

Systemes d'information et analyses de données

Journée PHENOME-EMPHASIS 13 avril 2023,

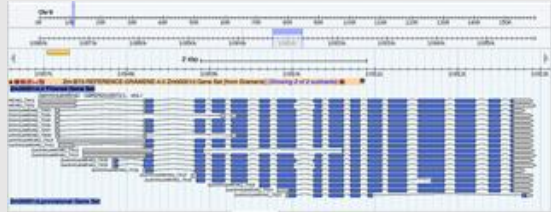
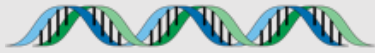
INRAE-Paris

Pascal Neveu, Cyril Pommier,

Isabelle Alic



Genetics & Genomics

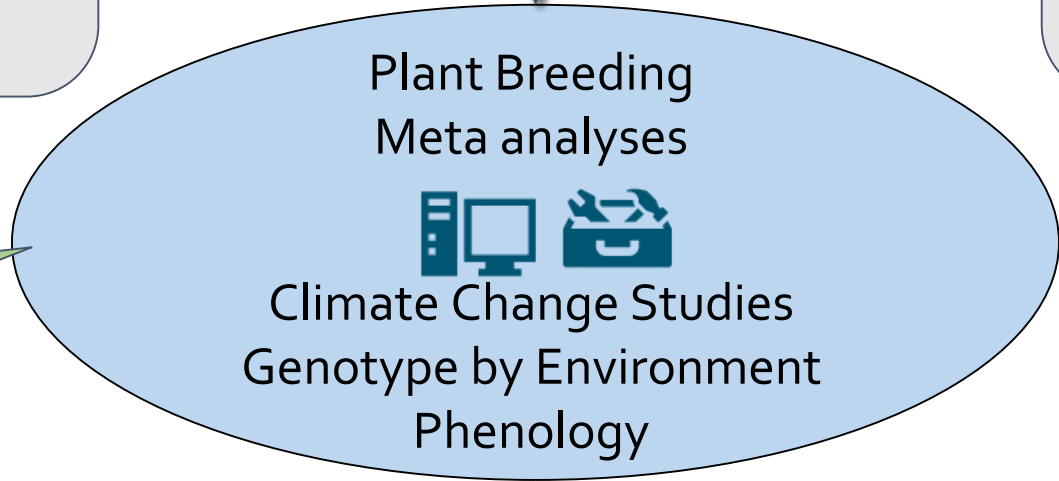


Phenomics



- *Expensive, lot of resources needed*
- *Complex design*
- *Cannot be reproduced*
- *Huge and very complex datasets*

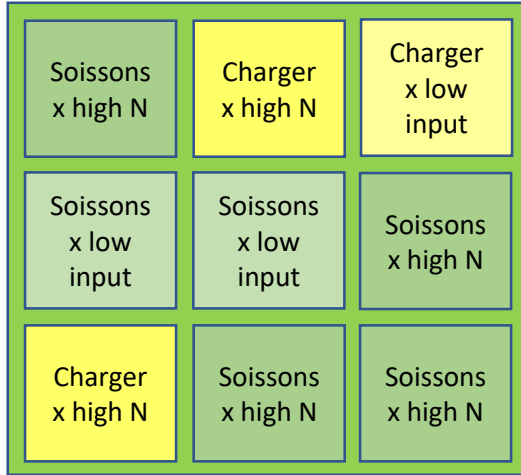
- *Reproducibility*
- *Tracibility*



Environment



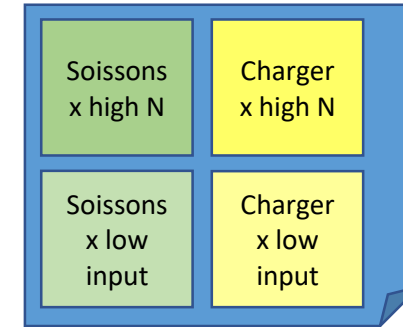
« Raw » data, pheno/env measures, variables



