IoT Week
20-23 June 2022, Dublin, Ireland

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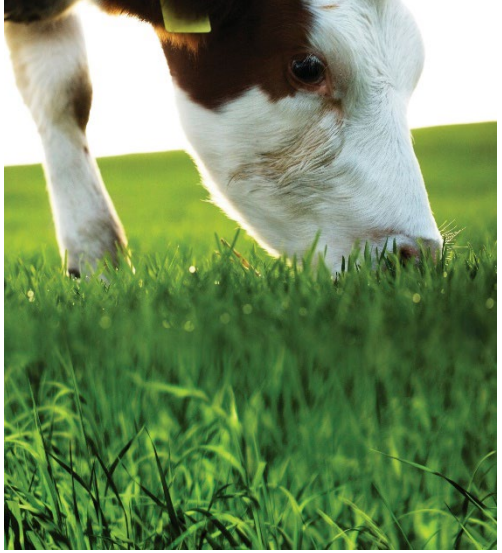
DEMETER
Data Driven Innovation in the Agrifood sector





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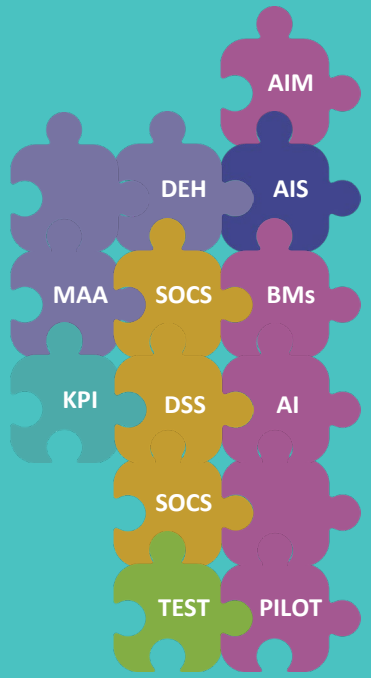
European Union
European Regional Development Fund

European Commission
Horizon 2020
European Union funding for Research & Innovation

DEMETER Objectives and Assets



Objective 1: Adopt and enhance existing **Information Models** in the agri-food sector easing **data sharing and interoperability** across multiple IoT systems and FMIS and associated technologies 1

Objective 2: Deliver an **Interoperability Space** for the agri-food domain and using a core set of **open standards** coupled with **security and privacy** protection mechanisms 2

Objective 3: Empower the **farmer to gain control in the data-food-chain** by identifying a series of new IoT-based, data-driven, business models 3

Objective 4: Establish a **benchmarking mechanism** for agriculture solutions, targeting end-goals in terms of productivity and sustainability performance 4

Objective 5: **Reverse the relationship with suppliers**, where suppliers are responsible for ensuring that a final solution is **optimal** to the farmer's needs 5

Objective 6: **Demonstrate the impact of digital innovations** across a variety of sectors and at European level 6

