Projet VDPA+ : Mieux valoriser les données des pratiques agricoles

UniLaSalle Terre & Sciences

MSc MASTER OF SCIENCE

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Hosting companies:

Alliance H@rvest
LE NUMÉRIQUE AU SERVICE DU MONDE AGRICOLE

EXXACT ROBOTICS

Terres Inovia
l'agronomie en mouvement

[1]Exxact Robotics
[2]Terres Inovia
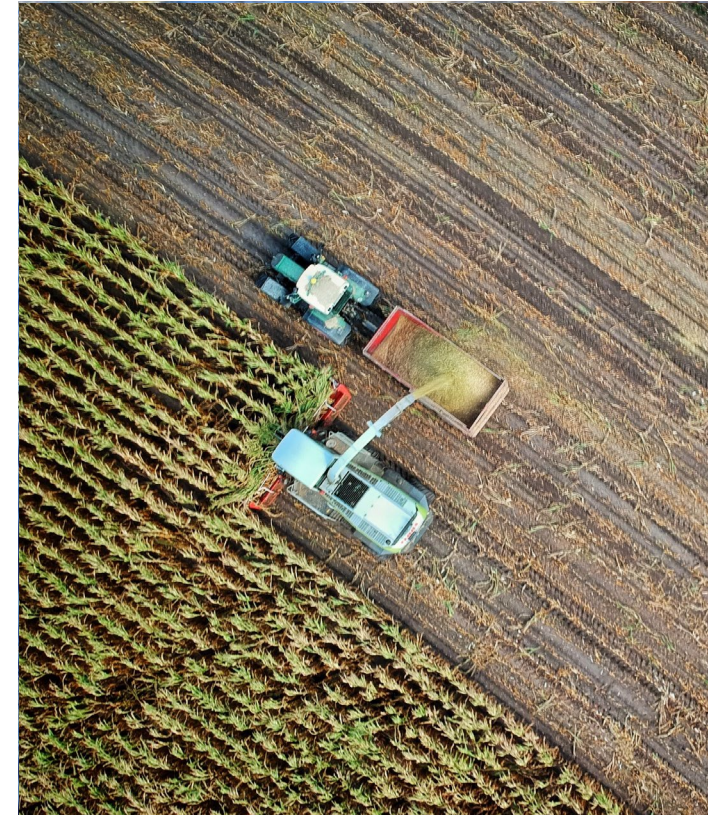
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1. Introduction

Projet VDPA+ : Mieux valoriser les données des pratiques agricoles

Alliance H@rvest

Main objective: to support the development and the use of **digital technology** for strategy, management and operating assistance issues in agricultural sector.

Members:

Source: https://alliance-harvest.com/en/alliance-harvest-2/

Exxact Robotics

Part of **EXEL Industries**, focus on **precision agriculture** business sector

Product:

Spot Spray Sensor (3S):
Reduce input on land by using camera detection on weeds.

Source: https://exxact-robotics.com/en/produit/3s-spot-spray-sensor/

Global challenges[1] → Need of better agriculture practices[2] → Innovation era[3] → Agriculture data growth[4] → **Data valorization?**
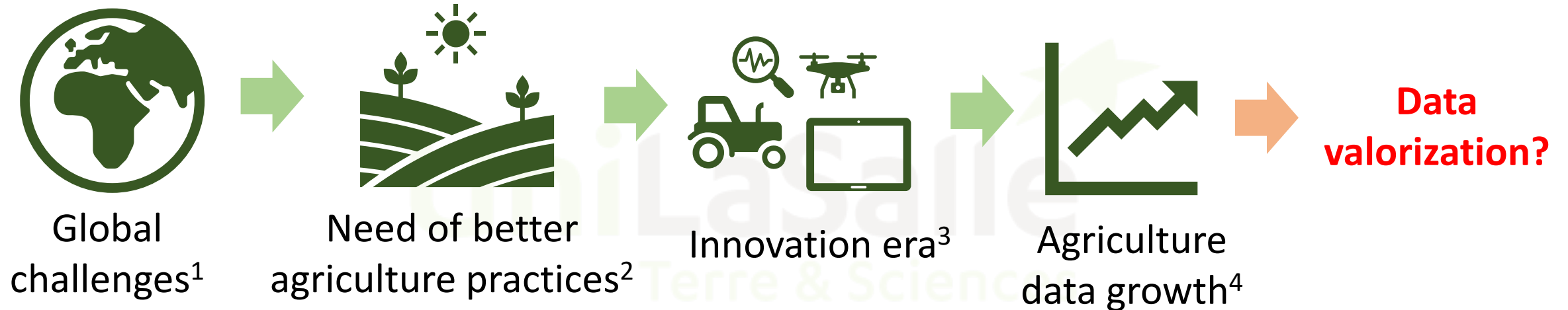
[1]United Nations (UN)

[2]Giray, G., & Catal, C. (2021). Design of a data management reference architecture for sustainable agriculture. Sustainability (Switzerland), 13(13). https://doi.org/10.3390/su13137309

[3]Cattaneo, G., Micheletti, G., Glennon, M., & Croce, C. La. (n.d.). Internal identification.

[4]Top, J., Janssen, S., Boogaard, H., Knapen, R., & Şimşek-Şenel, G. (2022). Cultivating FAIR principles for agri-food data. Computers and Electronics in Agriculture, 196. https://doi.org/10.1016/j.compag.2022.106909

Problematics:

a. What exists today in agriculture data? And where do they come from?

b. What are the limitations to valorizing them? And what are the possible actions/solutions to solve this?

c. What are the perspectives of the actors?

d. Can data fusion be performed? What are the benefits?

1. **Evaluate and characterize** the existing agricultural data platforms, databases, and sources to understand the types of data available, data quality, and accessibility.

2. **Identify** gaps, limitations, and challenges in the current agricultural data landscape, including issues related to data fragmentation, heterogeneity, reliability, and public regulation.

3. Apply **data fusion** methods to specific agricultural case studies to demonstrate their effectiveness in addressing real-world agricultural challenges.

This study will help to **describe actual condition** of agriculture data utilization/valorization that can **increase agriculture-business' awareness** towards digital transformation and data connectivity. Also, as a **base for future research** in developing data innovation in agriculture sector.

2. Methodology

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Mixed methods:

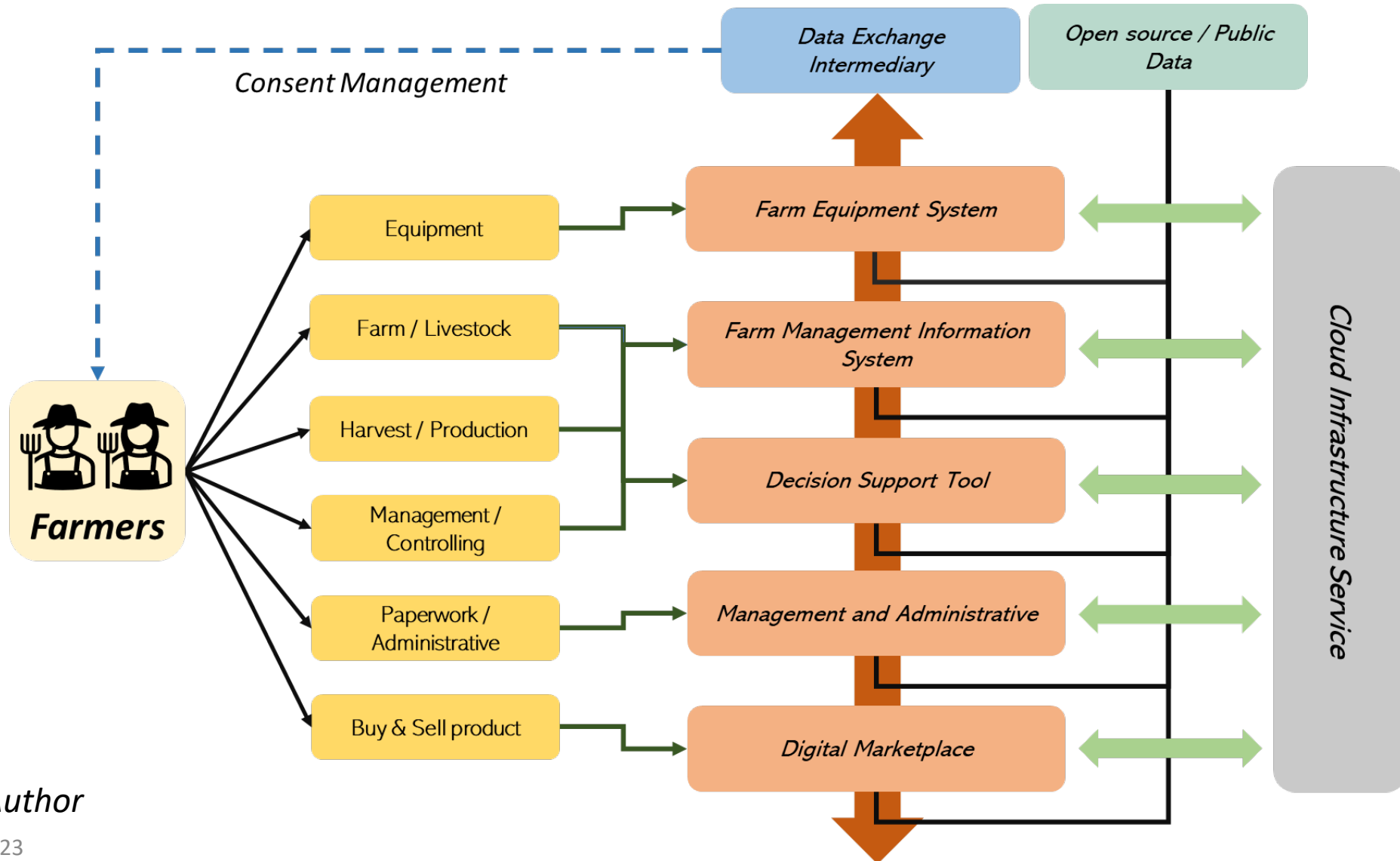| No	Activities	Methods	Expected result
1	Identify and characterize agriculture data utilization and valorization	**Review** (publication, web, database, etc)	State of arts in agriculture data utilization and valorization
2	Identify actual challenges and constraints from stakeholders	**Interview** and discussion; questionnaire	Perspective and insight for future development of agricultural data valorization
3	Data fusion study case	**Study case** development	Reference architecture, analysis of study case
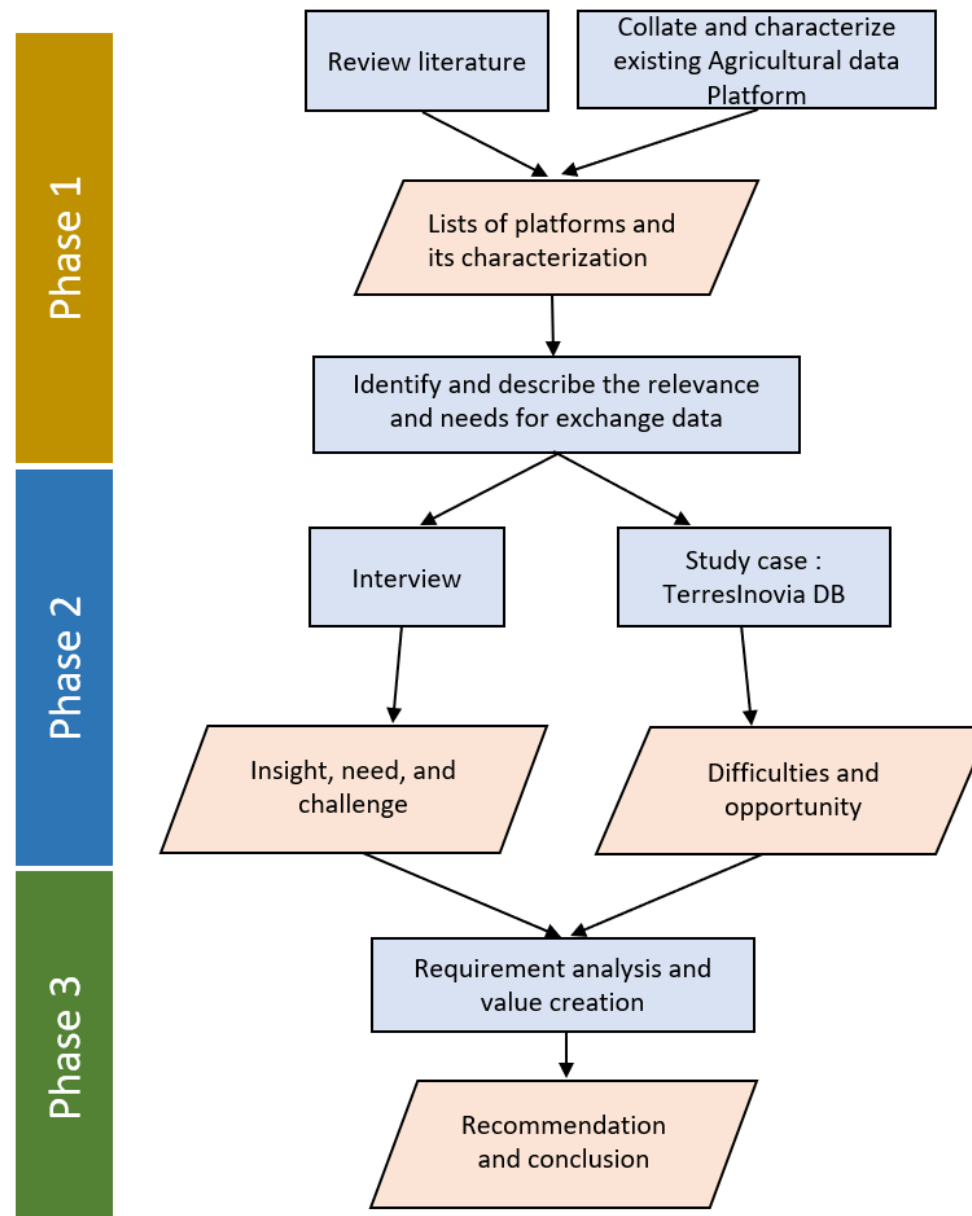
3. Results and discussion

Evolution of digitalization's system from a product into data exchange system
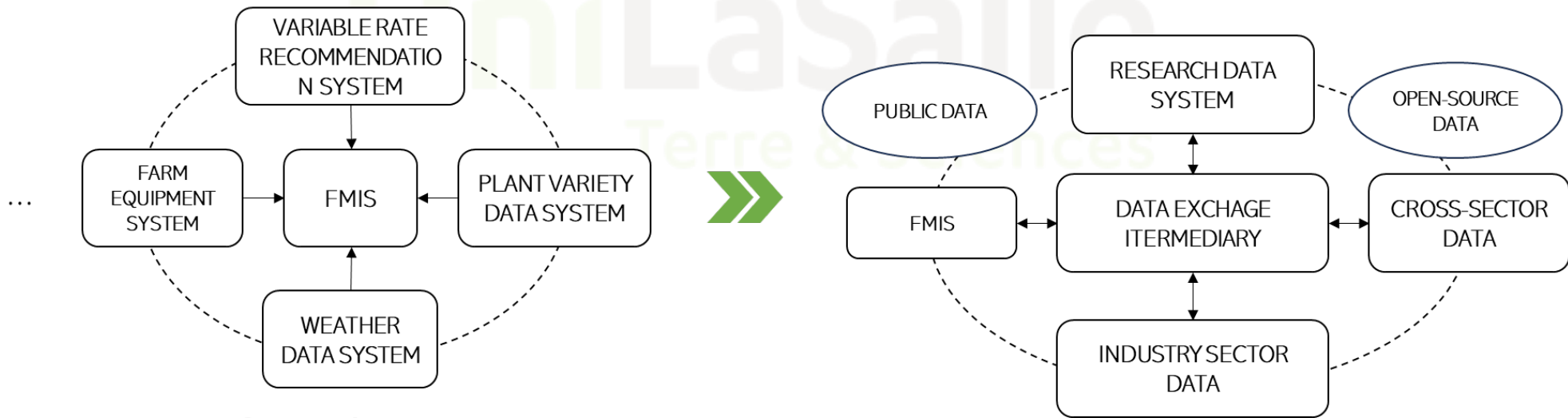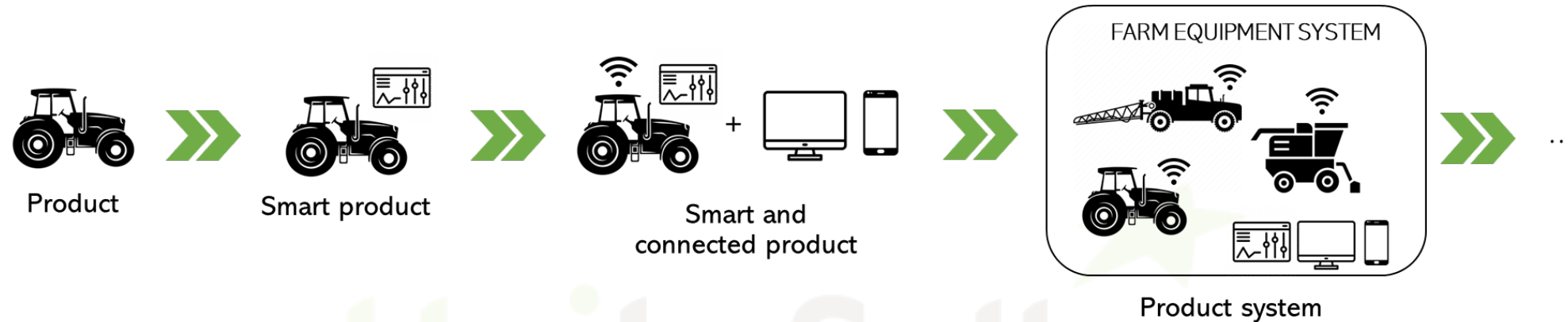
Source: Author, referred to Porter and Heppelmann (2014)
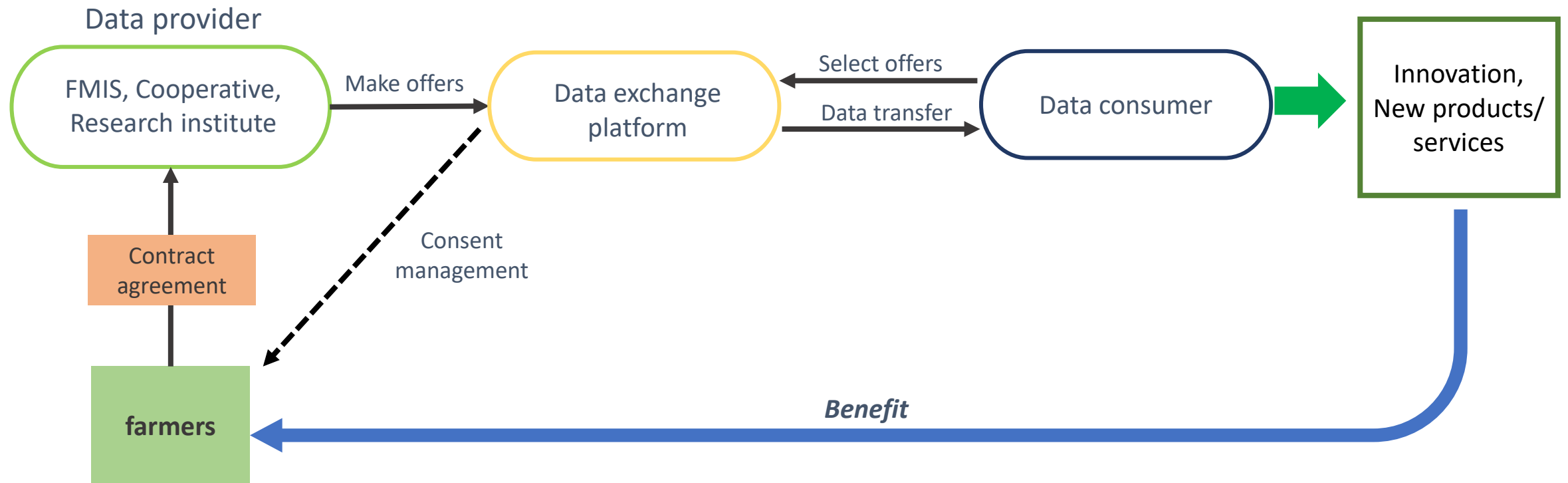
No	Type	Count
1	Farm equipment	4
2	FMIS; field and herd operation management	11
3	FMIS; Best practice	8
4	Agriculture digital marketplace/sales	4
5	Decision support tools platform	4
6	Data exchange and consent management tool	2
7	Management and administrative	3
8	Cloud insfrastructure services	3