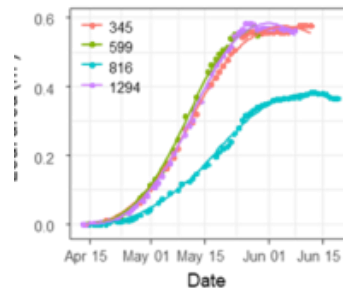
Derivation, Reduction



« computed » data, reduced, indicators



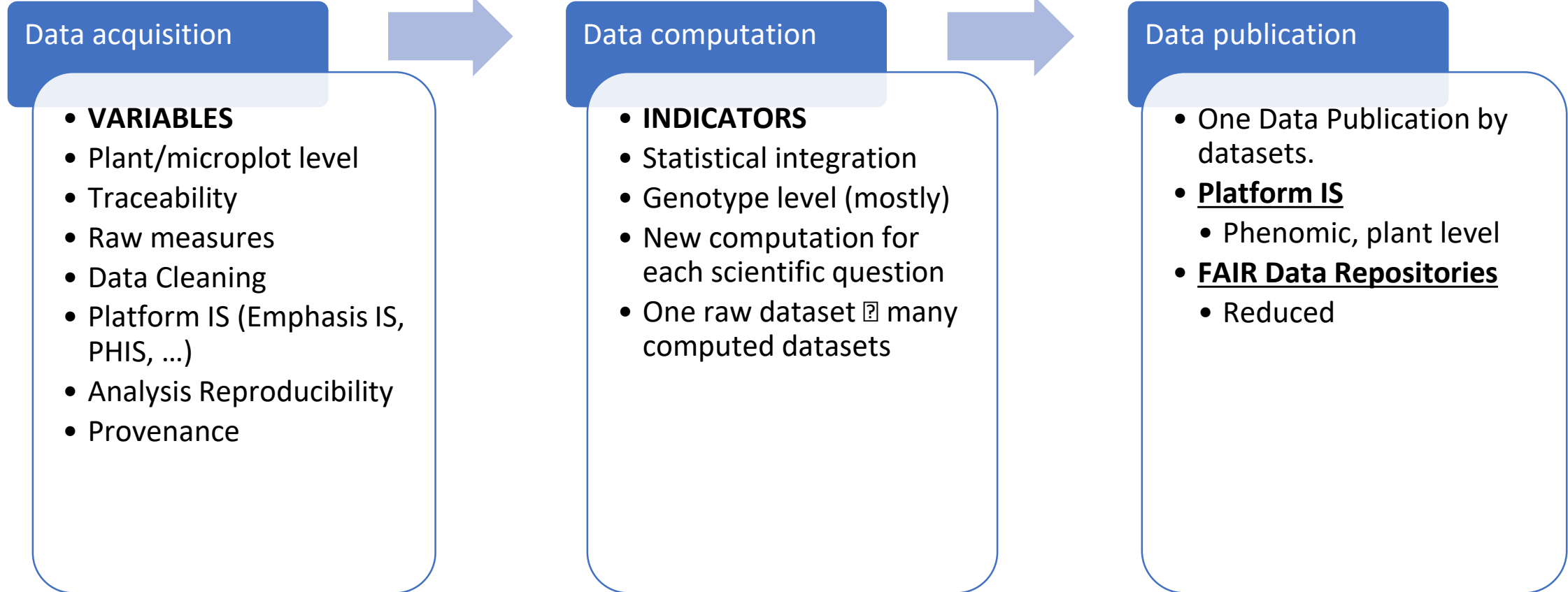
Genotype	Treatment	N input	Date	Rep	Fusariose
Soissons	low input	15,32253129	15/11/2011	1	5
Soissons	low input	15,31430556	16/11/2011	2	7



Genotype	Treatment	Fusariose
Soissons	low input	6

661300270	Ardon	2004	45.645632645603683	12/01/2004	284.3
661300270	Ardon	2005			
661300444	Ardon	2004	38.96112577281653	12/01/2004	228.8
661300444	Ardon	2005			
661300312	Cavallermaggiore	2004	52.4	01/01/2004	249.9
661300312	Cavallermaggiore	2005			
661300371	Cavallermaggiore	2004	45.74	01/01/2004	230.2
661300371	Cavallermaggiore	2005			
661300487	Cavallermaggiore	2004	72.52	01/01/2004	309.8
661300487	Cavallermaggiore	2005			
661300585	Cavallermaggiore	2004	71.73999999999999999	01/01/2004	305.7
661300585	Cavallermaggiore	2005			
661300468	Headley	2004	45.27	01/01/2004	
661300468	Headley	2005			
661300469	Headley	2004	70.93000000000000007	01/01/2004	
661300469	Headley	2005			
661300533	Headley	2004	57.67	01/01/2004	258.8