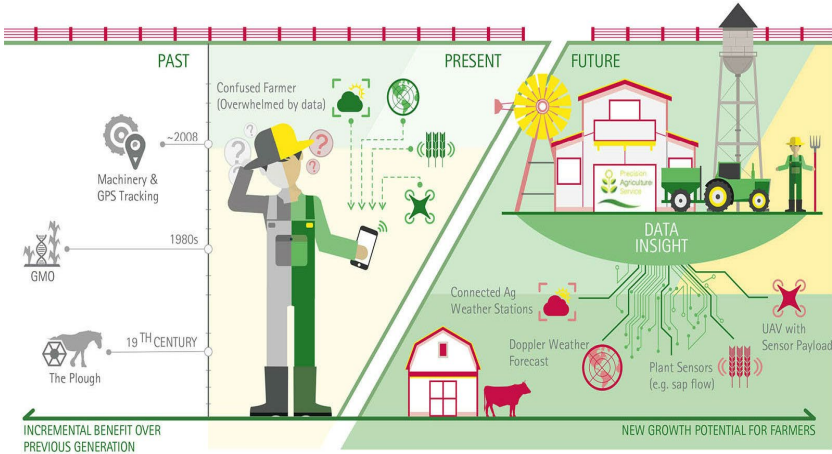
AgriTech Interoperability challenges

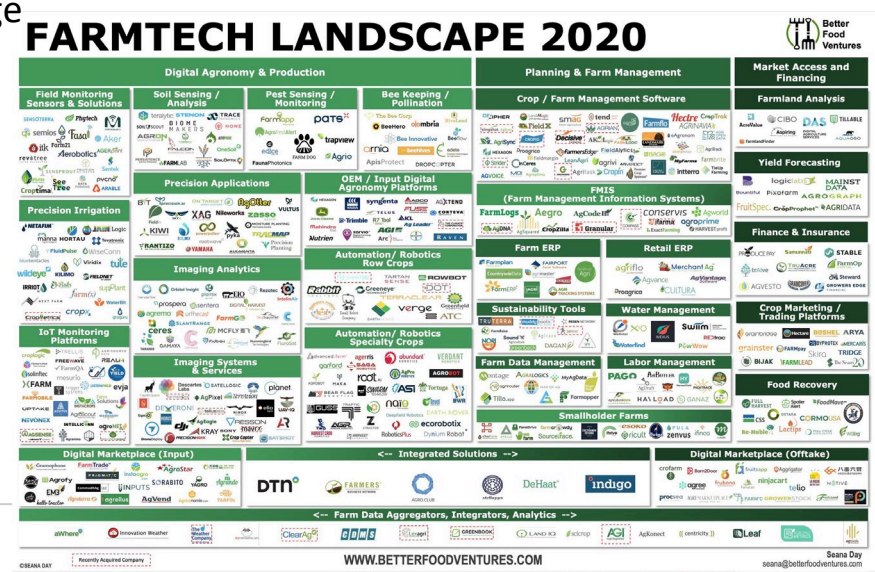
The rapid advances of IoT technologies, AI and Big Data, among others, have boosted the adoption of smart farming practices.

This, however, has led to an explosion of data, generated by a wide range of different systems and platforms that rarely interoperate.

Some of the key challenges hampering the seamless exchange and integration of the data produced or collected by those systems include:

- Availability of data in different formats and represented according to different models
  - heterogeneity of data models and semantics used to represent data
  - lack of related standards dominating this space
- Insufficient interoperability mechanisms that enable the connection of existing agri-food data models





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DEMETER's response to data interop challenges: Agricultural Information Model (AIM)

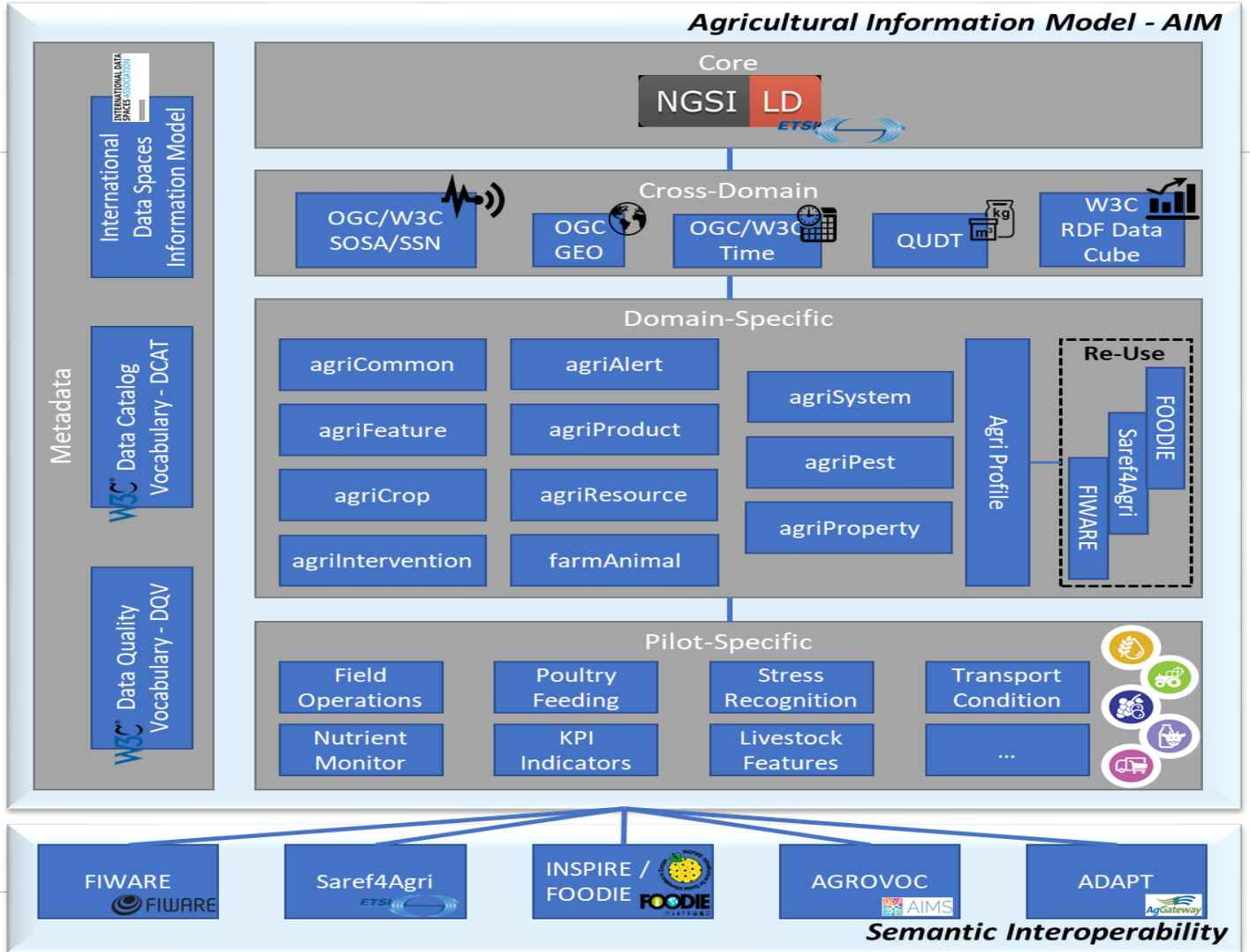
AIM consists of 5 main parts:

- Core meta-model
- Cross-Domain ontology
- Domain-Specific ontologies
- Pilot-Specific ontologies
- Metadata Schema

Layers of the DEMETER Agricultural Information Model (AIM)

AIM layered approach facilitates:

- interoperability with existing models
- alignment with other models, by module instead of the whole model
- extension of the domain/ areas covered in AIM with additional modules
- maintenance/update of the domain model, by modifying only specific module
- mapping to top-level/cross-domain ontologies



Types of data represented via AIM (I)

AIM represents a wide variety of data types that are generic or are specific to the agrifood domain, such as the following:

- **Farm data** (e.g., field data, field status, soil data, Crops/treatment/fertilisation data, farm input data, energy consumption data, ...)
- **Earth Observation Data** (e.g., satellite data, remote sensing imagery, soil maps, vegetation indices, such as NDVI, EVI, NDRE, NDMI)
- **Meteorological data** (e.g., temperature, humidity, wind speed/direction, solar radiation, pressure, etc.)

cont. →

Types of data represented via AIM (II)

cont. →

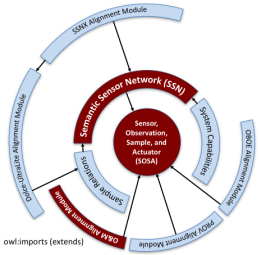
- **Agricultural machinery data** (e.g., engine data, fuel consumption, emissions, exhaust gas, NOx-conversion, exhaust temperatures, ...)
- Representation of **data quality metrics**
- **Field Operations data** (e.g., operation diary, irrigation, fertilisation, soil tillage)
- **Livestock data**
- **Traceability data** (e.g., farm product logistics, transportation, warehousing, etc.)
- **Financial farm data, benchmarking data and KPIs**
- **Farmer information**

Semantic Interoperability via AIM

AIM provides the basis to enable a semantic interoperability data space: it defines the data elements (concepts, properties and relations) relevant to agri applications, including the semantics associated to the information exchanged.

AIM establishes (semantic) mappings to various standards/ontologies:

- FIWARE (NGSI-LD)
- ETSI (Saref4Agri)
- EU initiatives (INSPIRE, FOODIE)
- FAO AIMS (AGROVOC)
- OGC (EO standards)
- ISO standards
- QUDT (Units Ontology)
- Other dominant solutions (ADAPT)



Next Steps and Future Plans for AIM

- Further extension of AIM with regards to:
  - Traceability concepts (drawing from **UN eCrop**, **GS1 EPCIS** and **FOODON**)
  - Integration of some further **ISOBUS** concepts as needed
  - Interaction with **GAIA-X** and **IDSA** to ensure AIM compliance
  - Interact with the **Common Agri Data Spaces** initiative of the EC
- Carry on the extension of AIM with **additional semantic mappings** and adding concepts to address final pilot needs (continuous work), e.g. adding additional vegetation indices in the AIM concepts/vocabulary as needed by pilots
- The current version of the DEMETER Common Data Models and Semantic Interoperability Mechanisms is available in **Deliverable 2.3** released in April 2021 and its final version will be presented in **Deliverable 2.5** to be delivered in October 2022.

AIM available in the OGC server

DEMETER AIM

URI

https://w3id.org/demeter/agri/agriCrop

Description

Agriculture Information Model managed on behalf of DEMETER project

Members

- https://w3id.org/demeter/agri
- https://w3id.org/demeter/agri/agriAlert
- https://w3id.org/demeter/agri/agriCommon
- https://w3id.org/demeter/agri/agriCrop
- https://w3id.org/demeter/agri/agriFeature
- https://w3id.org/demeter/agri/agriIntervention
- https://w3id.org/demeter/agri/agriPest
- https://w3id.org/demeter/agri/agriProduct
- https://w3id.org/demeter/agri/agriProperty
- https://w3id.org/demeter/agri/agriSystem
- https://w3id.org/demeter/agri/farmAnimal

Alternates Profiles

Different views of and formats:

Alternate Profiles ?