In total, there are **37** agriculture digital platforms and **27** open-source databases listed and analyzed
(data on October 30th, 2023)

Consent Management

Data Exchange Intermediary

Open source / Public Data

Farmers

- Equipment
- Farm / Livestock
- Harvest / Production
- Management / Controlling
- Paperwork / Administrative
- Buy & Sell product

Farm Equipment System

Farm Management Information System

Decision Support Tool

Management and Administrative

Digital Marketplace

Cloud Infrastructure Service

Source: Author

*Refers to AgDataHub model

Actual conditions:

1. Public data are relatively **findable** and **accessible**. **Digital services** in agrifood sector are growing.
2. Today, we can say that **lack of interoperability** has become one of the problems.
3. Lack of interoperability happens **not because there are no standards**, but because there are **gaps** between **existing standards**.
4. This problem can be solved by **not creating new standards**, but by creating a **link** between them (closing the GAP).

The FAIR concept allows:

1. **Easily discover** and locate a dataset.
2. **Retrievable** by their identifier using an open, free, and universally implemented communication protocol.
3. **Exchange and interpret** data between humans, machines, or human and machine.
4. Maximizing the **value** and **impact** of data
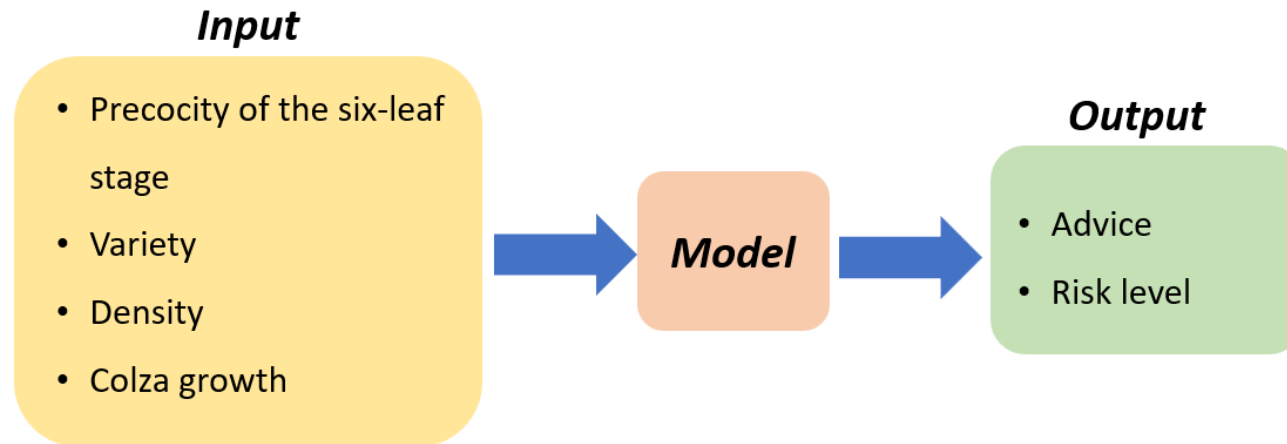
Where to apply FAIR principle?
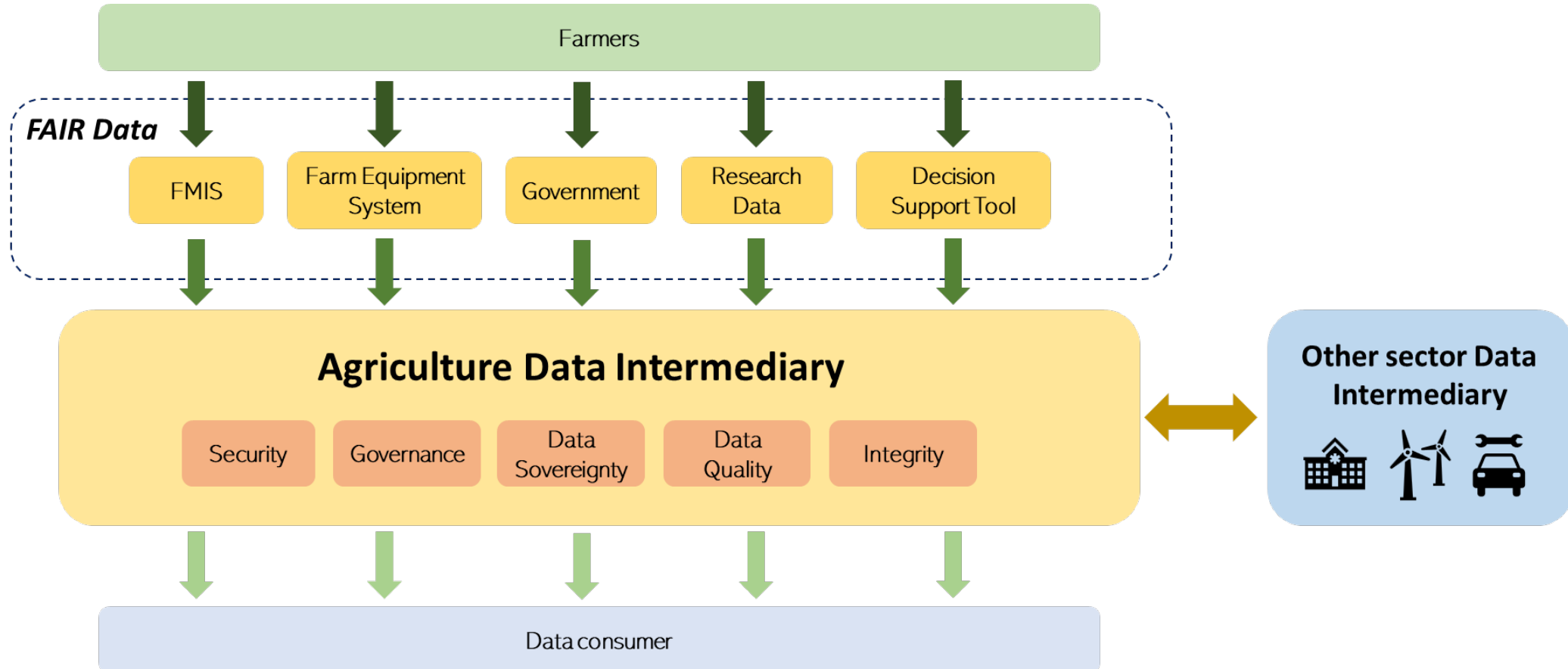
Source: *Author, refers to David, R et al. (2020). Literacy: The Achilles' Heel of Applying FAIR Principles. CODATA Data Science Journal, 19(32), 1–11. https://doi.org/10.5334/dsj-2020-032ï*

In total there are 11 respondents from different expertise (5 persons are affiliated to Alliance H@rvest and 6 persons are not)

Opportunities
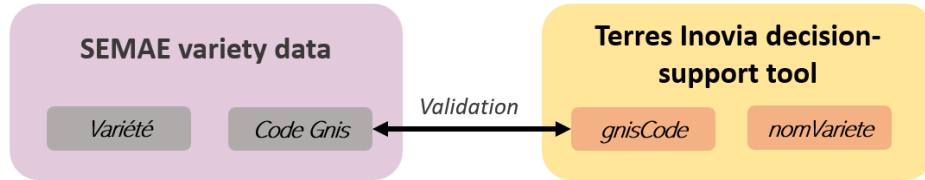
- Applicable regulations
- Digitalization
- Massive innovation

Challenges

- How to get good quality data.
- Increase data fusion
- Encourage data sharing

Constraints

- Skepticism from stakeholders
- Diverse and unharmonized data
- Limited knowledge

Limitations

- Regulations and law
- Data size

Context: The tool **estimates the risk** of autumn **elongation** of **rapeseed** and indicates the benefit or not of applying a growth regulator, depending on several variables (farmer's input).

Input

- Precocity of the six-leaf stage
- Variety
- Density
- Colza growth

Model
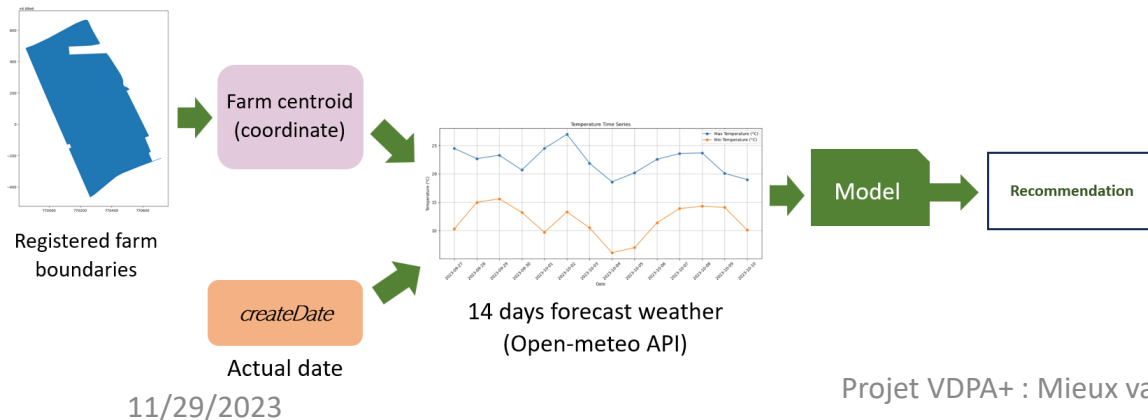
Output

- Advice
- Risk level

- How to **perform relevant data fusion** without adding more complexity to users?
- What are the **benefits** of fusing this data?
- The data used for the study case was **anonymized.**

