markets and business environment
  - Situational awareness, control, automation, autonomy, continuous improvement
  - Focus on effective primary use of data

**Business processes and ecosystems**
- Farm - Tech provider
- Farm - Farm
- Farm - Producer
- Farm – Consumer
  - Joint value creation
  - Verifiability, traceability, transparency
  - Collaboration and trust
  - Focus on secondary uses of data

**Rules and policies**

- Data sovereignty
- Right to control the data use
- EU CoC for Data in Agriculture
- EU regulation (including Data Act)
- Data agreements
- Technical data usage control mechanisms

**Data sources**

- The quality of raw data by primary use
- Processing and manipulation of data for secondary uses
- Metadata descriptions
- Effective use of FAIR principles (findable, accessible, interoperable, reusable)
Fair Data Economy Rulebook

Valued Grain Chain

The service bus routes the data, delivers it reliably to the destination, registers events and monitors (Cinia).

Co-creation with consumers

Data Collection / farms

Cloud Services

IM = Integration Module
Sends, receives, encrypts and decrypts data

Grain buyers

Customer farms

Hedåkers Säteri

Knehtila Farm

Simila Farm

Vilja-tori.fi

Grain ePassport

Grain Sense

Data-Växt

Agri-Smart

Agro-Intelli

Other AgTech

The coordinators are Luke and AgroVäst
Use Case: Farm planning and logistics

Data sharing matrix

- Strong focus on fair use of IoT data, and link to the forthcoming EU Data Act
- Finalised rulebook (business, legal, technology, ethics) used as a basis for other agrifood business cases
AgriFood Data Space Finland

- Finnish initiative covering broadly the AgriFood sector
- More than 50 committed participants
- Developed as Gaia-X compliant data infrastructure

AgriFood Data Space

Connecting platforms, services, data storages, apps, IoT systems and sensors to a data space where data connections are easy and cost-efficient to establish data flows – also for cross-sectoral data flows.
Thank you!

marko.turpeinen@1001lakes.com
Agri-Gaia

Prof. Dr. Stefan Stiene – University of Applied Sciences Osnabrück
Agri-Gaia & GAIA-X

• Agri-Gaia is a GAIA-X Use-Case in the German GAIA-X hub
• We build dataspace to exchange datasets, AI-models and AI-services in the agrifood domain.
• Goal: **Ease the development and application of AI in the agrifood domain.**
Agri-Gaia Goals

• Agri-Gaia creates an open **infrastructure** to easily bring AI innovations to the agriculture and food industry
• Agri-Gaia provides a **marketplace** and connected (modular) **platforms** using GAIA-X principles
• Agri-Gaia defines a common **vocabulary** and defines standards for semantic description of digital assets
• Agri-Gaia enables cross-enterprise **collaboration** while providing **protection** of trusted digital assets
• Agri-Gaia brings relevant stakeholders together and is an enabler for productive collaboration and integration of AI in practice
Who are the participants of the Agri-Gaia dataspace?

**Persons involved:**
- Data provider
- Data scientists
- AI-developer
- AI application engineers

**Organisations involved:**
- Agtech-companies
- Food companies
- Research institutions
- Data hubs
- FMIS manufacturers
- ...
### Agri-Gaia consortium

**Agricultural machinery**
- garant Kotte
- AMAZONE
- CLAAS

**Platform development partner**
- LMIS
- BOSCH

**Food industry**
- WERNINGS

**Research**
- DFKI
- AgBRAIN
- Hochschule Osnabrück
- AGROTECH VALLEY FORUM

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<thead>
<tr>
<th>Netzwerkpartner</th>
<th>Numerous partners (~40) from industry, research, and government with an interest in the Agri-Gaia ecosystem</th>
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What are the technological options currently available in GAIA-X?