Filter

Filter ?

Clear

DEMETER Agriculture Information Model

Last uploaded: April 14, 2021

Summary | Classes | Properties | Notes | Mappings | Widgets

Details

Acronym	DEMETER-AIM
Visibility	Public
Description	The DEMETER Agri Profile is a master profile importing focused specific profiles/modules of DEMETER AIM.
Status	Beta
Format	OWL
Contact	Raul Palma, rpalma@man.poznan.pl Ioanna Roussaki, ioanna.roussaki@cn.ntua.gr
Categories	Farms and Farming Systems

Additional Metadata

URI	https://w3id.org/demeter/agri
Deprecated	false
Endorsed By	
Endpoint	

Links

Go to the REST API JSON entry

Get my metadata back

N-Triple | Json-LD | RDF/XML

Metrics

Classes	180
Individuals	137
Properties	286
Maximum Depth	6
Maximum Number Of Children	45
Average Number Of Children	7
Classes With A Single Child	14

Horizon Europe DIVINE project outline

DIVINE is a **Research and Innovation Action** with full title:

- **D**emonstrat**I**ng the **V**alue of data shar**IN**g to boost the agri-data **E**conomy

Funded under:

- **HORIZON-CL6-2021-GOVERNANCE-01-20**: Data economy in the field of agriculture – effects of data sharing and big data

DIVINE duration:

- October 2022 – September 2025

DIVINE vision and scale

Vision:

- to build an ecosystem for sharing andanalysing agri-data
- to investigate the value of agri-data sharing from a technical, business and policy perspective
- to demonstrate this value via series of real-world pilots
- to boost the agri-data economy

Scale:

- 15 partners, 8 member states, 4 pilots.
- Potential to impact 4 Ministries of Agriculture and reach 14 Farmer Associations, 15 M farmers worldwide (via WFO) and 10 EU working groups.

INFORMATION MODEL

Analyse and adapt existing information models in the agriculture sector

DATA MARKETPLACE

Enhance and extend agri-data exploitation

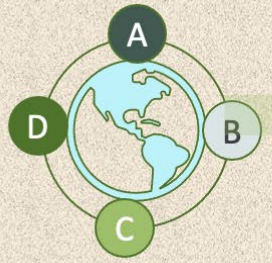
DIVINE

GOVERNANCE & POLICY

Increase use by public and private actors

MULTI-ACTOR APPROACH

Engage farmers and domain experts to enable co-creation



TRANSPARENCY

Increase data sharing, data trust & sovereignty, data traceability & usage monitoring

DIVINE expected outcomes

- EO1 - **Awareness and informed decisions** based on the demonstration of the costs, benefits, risks, and added value as well as the economic and societal potential of agricultural data sharing taking an EU perspective.
- EO2 - Increase in **transparency in data sharing** in the agricultural value chain.
- EO3 - **Increased sharing of agricultural data**, effective and efficient use of private and public data for private and public purpose, particularly through demonstration of the costs, benefits, risks, and added value as well as the economic and societal potential of agricultural data sharing taking an EU perspective.
- EO4 - Contribute to an **increased uptake of digital and data technologies in the agricultural sector** and indirectly contribute to an increase in environmental and economic performance through increased and enhanced used of digital technologies and data.
- EO5 - **Strengthen policy-making & -monitoring capacities** in agriculture and data technologies.

Key Technical Considerations

- Data modelling, sharing & semantic interoperability
- Agri Data Analytics, Fusion & Knowledge extraction
- Transparent Decision Making Support & Benchmarking for agri stakeholders
- Agri Data Security, Transparency, Trust, Sovereignty, Traceability
- Agri Data Sharing Governance Models & Policy making
- Stakeholder Open Collaboration Space
- **Agricultural Data Space Ecosystem**

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For more information visit:

www.h2020-demeter.eu

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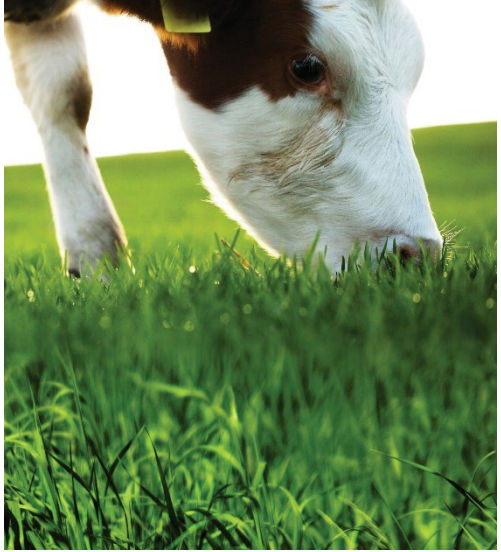

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