1. *Connection to variety database (SEMAE) for more valid varieties*

SEMAE variety data
Variété   Code Gnis

Validation

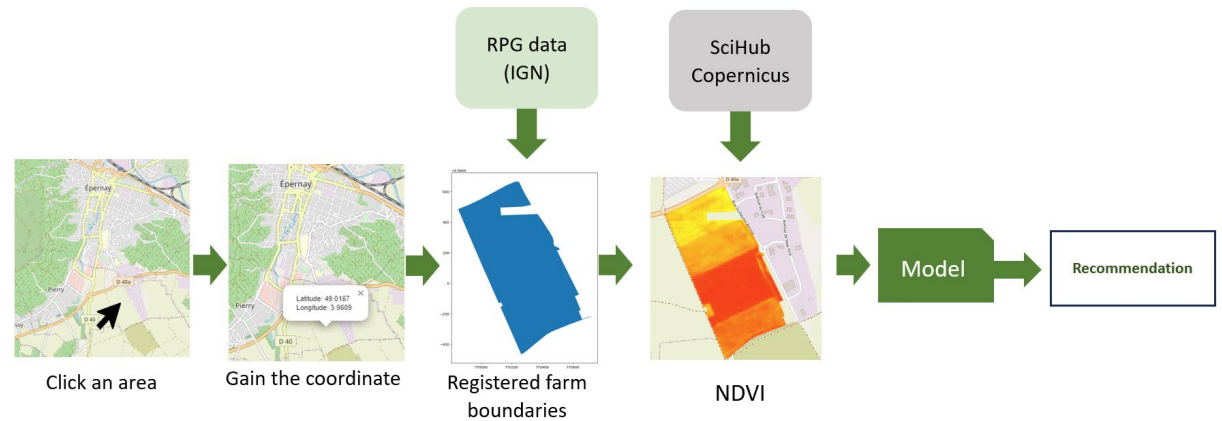**Terres Inovia decision-support tool**
gnisCode   nomVariete

- **Added value:** Validate and update varieties
- **Constraint:** Variety database (SEMAE) **does not provide an API version**, the data must be downloaded manually (interoperability)
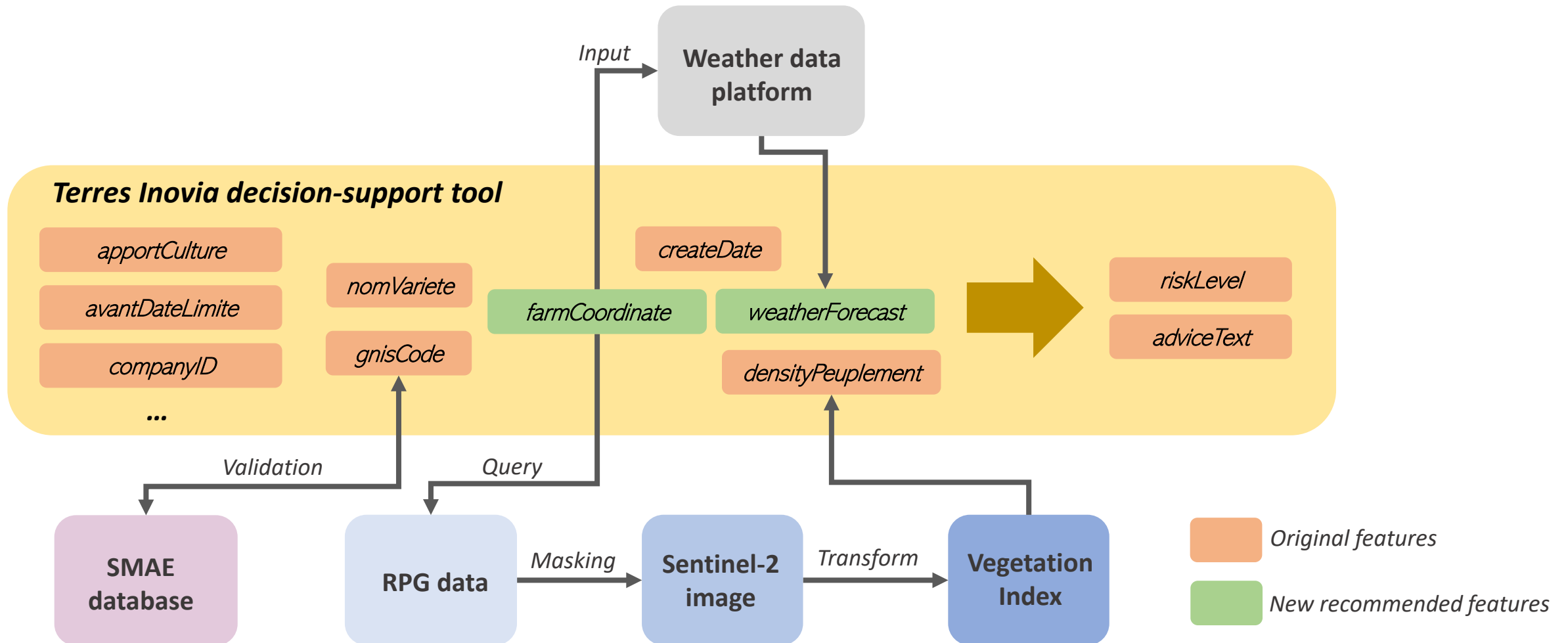
2. *Integration with geo-location data*

RPG data (IGN)   SciHub Copernicus

Click an area   Gain the coordinate   Registered farm boundaries   NDVI   Model   Recommendation

- **Added value**: Enrich the input for measuring crop density and colza growth, possible to give more accurate results.
- **Constraints:** 1. RPG data have a **large size,** will take some time to query the data.
                    2. **RPG data are updated annually**, possibly getting irrelevant data.
                    3. **Low-resolution** images, and **cloud coverage** problems.
                     (data quality)

3. *Integration with weather data*

Registered farm boundaries

Farm centroid (coordinate)

createDate

Actual date

14 days forecast weather (Open-meteo API)

Model   Recommendation

- **Added value:** Enrich the input for measuring risk by adding weather variable
- **Constraint:** Limited requests (need to pay for having larger requests per second or for commercial purposes) (accessibility)

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4. Conclusion

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1. **Digitalization and data innovation** in the agriculture sector are showing **positive trends**, and in correspondence with proper **underlying laws/regulations** on how to treat, exchange, and valorize data, it will be an **opportunity** to optimize agricultural practices.

2. **Diverse and unharmonized** data are still the main issues for today. Efforts to harmonize data can be made by **closing the gap** in each existing system, and the **application of the FAIR principle** is considered as a solution.

3. **Open data ecosystem** is still considered **far from ideal**; immature technologies, low adaptation of law, unconfident actors. However, there is an available **data exchange** mechanism through intermediary actors.

4. **Data fusion** can give more variables to be taken into consideration when building a model and **may leverage the value of the outputs**.
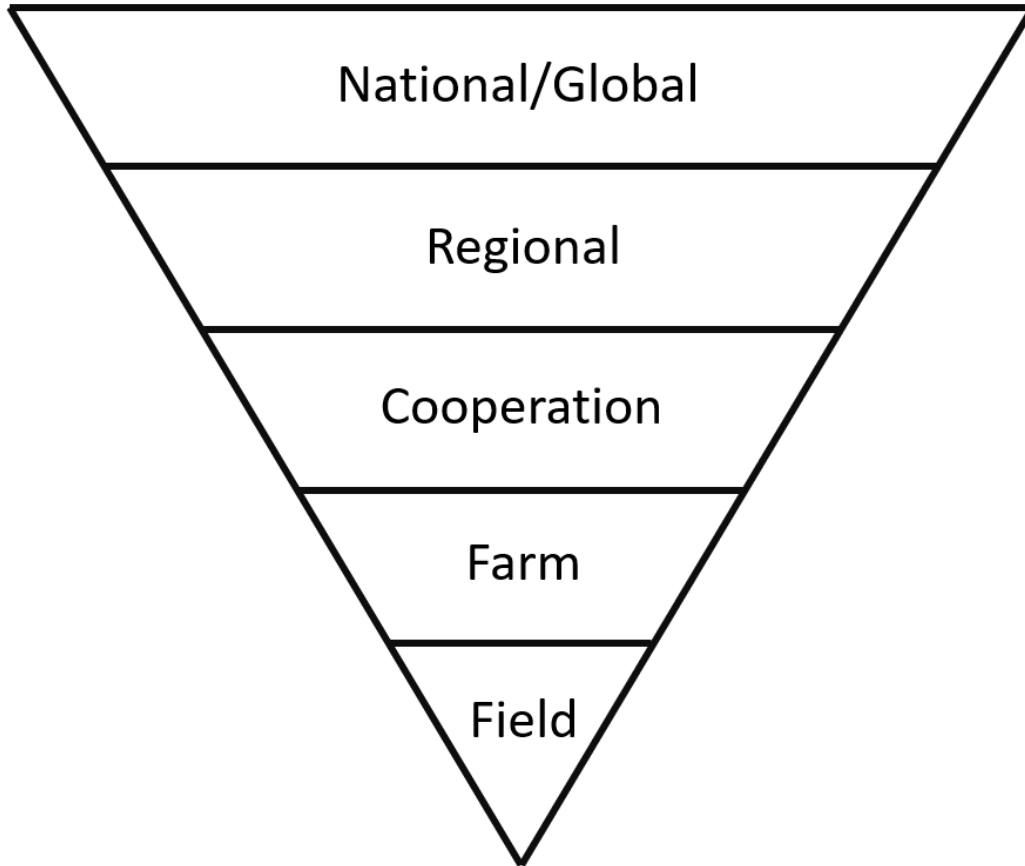
Thank you

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Annexes

Yield data scale

Main objective and actors :

Platform (exp.) :