Raw data long term conservation



Data acquisition

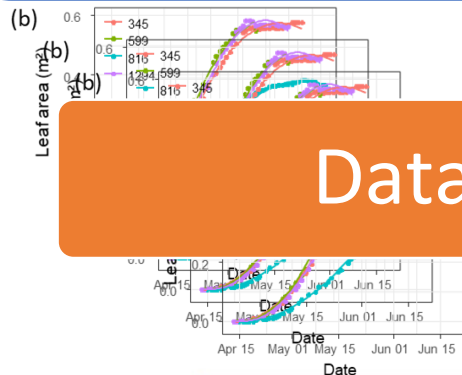
- **VARIABLES**
- Plant/microplot level
- Traceability
- Raw measures
- Data Cleaning
- Platform IS (Emphasis IS, PHIS, ...)
- Analysis Reproducibility
- Provenance

Data computation

- **INDICATORS**
- Statistical integration
- Genotype level (mostly)
- New computation for each scientific question
- One raw dataset → many computed datasets

Data publication

- One Data Publication by datasets.
- **Platform IS**
 - Phenomic, plant level
- **FAIR Data Repositories**
 - Reduced



Data

Genotype	traitement	Fusariose
Soisson	low input	5
Soisson	high N	1
Charger	low input	1
Charger	high N	2

Knowledge

Variety charger
intensive cultural practice

Semantic

- Description of the data
- Crop ontology
- www.croponontology.org
- Phenotyping/environment
- variable = Trait + Method + Unit/Scale
- *Biologist* driven



Structure

- Formatting, Modelling and Organizing Data
- Minimal Information About Plant Phenotyping Experiment
- www.miappe.org
- Dataset : greenhouse, field, multiannual, multilocal
- Variables and plant material
- *Biologist & Computer scientist* driven

Persistent Unique Identifiers

URI, sensor ID, accessions ID, Trait ID, DOI,...

Technical

- Data integration and sharing
- Interoperability : tools and systems
 - Breeding API www.brapi.org
- *Computer scientist* driven



- Implementations
 - File templates
 - Recherche Data Gouv
 - FAIDARE Data portal
 - PHIS/Sixtine Information System
- Research Data Management Kit
 - List recommended standards, tools practices ...
 - <https://rdmkit.elixir-europe.org/>

The screenshot shows the RDMkit website interface. At the top left is the RDMkit logo. To the right are navigation links: "Data management" (highlighted in a pink box), "About", and "Contribute". Below the logo is a vertical menu with the following items: "Data management" (underlined), "Data life cycle" (with a downward arrow), "Your role" (with a downward arrow), "Your domain" (with a downward arrow), "Your tasks" (with a downward arrow), "Tool assembly" (highlighted in a pink box with an upward arrow), and a list of tool categories: "COVID-19 Data Portal", "CSC", "Galaxy", "IFB", "Marine Metagenomics", "MOLGENIS", "NeLS", "OMERO", "Plant Genomics", and "Plant Phenomics".

On the right side of the page, under the heading "Your domain", the text "Plant sciences" is displayed in large black font, followed by three small icons: a pencil, an exclamation mark, and a circular arrow. Below this is a list of links in a light gray box:

- Introduction
- Plant biological materials: (meta)data collection and sharing
- Phenotyping: (meta)data collection and publication
- Genotyping: (meta)data collection and publication
- Related pages
- More information
- Relevant tools and resources

Below the list is a section titled "Introduction" in bold red font, followed by the sub-heading "Data management challenges in plant sciences" in bold black font. The text below reads: "The plant science domain includes studying the adaptation of plants to their env... improving crop yield or resistance to environmental conditions, to managing for... facilitators for understanding the play between genotype and environment to pr... phenotyping experiments and genomic assays made on the same plant material".