- (To the best of my knowledge) There is no GAIA-X compliant off the shelf implementation yet.
- Several technologies are discussed in the context of GAIA-X that are working towards enabling a GAIA-X compatible dataspace.
Agri-Gaia will use the Eclipse Dataspase Connector (EDC)

- We choose the EDC.
Agri-Gaia will use the Eclipse Dataspace Connector (EDC)

Data management and AI-platform used by Org1

Data management and AI-platform used by Org2

Frontend
Beside semantic participant description,... (like in any other GAIA-X dataspace)
We deal with:

- Semantic labeling of images
- Semantic technologies for metadata description
Agri-Gaia Use-Cases

- Agri-Gaia has 9 Use-Cases that show the application of the Agri-Gaia infrastructure.
Agri-Gaia & synthetic datasets

- Agri-Gaia evaluates synthetic training data in the AI-development loop.
Thank you!

Prof. Dr. Stefan Stiene
s.stiene@hs-osnabrueck.de
Zero Waste
Systemic Innovations Towards a Zero Food Waste Supply Chain

Simon Dalmolen – TNO
Scope

- About 20% of the food produced in the EU goes to waste!
- 36.2 million people in the EU cannot afford a quality meal every second day (Eurostat, 2020).
- ZeroW directly addresses the challenge of food loss and waste (FLW) by developing and testing a synergetic mix of innovations in real life conditions with the aim to deliver ambitious reductions at all stages of the food value chain from post-harvest to consumption.
Facts about ZeroW

Type of action: IA
Project period: 1 January 2022 – 31 December 2025
Total budget: € 12,932,881.25
Project consortium: 46 partners from 17 countries

Funded under:

SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy

Grant agreement no. 101036388
Systemic Innovation Living Labs (SILLs)

- The methodology that ZeroW uses to coordinate our multi-organizational innovation process is the Living Lab approach.
- It is focused on a **systemic co-creation methodology** that involves the full scope of food chain actors and beyond: introducing social and governance dimensions to industrial partners in a real-life setting.
- ZeroW has built up 9 real-life Living Labs embedding systemic innovations with the potential to lead to fundamental societal changes in both social dimensions (values, regulations, attitudes) and technical dimensions (infrastructure, technology, tools, processes) and, most importantly, in the relations between them.
Architecture of open-source ZeroW platform
• ZeroW will establish the 0FLW Dataspace by supporting semantic interoperability in the SILLs and supporting scaling through adoption of IDSA standards and methodologies. And towards GAIA-X
• A federating catalogue of compliant data sources will be set up and managed.
• ZeroW will set up the 0FLW Dataspace, its catalogue, governance and collaborative business models, starting with and between the SILLs as well as with the existing relevant Data Spaces and data sharing initiatives and developments.
• ZeroW will also make available a Catalogue of demonstrated and 0FLW DS compliant intelligent technologies for 0FLW applications.
ZEROW Data Space

- Identification
- Authentication
- Authorization
- Secure data exchange
- Governance
- Interoperability
- Business & IT services
- Vocabulary, metadata & discovery
- Provenance & traceability
- Identification
- Authentication
- Authorization

Governance
Interoperability
Vocabulary, metadata & discovery
Secure data exchange
Provenance & traceability
Identification
Authentication
Authorization
More information

• zerow-project.eu
• linkedin.com/company/zerow-project

Thank you!

Simon.Dalmolen@tno.nl
Agro-Meteo real-time data collection over 26,000ha in Romania
SysAgria Sensor Mesh Network

Hannelore Valkanov – Syswin Solutions
<table>
<thead>
<tr>
<th>The Farm</th>
<th>26.000 ha</th>
<th>26 SYSAGRI A</th>
<th>17 sensors</th>
<th>Technology</th>
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<tbody>
<tr>
<td></td>
<td>Corn, Wheat, Soy,</td>
<td>Monitor 150.000 ha</td>
<td>Microclimate &amp; Soil parameters</td>
<td>GPRS and LoRa and Nb-IoT</td>
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<td>Sunflower</td>
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<th>Data sampling</th>
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<td>15/60 minutes</td>
<td>Azure Microsoft</td>
<td>2020-2022</td>
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</table>
Data Interpolation

Temperature Map

Precipitation Map
The Solution

Real time ALL-IN-ONE system

HARDWARE
- Meteo Module
- Pest & Pathogen Alert Module
- Soil Analysis Module – SysCrop NPK

Irrigation & fertilizer dosage recommendation correlated with yield estimation

SOFTWARE
- Complex agro-mathematical models
- Big data analysis
- AI

FUNCTIONS
- Real-time field data collection with sensors
- Data input from the experimental field by the farmer
Decision Support