National/Global

Regional

Cooperation

Farm

Field

Global security food
Actors: World organisation, NGO

Policy-making
Actors: National/regional government

Supply chain and commerce
Actors: Cooperative

Farm management
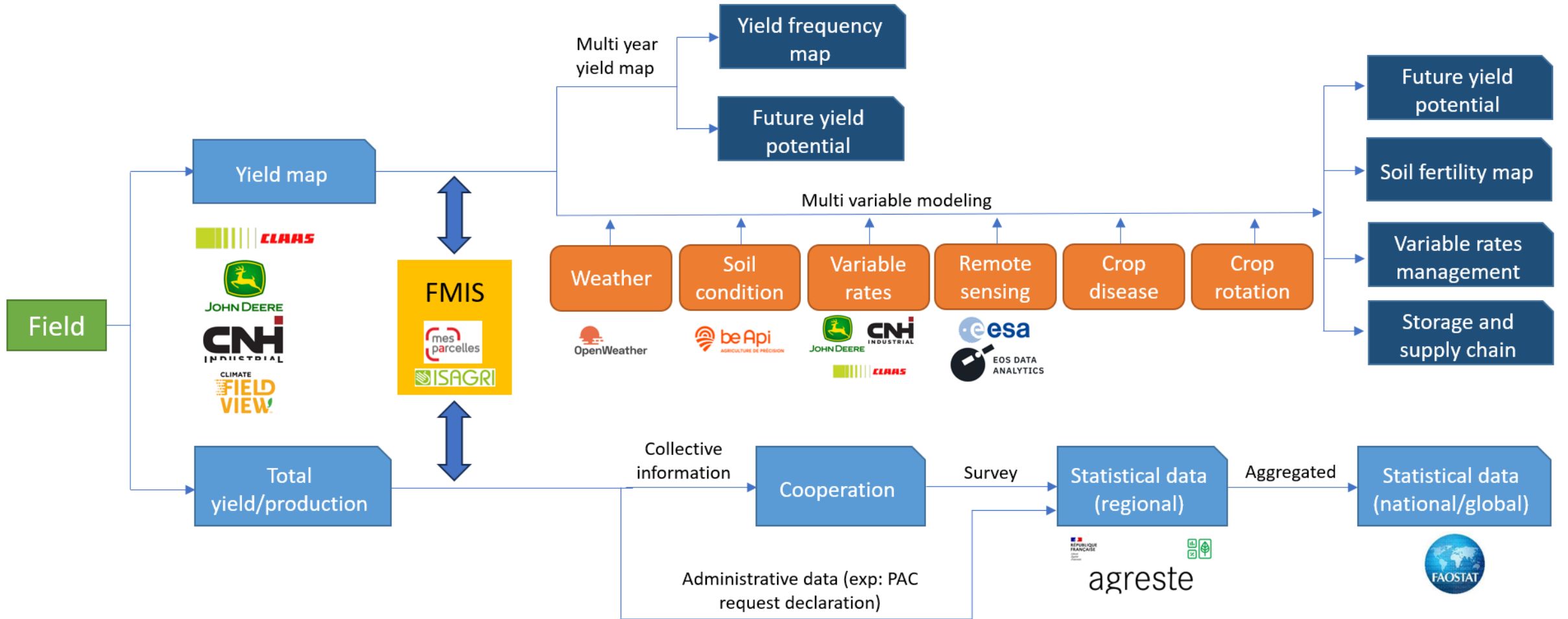Actors: Farm owners, ag-consellor, agtech bussines

Precision agriculture
Actors: Farm owners, ag-consellor, agtech bussines

Source: Author

Country/region	Project	Description	Status
France	AgDataHub	Agricultural and agri-food data intermediation platform.	Created on 2017
European Union	AgriDataSpace	**Provide** a complete conceptual **reference architecture**, and **reference technology** for navigating **heterogeneous repositories**. **Assess and share** knowledge on those **technological requirements**.	On going project : 1/10/22 – 31/3/24
USA	Open Data Framework	A **framework** to create a neutral and secure **data repository** and **cooperative** where producers, universities and nonprofit entities can **store** and **share** data	Request for applications (6/4/23)
France, Germany, Belgium, EU	AgriGaia	**B2B marketplace,** enable a simple **exchange of industry-specific data** and **AI algorithms**, which are described with **uniform standards**	On going project: 1/1/21 - 12/31/23
Australia	Australian AgriFood Data Exchange (AADX)	Initiative **designed** and overseen by members of the **agrifood industry** to enable participants to **share**, **reuse** and **merge** data from disparate systems in a **secure environment** on a permissioned basis.	On going project: Aug2020 – 2023
India	Agriculture Data Exchange (ADeX)	Collaborative venture to create India's first **data exchange platform** for **farmer services**.	Launched (11/8/23)
Belgium	DJustConnect	**Stimulate data exchange** in the **Agrifood** sector with respect for the different stakeholders.	Launched on 2020

Status: On going project
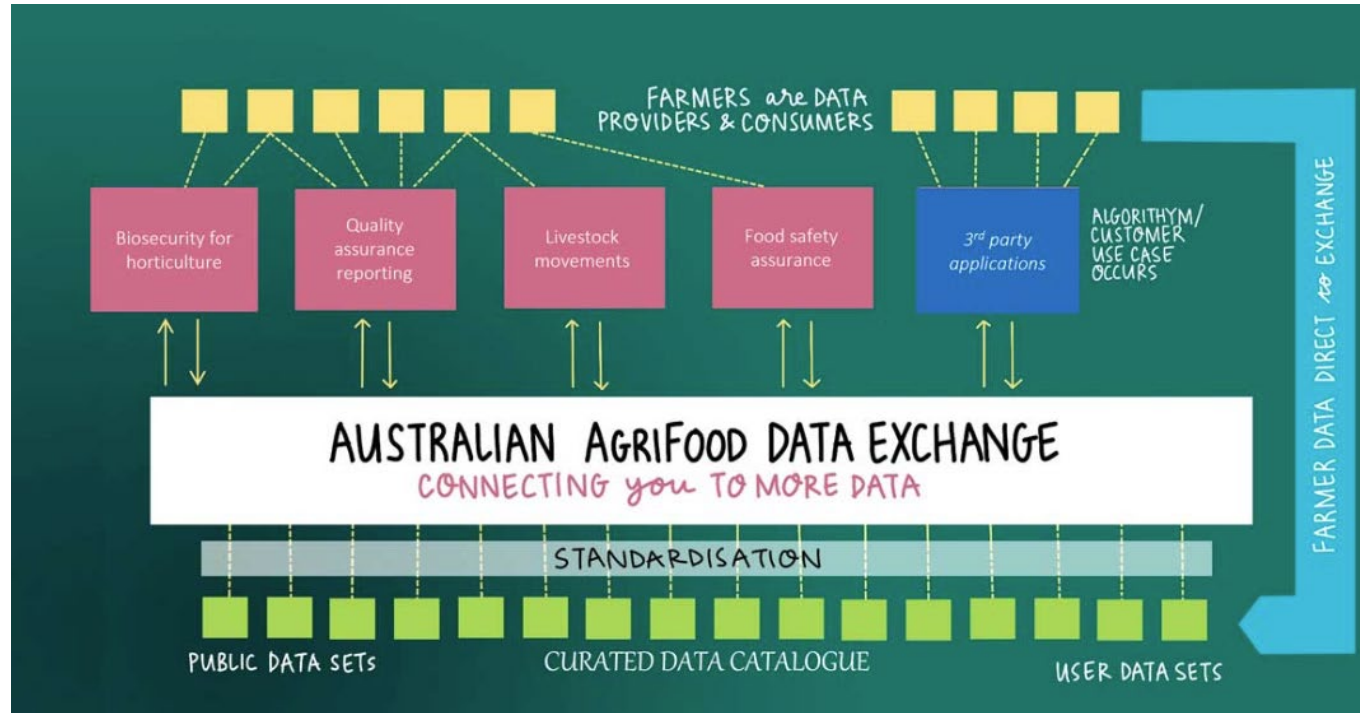
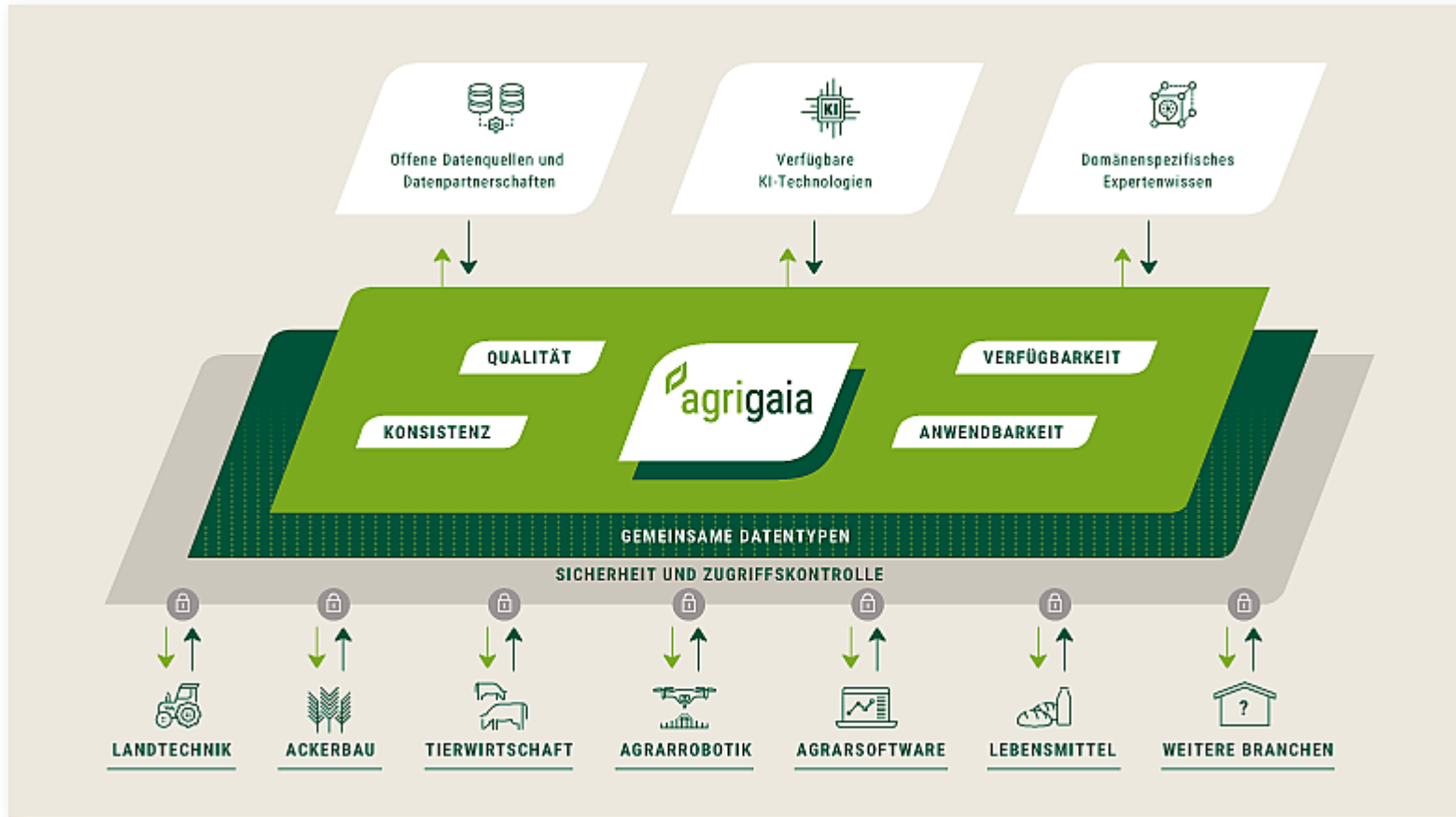*Acquisition date (August 25th, 2023)*