https://rdmkit.elixir-europe.org/plant_phenomics_assembly

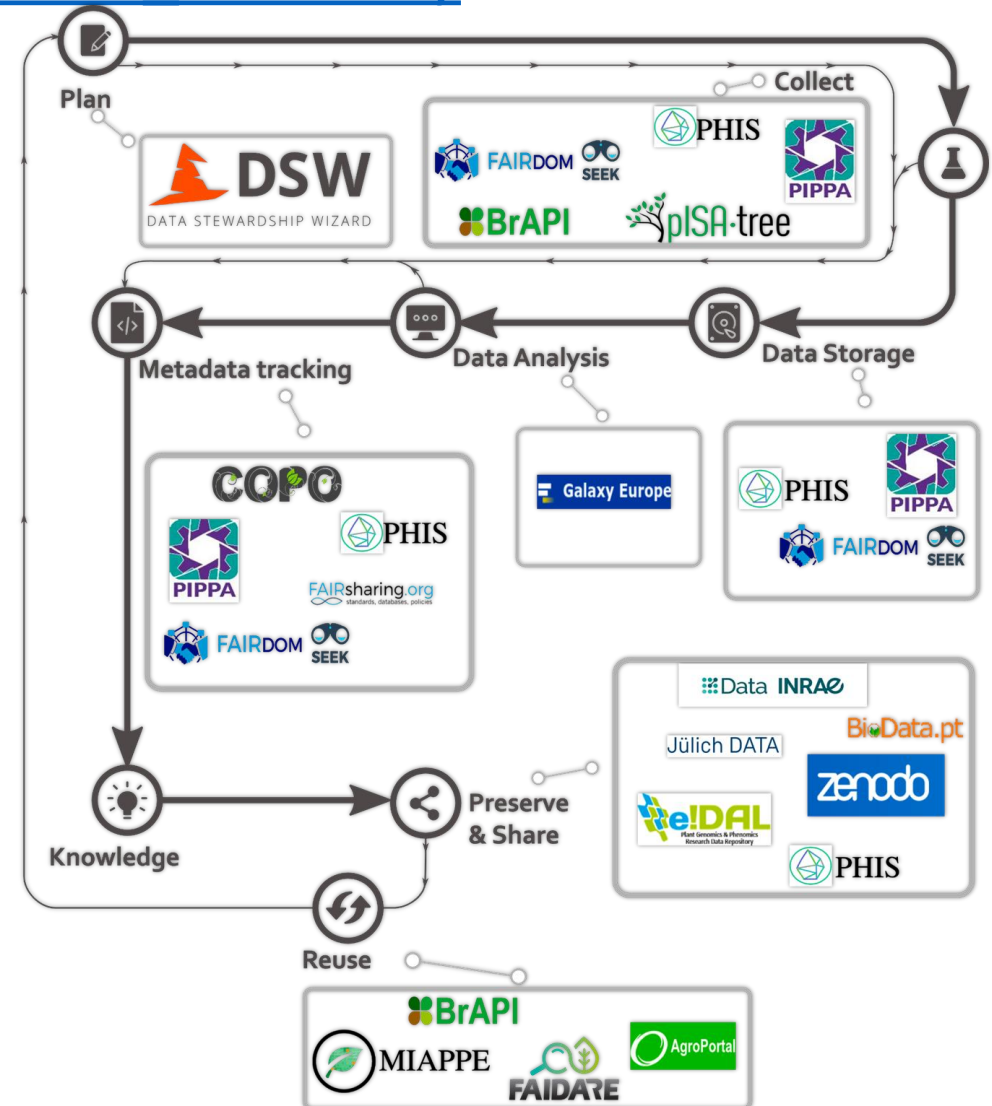
RDMkit Data management About Con

Data management

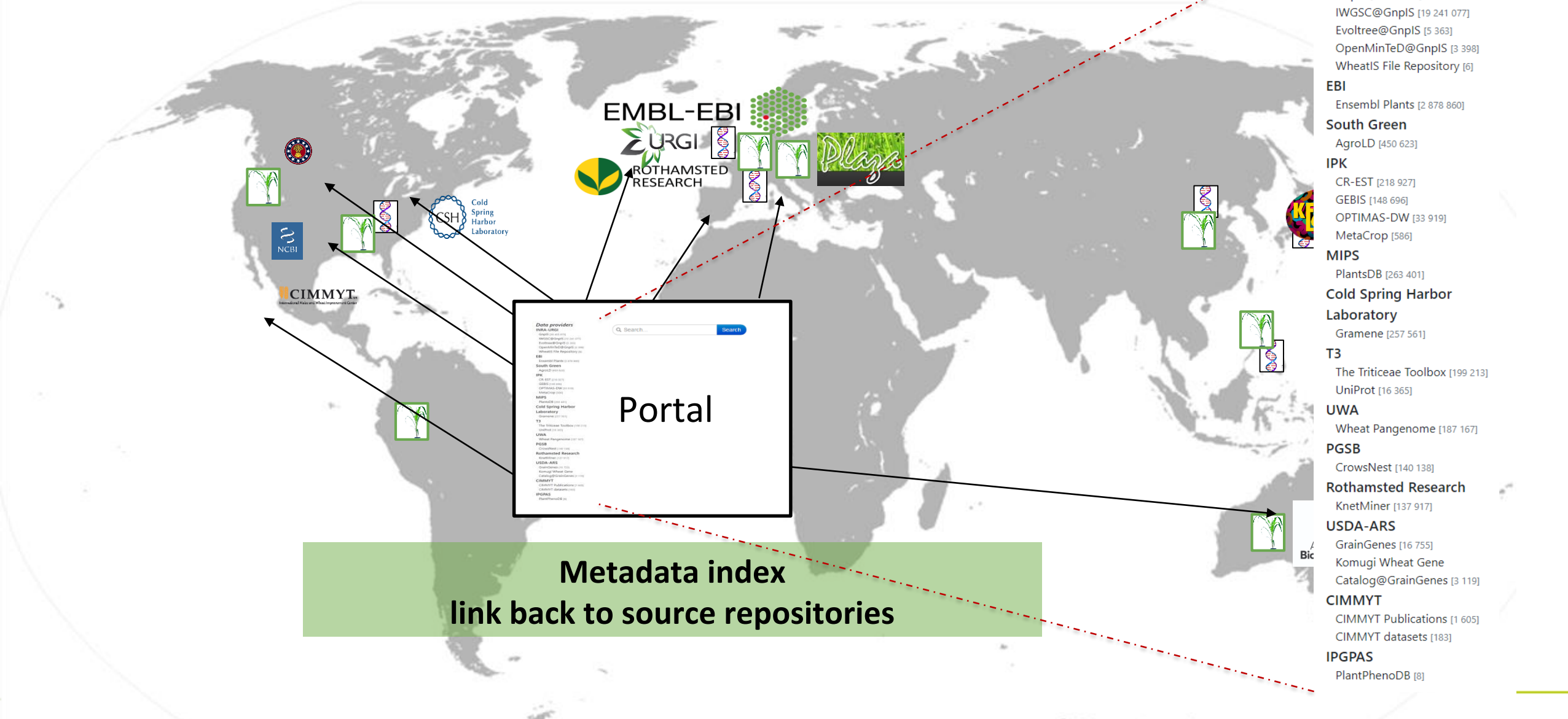
- Data life cycle
- Your role
- Your domain
- Your tasks
- Tool assembly

Plant Phenomics

- What is the plant phenomics tool assembly and who can use it?
- How can you access the plant phenomics tool assembly?
- Related pages
- More information
- Relevant tools and resources



Dedicated plant data search engine



Data providers

INRA-URGI
GnplS [36 420 075]
IWGSC@GnplS [19 241 077]
Evoltree@GnplS [5 363]
OpenMinTeD@GnplS [3 398]
WheatS File Repository [6]

EBI
Ensembl Plants [2 878 860]

South Green
AgroLD [450 623]

IPK
CR-EST [218 927]
GEBIS [148 696]
OPTIMAS-DW [33 919]
MetaCrop [586]

MIPS
PlantsDB [263 401]

Cold Spring Harbor Laboratory
Gramene [257 561]

T3
The Triticeae Toolbox [199 213]
UniProt [16 365]

UWA
Wheat Pangenome [187 167]

PGSB
CrowsNest [140 138]