- Real-time alerts for pests and pathogen occurrence
- Algorithm corrections based on field feedback
- Yield estimation reports
- Reports of the NPK assimilation rate
- Soil health by monitoring the NP-Balance
Why will farmers want to use SYSPEST ALERT & SYSCROP NPK?
It’s **EASY**

**EASINESS**
Easy to understand and use as a decision support platform

**AFFORDABILITY**
Financeable through different programs

**SUSTAINABILITY**
Reduction of agrochemical waste, water waste in line with the Green Deal directives

**YIELD POTENTIAL INCREASE**
Yield estimation and intervention recommendations throughout the crop cycle
Discussion Panel, Data Space Today

Stefan Stiene - Professor, Hochschule Osnabrück
Simon Dalmolen - Senior Researcher, TNO
Doris Marquardt - Programme Officer, European Commission, DG AGRI
Hannelore Valkanov - Founder, SysAgria
Marko Turpeinen - CEO, 1001 Lakes
Natalie Bertels - Valorisation Manager, imec-CiTiP-KULeuven
Daniel Azevedo - Director of Commodities, Trade and Technology, Copa-Cogeca

Jurgen Vangeyte – Moderator
Cooperation of Agdatahub & Djust Connect
From regional data spaces towards a federated European dataspace

Sébastien Picardat – Agdatahub (CEO)
Jurgen Vangeyte – ILVO / Djust Connect
A very large amount of **heterogeneous, competing, non-interconnected and sometimes inaccessible data**, scattered among the partners of the farms

**Similar needs** for sharing data between stakeholders

**Similar use cases**: Traceability, grain logistic optimization, carbon credit valorization...

**New role of data intermediary (DGA)**

<table>
<thead>
<tr>
<th>Number of actors involved</th>
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<tbody>
<tr>
<td>Farms</td>
<td>10 000 000</td>
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<tr>
<td>Farm partners</td>
<td>500 000</td>
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</table>
Horizon Europe project

Goals
To improve the data economy for food systems by expanding its definition, mapping its development, performance and impact to create new insights and opportunities.

Case study « Agdata interoperability »
Explore the possibilities offered by the GAIA-X, for compliance, sovereign data exchange and federated access under different data sharing architectural patterns (centralized and decentralized).
Multi-level objectives

Technical
Investigate and promote the possibilities offered by the GAIA-X for decentralization and federation of the services but also support the connection with the GAIAX working group for agriculture.

Business
Investigate business models to allow data intermediaries to cooperate.
Explore ways to support data providers in determining the value of their data.

Governance
Explore the opportunities of a federated governance structure under different data sharing architectural patterns (centralized and decentralized) that will define the scope, the openness, the technical interfaces and the 'federated' services.
The case study ecosystem: Network of regional data intermediaries
Implementation of use cases

Agricultural use cases in progress
- Origins of feed for the dairy herd
- Traceability for the French maize sector
- Grain logistics optimization
- Soybean industry in France
- Plant health surveillance
- Weather data standardisation

Potential use case
- INPUTS: plant and animal sectors
- Agricultural practices and traceability
- Upstream agricultural: traceability of veterinary drugs
- Precision agriculture: IOT and Decision Making Tools
- Agricultural machinery: expand the scop of Isobus system
- Pilot, buildings and environmental parameters
- Unique farm identification
- Plant and animal productions and bioeconomy
Exploiting Agri data in an Alpine use case

Raffaele Giaffreda – Fondazione Bruno Kessler (FBK)
Alpine Agri Data Use Case: the contextual background

- Apple orchards, vineyards
  - water management
  - frost protection
  - incentivising virtuous behaviours
Agricultural water use in a mountain context

- many stakeholders: water management consortia, farmers, agtech providers, energy (water-based electricity generation), tourism (water reservoirs interests)
Huge savings potential

• Water balance for tree crops is a moderately complex problem – yet, potential for huge savings

• Individual – AI leveraging data aggregation

• Collective – data for supporting cross sectorial policies

• Innovative use of cross-application data collection:
  • incentive-based system based on blockchains and smart contracts rewarding water savings based on water value set by stakeholders
Incentivising virtuous behaviours