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Link: Australian AgriFood Data Exchange

The Agri-Gaia project creates an **AI ecosystem** for the **medium-sized agricultural and food industry** in close connection with GAIA-X. In the ecosystem, an innovative **B2B marketplace** enables a simple **exchange of industry-specific data** and **AI algorithms**, which are described with **uniform standards**.

Acquisition date (August 25th, 2023)

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Link: AgriGaia
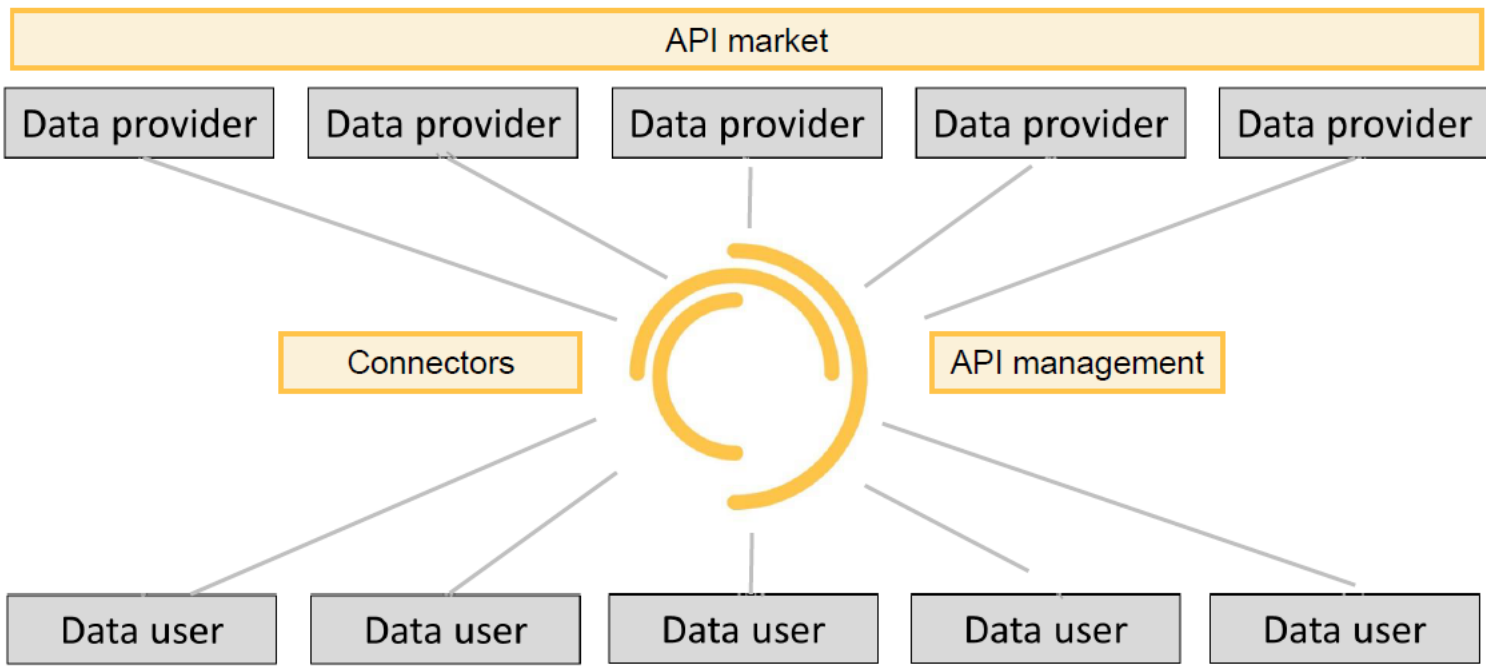
Our mission is to **stimulate data exchange** in the **Agrifood** sector with respect for the different stakeholders; the **usage and valorisation of data**, eliminating repetitive, boring data entries, **unlocking the full potential of applications** and creating benefits throughout the value chain.

Acquisition date (August 25th, 2023)

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Link: DJustConnect

Acquisition date (August 25th, 2023)

Link: Agriculture Data Exchange (ADeX)

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Reference: Manufacture/Industry domain

Current condition:

- The data are stored in **silos** from different factory department.
- The data managed using **vendor/data solution** (exp: *SAP, Siemens PLM Software, IBM, Oracle*)
- Data used for operational, RnD, marketing, certification.

Problem/Challenge:

- **Strong confidential issues** about crucial manufacturing process is still a constraint to open data initiatives -> Afraid of losing control of their data**.**
- Need to harmonize diff **heterogenous**, cross-national policies and regulation.

Differences with agrofood sector:

- Data produced more **frequent** and in mostly controlled environment. *Less uncertainty*
- Real-time monitoring are critical event (low latency).

Things that can be adapted:

- Data integration (**machine interoperability and connected apps**)
- Farm industrialization

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Current condition:

- Very heterogeneous practice of collecting data.
- Different countries have their own centralized medical framework.
- Data used for medical record and RnD.

Problem/Challenge:

- Transfer of relevant information between different organizations in the healthcare system.

## Differences with agrofood sector:

- The data are more complex (variety) and sensitive.
- Major intervention from government.

Things that can be adapted:

- Personal electronic records (mon espace santé) -> mobile apps
- Personification of pharmacotherapy.
- Research data connectivity
- Ontology

Medical research database : Services | EMBL-EBI
Accueil - Archive ouverte HAL

Open Science framework : Home | CyVerse

The Linked Open Data Cloud from lod-cloud.net
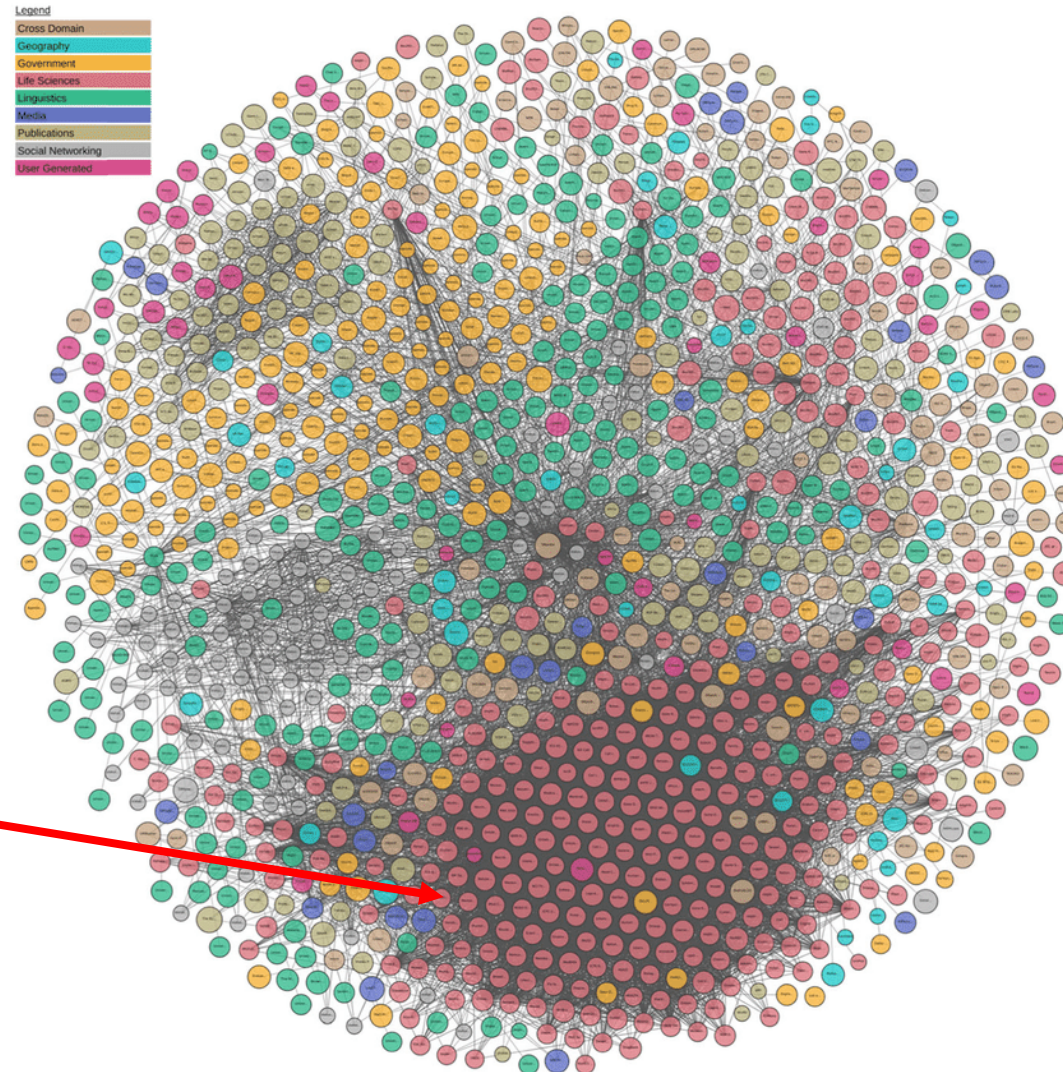
Life sciences domaine are well-linked

Source : Linking open data cloud diagram 2020, by Max Schmachtenberg et al

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List of respondents

No	Name	Organization/Company name	Position	Alliance H@rvest
1	Nicolas MANIEZ	AgreenValley Tech	RnD Innovation Project Manager	Yes
2	Jérôme DANTAN	UniLaSalle	Professor and Researcher (IoT and Big data)	Yes
3	Isabelle GATTIN	UniLaSalle	Professor and Researcher (Soil science)	Yes
4	Baptiste FAINEANT	Sofiproteol	Project Manager, Innovation Fund and Sustainable Sectors	Yes
5	Laurent DECREUSEFOND	Télécom Paris	Professor and Researcher (mathematics & statistics)	Yes
6	Nicolas VANNETZEL	AgDataHub	Responsible Support Client	No
7	Marie BEURET	AgroEDI Europe	Executive Officer	No
8	Lucas PREZELIN	OKP4	Business Development Manager	No
9	Héloise GILLES	FAST-Agri (AgataConsent)	Directrice	No
10	David TALEC	WiuZ	Responsible Partenaire	No
11	Melchior BIZOT-ESPIARD	FNSEA	Chargé de mission innovation et prospective	No

Q1. What types of data does your company/organization collect and analyze? And how to collect them? Do you collect/give data from/to external sources? (buying/selling/open source)

Q2. What are of the major challenges or constraints you face right now in terms of data valorization?

Q3. Do you foresee in the future any trends or developments in this subject? and how do you plan to adapt into that kind of situation? What is missing today?

Q4. Are there any specific regulations or legal considerations that impact the way you handle your data?

Q5. What are the important aspects to manage if we want to apply the open data or data exchange with other organizations?

Q6. What is your opinion about open data movement where companies share the data together?

Q7. Do you have an example of data fusion you would like to test?

Q8. How can VDPA+ project help you?

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The most used method for data collection are collecting directly from farmers, and data from partnership. And sometimes open-data, but not very often.

Problem and challenge to valorize the data: it's difficult to obtain data with good quality. Also, some stakeholders considers interoperability is not a big issue.

Prediction in the future and how to adapt: There will be an increasement of data usage, development and innovation. For adapting, mostly the respondent strategy is just tried to follow the trends and do nothing.

What is missing today? : Nowadays, spirit of sharing data considered low.

Regulation that impacted the data processing: RGPD, farmers consent, soon to come: Data Governance Act (DGA) September 2023.

Benefit of sharing data with another organization: Crossing data to produce/validate more knowledge.

Important aspect to manage for data exchange: Standardisation, data proprietary, consent, and security.

Opinion about open data movement: Data should be open and controlled with good regulation (trust, how? And what purpose?).

Example of data fusion: Data collected by commercial machine with research sample (direct observation) or open-source data.

Things that can help them from this project: List of the data platform, map of condition (about ag-data) in different countries, make data from farmers accessible.

- Farmers often **filling the same information again and again** -> lack of connectivity between ag-service providers.

- Data fusion challenge: connecting **ag-data** with **environment impacts**

- Shifting of business model: now most of company **not selling product**, but **product + service** (recommendation).

- Data management: it's better to have **decentralized storage** for each tematic data, rather than have **one big data lake** to all data theme. Must be supported by **good government** and **metadata**.

- Needs of **safe sharing data environment**; case example: cooperative selling farmers data.

- **Different perception** of ag-data: Central Europe countries considers farm data are personal.

- AgriDataSpace: Provide **access and advise** to connect to different data; data gouvernance

- Pollen - OKP4: **Tools for data valorization** (flexible orchestration, open big opportunity of business model and not attached only on ag-sector).

- AgataConsent: **Consent management service**. Most of the costumers are in cattle breeding.

Agriculture 4.0 : du bien-fondé des normes volontaires pour accompagner cette transition numérique

1. Update on International normalisation activity: USA and Germany propose a new ISO comite technic.

Standardization in the field of multi-objective, optimization of large-scale agricultural and food systems, based on data and decision-making principles (still in discussion; not official)

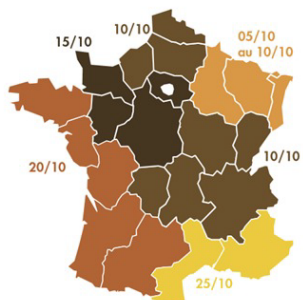*2. Normalisation's projects for agriculture digital transformation (2024).*

Reference architecture, Compliance of Data and Exchanges (FAIR), Semantic Infrastructure, Farming concept.

3. Looking for perspective/interest/norm from economic actors in France.

Define the posisiton of France and it's economic actors (in agriculture practices) to represent the interests by a delegation.

TerresInovia Colza regulateur decision tool interface

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```
{'adviceText': "Le niveau de risque est moyen.\nL'emploi d'un régulateur est possible à conse
illé.\n\nIntervenir si possible dès le stade 6 feuilles, sinon le plus tôt possible et avant
le stade 7/8 feuilles. \nDans tous les cas, intervenir avant la date limite pour votre départ
ement.",
  'apportCulture': 'false',
  'avantDateLimite': True,
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  'createDate': 1679590954367,
  'densitePeuplement': 'forte',
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```

List of platforms

Type	Platform	Author	Functionality	Input data	Output (meta) data	Objective
Farm equipment system	MyJhonDeere	Jhon Deere	· Fleet management	· GPS	· Working plan	Help farmers organize their machinery work, and maintenance scheduling.
			· Field data recording	· Fuel consumption	· Machine report	
				· Working duration	· Location history	
				· Machine performance		
	MyPLM Connect	NewHolland	· Field data recording	· Agronomic data	· Working plan	Monitor the productivity and performance, cost efficiency, data analysis, farm management
			· Data sharing	· Machine data	· Machine report	
				· Personal information		
	AFS Connect	CNH	Field data recording	GPS data	Working plan	Manage users machinaries resource and records field agronomic data.
			Fleet management	Agronomic data	Machines' location	
				Machines performances data		
	CLAAS Connect	CLAAS	Field data recording	GPS data	Working plan	Manage users machinaries resource and records field agronomic data.
			Fleet management	Agronomic data	Machines' location	
			Spare parts shop	Machines performances data		
Farm Management Information System; field and herd operation management	Doctofarm	ISAGRI	· Transfer information	· Text message	· Farm portfolio	Allows technicians and farmers to work remotely through a chat, or to create georeferenced and shared observations
			· Consultation	· Image		
	MesParcelles	Chambre d'Agriculture	· Field activity record	· Fertilization data	· Fertilization and phytosanitary scheduling	Protect from disease and record fertilizer and phytosanitary use
				· Phytosanitary data		
				· Satellite images		

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	Field manager	Xarvio	Field monitor	Satellite images	Biomass map (every 3 day)	Help farmers to monitor their fields and recommend better crop management to increase effeciency and productivity
			Seeding	Yield map	Weather data	
			Nutrition	soil map	irrigation recommendation	
				weather data		
	FieldView	BAYER	Data connectivity in real-time, record historical data, sharing data	Machines data	Field health analysis	Providing a connected tool to visualize machines' works to a cloud platform
				Satellite images	Variable rates recommendations	Giving recommendation about variables rate application
					Repository	
	MyEasyFarm	MyEasyFarm	Integration and visualization of different FMIS	Data from other FMIS	Data visualization from different FMIS	Consolidate different digital solutions into a platform.
				Machines data		
				Satellite images		
				Weather data		
	WIUZ	WIUZ	Planting to harvesting management	Farm data boundaries	Operations management	Recommending farms operation with actual resources
			Online consultation			
	Agreo Vigne	SMAG	Manage vineyards operations	Vineyard's report (on-land audit by agronomist)	Vineyard map	Helps user manage their resources and increase products' values by tracebility
			Financial/economic management	Working records (employee, working hours, etc)	Resource monitor and management	
			Product traceability (certification HVE)			
	SMAG Farmer	SMAG	Manage operations from planting to harvest	Machines data	Machines performance	Providing and consolidating informations for farmers, and giving recommendations.
				weather data	Crops growth maps	
				Satellite images	Weather prediction	
				Plot data	Recommendations	

				Production cost		
	Cattle management	SMAG	Manage and monitor cattle milk and slaughter operations	Machines data	Data visualization from machines	Manage herds operations.
				Repository		
Farm Management Information System; Best practice	BeAPI	BeAPI	· Soil mapping	· Soil conductivity	· Soil heterogeneity map	Optimizing fertilizer appliance based on soil heterogeneity data.
				· Soil fertility	· Fertilizing recommendation	
				· Yield data	Soil potential map	
	GeoFolia	ISAGRI	· Providing several tools for farm optimization	· Satellite image	· Fertilizing recommendation	Help farmers to making decision
				· Yield data	· Risk alert	
				· Fungicide data		
	Farmstar	Farmstar	· Fertilizer recommendation	· Satellite image	· Recommendation	Optimizing yield, reduce cost
				· Chlorophyll and biomass measurement		
	Weenat	SmartAg	With their module, records and forecast weather on specific location	Weather sensor data (windspeed, rain, temperature,	Recommendation based on the weather monitoring and forecast	Help farmer to decide the best time to apply fertilizer and prepare from natural events
	Movida	BAYER	· Fungicide application management	· Weather data	· Spraying plan	Optimizing the fungicide appliances to vineyard
	TankMix	YARA	Customization of fertilizer, phytosanitary, and fungicide products.	Users inputs	Recommendation product	Help farmers to find the right product and give recommendations based on tested mix.
			Product recommendation	Laboratory test	Mixing results	
	Avizio	Syngenta	Recommendation for wheat's fungicide application	plot data (sow, soil type, variety, cultivation method)	Recommendation map	Predict the risk of yield loss, and recommend fungicide application on wheat.
	Sencrop	Sencrop	Weather monitoring	Weather sensor data (windspeed, rain, temperature,	Recommendations based on the weather monitoring and forecast	Help farmer to decide the best time to apply fertilizer and prepare from natural events
Agriculture digital marketplace/sales	Isanet marche	ISAGRI	· Market portal for farmer and distributerur	· Product offer	· Price graphs	Product selling with secure transaction. Help farmers to decide which crop to be planted based on market stock.