Interoperable and shared data access enables multi-stakeholders monetisation of virtuous behaviours...
Further extensions to the concept

• Extensions to sustainable farming practices is one (few) step(s) / sensor(s) / dataspace(s) integration away...
  • DATA: Irrigation, pesticides, energy, CO2 emissions etc.
  • USAGE: Risk management, incentives, CAP subsidies, traceability for quality labelling (i.e. POD, PGI)

• Strategy: background monitoring with no impact on operational farm business

• Tragedy of commons and what data is shared: producing evidence of virtuous behaviours
Thank you!
Contact details: 
Raffaele Giaffreda
rgiaffreda (at) fbk.eu
National farm management platform (data-centric decision support services for farm management)

Maciej Zacharczuk – Project leader
Greater Poland Regional Agriculture Advisory Center
Advisory and Decision Support Online Platform for Integrated Plant Protection

Project period
from 1 June 2019 to 31 Oct 2022

Founding
Digital Poland Program for 2014-2020,
E-administration and open government axis
Main strategic objective

Develop of a national IT system for plant protection by **31.10.2022** including 4 public e-services:

- Virtual farm
- Tracing the origin of products labelled as originating from agriculture and plant protection products used
- Risk reporting
- Sharing meteorological data
Partners

Consortium: 19 partners

Bio Scientific coordinator

Main coordinator

ICT coordinator

Advisory organising coordinator

All regional Public Agriculture Advisory Centres in Poland

Under Ministry of Agriculture

Pilotaże, testy
• **Meteorological data sharing** – a service that enables the acquisition of meteorological data, crucial for agriculture and rural areas, aggregated to the local level;
  *recipients: local authorities, public and scientific institutions, others (launched 4 June 2022)*
• **Virtual farm** – the service will address a multicontextual issue related to problems identified by crop protection users;
  *recipients: farmers (launched 4 June 2022)*
• **Tracing the origin of products** labelled as originating from agriculture and plant protection products used;
  *recipients: consumers (scheduled to be operational by 31 October 2022)*
• **Risk reporting** – a service enabling the generation of reports, both in tabular and graphical form;
  *Recipients: public administration, scientific institutions, local authorities (scheduled to be operational by 31 October 2022)*
FARMER <-> ADVISOR COOPERATION

Virtual farm

advisory

Common data

Advisor backoffice
Advisory platform

The system is developed as many services, by integrating directly with the information broker or through an indirect interface.

KAFKA - information broker
Stores the states of the objects

Identity Providers

Mobile apps
Web Apps

CENTRAL SERVICE, METEO SERVICE
CENTRAL SERVICE 2
CENTRAL SERVICE 3

SERVICE X
SERVICE Y
SERVICE Z
Stations in numbers:

- **Current state**: 549
- **During the integration**: 63
Public access, provided on the edwin.gov.pl website and includes:

- Map of stations
- Location of the nearest stations
- Tabular data in several time aggregates
- Export to file

A software interface (API) for data capture by institutions is currently under development
## Integrated data

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<th>No</th>
<th>Data and service source</th>
<th>Institution</th>
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<tbody>
<tr>
<td>1</td>
<td>Service and database of pest and disease threats</td>
<td>Institute of Plant Prot.</td>
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<td>2</td>
<td>Plant protection products, labels of plant protection products</td>
<td>Ministry of Agriculture and Rural Development</td>
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<td>3</td>
<td>External agri-meteo data</td>
<td>Meteorological institute and others</td>
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<td>4</td>
<td>Registered varieties of arable crops</td>
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<td>Meteo prognosis</td>
<td>ICM</td>
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<td>6</td>
<td>Farm and plots data</td>
<td>Payment agency</td>
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DSS and pest risks

Agrophage models currently available:
- Potato late blight
- Potato beetle
- Beet weevil
- Pests in beets
- Horsetails in cereals
Virtual farm

digital mapping of the farm
fields, their boundaries
crops, field cards
planning, crop management, agrotechnical measures
Meteorological data, pest risks, decision support in plant protection
advisor mentoring
Virtual farm

Applications for farmers

WEB – web browser

MOBILE - Android and iOS
The eDWIN system is designed as a platform:

- Interoperable
- Fully open
- Based on OpenSource standards

Planned:

- To expand the system with further modules
- Providing space for other applications within the platform

*By basing the system concept on modules that are fully independent of each other, maintaining the openness of the entire platform will be significantly simplified.*
Open architecture and complementarity with other projects

ROLNIK.GOV.PL
Thank you!