					· Stock graphs	
	Frais et local	Chambre d'Agriculture, ministère de l'Agriculture et de l'Alimentation	Giving maps of local shops	Shops database	Maps of shops and their products	Facilitate both consumer to find nearest local product shops and also help shop owners to increase selling.
	aladin.farm	Invivo	Market place for agriculture products and services	Products/services data	Products/services detailed information	Facilitate distributors to sell their products/services and also facilitate costumers to buy a products
	Agri Maker	FAST Agritech	Information portal for farmers	Database of digital tools	Catalog of digital tools, news and updates	Providing information about updates, information, and existing tools to help farmers optimize their farming practices.
Decision support tools platform	Terres Inovia	Terres Inovia	Informations and recommendations for sunflower, rapeseed, soja	Users inputs	Recommendations	Helps farmers by providing information on each specific problems (giving insight for decision-making)
			Weed, insects, and disease information		Informations	
	ARVALIS	ARVALIS	Information and recommendations for various crops (plant physiology, disease, seeding, etc)	Users inputs	Recommendations	Helps farmers by providing information on each specific problems (giving insight for decision-making)
					Informations	
	B-GNR (Carburant)	Chambre d'Agriculture	· Carburant analysis	· Fuel consumption	· Recommendation	Identify priority paths to save fuel on each farm. B-GNR is particularly suitable for livestock farms.
				· Tillage		
				· Meadows management		
Data exchange and consent management tool	AgDataHub	AgDataHub	Data exchange intermediary	data offers from data providers	Data offers metadata	Facilitate secure and trusted exchange between data providers and data consumers
	Agata Consent	FAST Agritech	Consent management			Provide consent management between users and data consumers
Management and administrative	LEA	SMAG	Contractors' operation management	Orders' receipts	Oders' constracts docimentation	Facilitate management with equipments' contractors
	Replace.Me		Workers management			Manage workers by finding replacements.

	DematAgri		Archive and documentation	Digital document		Provide secure digital document management tool
Cloud infrastructure services	Microsoft Azure for Agriculture Data Manager	Microsoft	· Ingest, store & manage farm data	· Sensor's data	· Models	Drive innovation through insight, reduce environmental impact, optimize agriculture operations
			· Build & run models	· Satellite image	· Insight	
				· Weather data		
	AWS Solution	Amazon	· Customize a cloud computing architecture	· Sensor's data	· Models	Providing customizable architecture for agricultural needs with cloud computing technology.
				· Satellite image	· Insight	
				· Weather data	· Architecture	
	OKP4		Customize a cloud computing architecture with blockchain technology			Providing customizable architecture for knowledge/value creation.

List of open databases

No	Author/ platform name	Type of Data	address	Format	Metadata	API	Accessibility	Frequency	Context
1	Open-Meteo	String, float, Boolean	https://open-meteo.com/	JSON, CSV, XLS	Yes	Yes	Everyone can access; 10.000 request per day (max) for free and non-commercial use	Data updated every 1-6 hours, depends on the data provider	Open-Meteo utilize open-data weather forecasts provided by national weather services.
2	FAOSTAT	String, integer, double	https://www.fao.org/faostat/en/#data/	CSV, XLS	Yes	No	Everyone can access; No limitation	Annually	The quality of data varies considerably between countries depending upon their individual data collection methodologies.
3	Copernicus SciHub	Image	https://scihub.copernicus.eu/dhus/search?q=*	Jp2	Yes	Yes	Require account creation; Very big size data (up to 20GB per file)	Updated every 2-3 days	The quality of data varies considerably depending on cloud cover condition
4	GéoServices (RPG)	Shapefile	https://wxs.ign.fr/agriculture/geoportail/wmts?SERVICE=WMTS&VERSION=1.0.0&REQUEST=GetCapabilities	shp	Yes	No	Everyone can access; no limitation	Annually	These data have been produced by the Services and Payment Agency (ASP) since 2007.
5	European Commission	All format available, depends on the data	https://data.europa.eu/en	Depends on the data	Yes	No	Everyone can access; No limitation	Not specified, depends on publisher	The data were published by EU member organization. The quality of data is various on each country member.
6	Ministère de la Transition écologique	String, integer, double	https://www.data.gouv.fr/fr/datasets/donnee-secheresse-propluvia/	CSV	Yes	No	Everyone can access; No limitation	Updated daily	The data publish a level of drought periodically of France area.
7	FranceAgriMer	String, text	https://visionet.franceagrimer.fr/Pages/accueil.aspx	xlsx, PDF	Yes,	No	Everyone can access; No limitation	Annually, monthly	Providing data from various category (crop production, livestock, price, land use, etc). Some datasets are not completely filled due to confidentiality.
8	AGRIVOC (FAO)	String, text	AGROVOC: AGROVOC Multilingual Thesaurus (fao.org)			no	Everyone can access; No limitation		Semantics vocabularies for different name of species
9	GéoPortail	Image	https://www.geoportail.gouv.fr/donnees/carte-des-sols	pdf	Yes	No	Everyone can access; account creation needed for export a file	Varies (based on map type)	Visualize different type of maps.
10	Research Data Gouv	dataset	https://entrepot.recherche.data.gouv.fr/	Varies, based on data	Yes	No	Everyone can access the metadata; account creation needed for export data	Varies, based on data	Providing research dataset and publish a data. The data are variated since they are collected with different method.
11	World soil dataset (FAO)	dataset	https://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/ru/		Yes	No	Everyone can access; require software installation to open the dataset		Dataset about soil type in all country with scale 1 : 5.000.000
12	Climate reanalysis data	dataset	https://cds.climate.copernicus.eu/cdsapp#!/search?type=dataset	Zip, tar, gz	Yes	Yes	Everyone can access; No limitation	annually	Data about climate in past, present and future (prediction).

13	SEMAE (plant variety database)	dataset	https://www.semae.fr/catalogue-varietes/	CSV	Yes	No	Everyone can access; No limitation	annually	
14	ADEME	string	https://data.ademe.fr/datasets?topics=TQJGtxm2_	CSV, JSON, XLSX, ODS	Yes	Yes	Everyone can access; No limitation	annually	Data about ecological and environment; example: nitrogen application on soil, electricity use, housing, etc
15	E-Phy	dataset	https://ephy.anses.fr/	CSV, XML			Everyone can access; No limitation		Phytopharmacies data catalog
16	THEIA	dataset	https://catalogue.theia-land.fr/		Yes,	No	Everyone can access; account creation needed for download a file		Geographic product
17	UPOV	dataset	GENIE Database (upov.int)			No	Evryone can access the limited free data; 750CHF annual subcription needed to have full access		Plant variety data and license
18	(SIG_GR) Ecological status/potential of surface water bodies	dataset	https://data.public.lu/fr/datasets/ecological-status-potential-of-surface-water-bodies/	geojson, shp	Yes	Yes	Everyone can access; No limitation		Ecological status/potential of surface water body
19	DataGrandEst	dataset catalog	https://www.datagrandest.fr/data4citizen/portail?facet.field=%5B%22organization%22,%22tags%22,%22themes%22,%22features%22%5D&rows=12&start=0#	csv, json, XLSX, geojson, kml, WMS	Yes	Yes	Everyone can access; No limitation		Provide dataset catalog to help users find available data in Grand-Est region
20	Open data - Département du Calvados	dataset catalog	https://open.isogeo.com/s/434296189d794266a04a8678e256f0c4/HiLeps3y1qrSx6aTDmKyp0spGPix0		Yes	No	Everyone can access; No limitation		Provide dataset catalog to help users find available data in Calvados region
21	Data Economi Gouv	dataset catalog	https://data.economie.gouv.fr/explore/?sort=modified		Yes	Yes	Everyone can access; No limitation		
22	Alim'Confiance	dataset	https://www.data.gouv.fr/fr/datasets/resultats-des-controles-officiels-sanitaires-dispositif-dinformation-alimconfiance/	csv	Yes	Yes	Everyone can access; No limitation		Data about sanitary control
23	UMR 1069 SAS INRAE - L'institut Agro	dataset catalog	https://www.data.gouv.fr/fr/organizations/umr-1069-sas-inrae-linstitut-agro/#/datasets						
24	ADES-Water quality	dataset catalog	https://ades.eaufrance.fr/Recherche	PDF, txt	Yes	no	Everyone can access; No limitation		Data about water quality in France
25	Pesticides on underground water	dataset	https://www.data.gouv.fr/fr/datasets/pesticides-dans-les-eaux-souterraines/	txt, csv	Yes	No	Everyone can access; No limitation		Pesticide content in underground water

26	L'Indicateur de Fréquence de Traitements phytosanitaires (IFT)	dataset	https://www.data.gouv.fr/fr/datasets/doses-de-reference-indicateur-de-frequence-de-traitements-phytosanitaires/#/resources	csv, pdf	Yes	Yes	Everyone can access; No limitation	weekly	
27	EUPVP - Common Catalogue Information System	dataset catalog	https://ec.europa.eu/food/plant-variety-portal/index.xhtml;jsessionid=c6dwDaaS7gi1hq4b3Gk5_tBN1JgBVgrpTuTn_JhflrOoyEHYS2fw!1235683713	xlsx	Yes	No	Everyone can access; No limitation		EU common catalog for plant variety