Maciej Zacharczuk
Wielkopolska Agriculture Advisory Centre in Poznan
Project Manager
maciej.zacharczuk@wodr.poznan.pl
phone +48 723 678 001
Applying Gaia-X to Agriculture Data through the UdL Science and Research Portal

Roberto García – Universitat de Lleida (UdL), Spain
• Agricultural digitalisation requires **lots of data**
• **Reluctances:**
  • Insecurity, lack of transparency, power unbalances, no perceived benefits...
• Mandatory sharing or auto-regulation, **codes of conduct**
• “EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement”, 2018
  • **Originator:** generates data as a result of its activity, even if commissioned its collection (e.g. farmer)
  • **Originator Rights:** to **control** data use and **benefit** from it
    • Sharing should be explicit, express, and informed
• Code of Conduct is not enough:
  • Combine it with regulatory and technical means to scale agriculture data sharing —> EU Data Spaces initiative

• Key features of a common European data space:
  • A secure and privacy-preserving infrastructure
  • Trustworthy data governance mechanisms
  • Data holders control who can access their data
  • Data reused against compensation, including remuneration, or for free
  • Open participation
• Enable **technical control** over the data and **require consent** for data usage, while **preventing centralisation**

• Compute-to-Data (CtD), Trusted Execution Environments (TEE), Blockchain and Self-Sovereign Identity (SSI)
  - **Control** — data remains on premises or on trusted environment, *computation goes to data* and extracts value without revealing data, and just *after explicit consent*
  - **Ownership** — cryptography provides *technically guaranteed* data self-sovereignty
  - **Transparency** — data transactions *recorded* on blockchain, *linked* to actors who sign them and, thus, *non-repudiable* and *auditable*
Current Work: Blockchain-based technologies enforcing ownership and privacy

UDL Science and Research Portal
An open research and science platform following the principles of findability, accessibility, interoperability and reusability.

Compute-to-Data: Privacy/Ownership "by design"
• Farmers share **pigs weighing pictures**, including scale digits
• Researcher use pictures to **train** an automatic weighing algorithm
• Farmers have access to **automatic weighing algorithm**
Algorithm Execution

For using this dataset, you will buy 1 TURCOR-87 and immediately spend it back to the publisher and pool. Additionally, you will buy 1 QUIHE-5 algorithm and spend it back to its publisher and pool.

If you consume a service offering, your wallet address and public key will be stored permanently on-chain on the Gaia-X testnet. For more information, please refer to our [privacy policy](#).

Your Compute Jobs

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<td>show details</td>
<td>1 day ago</td>
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• Inspiration from **EU Code of Conduct**, using **Gaia-X** to scale it while technically facilitate:
  • Data sovereignty, ownership, trust
  • Fair compensation

• Align with **Legal Framework**:
  • Data Governance Act, Data Act, Artificial Intelligence Act,…

• Consider **ethical aspects**:
  • Value Sensitive Design

• Explore **governance** opportunities to **empower weaker** players:
  • Data Cooperatives, Trusts, Unions…
  • …or Decentralised Autonomous Organisations (**DAOs**)
Thank you!

Roberto García (roberto.garcia@udl.cat)
Session 2 Discussion Panel, Data Space
Tomorrow

Roberto García - Associate Professor and Deputy Vicerector for Research and Transfer, Universitat de Lleida
Daniel Azevedo - Director of Commodities, Trade and Technology, Copa-Cogeca
Raffaele Giaffreda - Chief IoT Scientist, FBK
Sébastien Picardat - CEO, AGDATAHUB
Jelle Hoedemaekers - Expert ICT Standardisation, Agoria;
Doris Marquardt - Programme Officer, European Commission, DG AGRI
Maciej Zacharczuk - Project leader
Greater Poland Regional Agriculture Advisory Center

—

Jurgen Vangeyte – Moderator
Thank you!

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