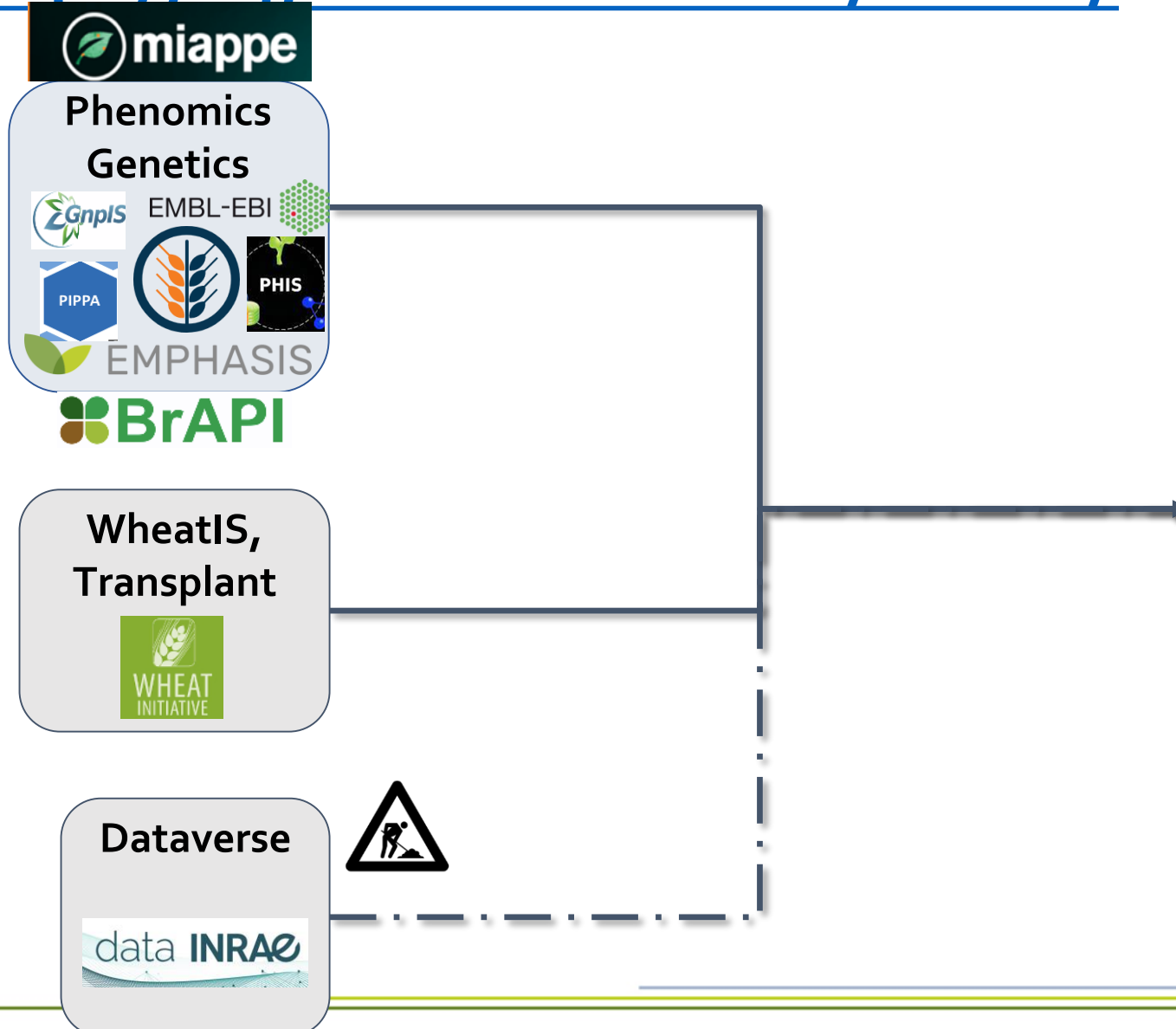
Rothamsted Research
KnetMiner [137 917]

USDA-ARS
GrainGenes [16 755]
Komugi Wheat Gene
Catalog@GrainGenes [3 119]

CIMMYT
CIMMYT Publications [1 605]
CIMMYT datasets [183]

IPGPAS
PlantPhenoDB [8]

<https://urgi.versailles.inrae.fr/faidare/>



The screenshot shows the FAIDARE web portal interface. At the top, there is a search bar with the text "peuplier" and a "Rechercher" button. Below the search bar, the results are displayed in a list format. The first result is "ABELE - GrainGenes", which is a germplasm of *Triticum aestivum*. The second result is "Populus alba x Populus tremula var. glandulosa - brapi@GnpIS", which is a germplasm of *Populus alba x tremula var. glandulosa*. The third result is "AUBE - brapi@GnpIS", which is a germplasm of *Triticum aestivum*. The search results are filtered by "Espèces (30)", "Groupe taxonomique (11)", and "Type de données (13)". The "Type de données" filter is expanded, showing a list of data types: Genome annotation [329238] x, Germplasm [4791] x, Genotyping Study [1692] x, Protein [66] x, Expressed sequence tags [2502], Marker [149], Phenotyping Study [80], QTL [77], Bibliography [4], Experiment [3], Genetic map [2], and Biochemical reaction [1].

[https://github.com/MIAPPE/MIAPPE/tree/master/MIAPPE Checklist-Data-Model-v1.1/MIAPPE template](https://github.com/MIAPPE/MIAPPE/tree/master/MIAPPE%20Checklist-Data-Model-v1.1/MIAPPE%20template)

	A	B
1	Investigation*	Investigations are research programmes with defined aims. They can exist at various scales (for example, they could encompass a grant-funded programme of work, the various components comprising a peer-reviewed publication, or a single experiment). <i>This section is mandatory.</i>
2	Study*	A study (or experiment) comprises a series of assays (or measurements) of one or more types, undertaken to answer a particular biological question. <i>This section is mandatory.</i>
3	Person*	A human involved in the investigation or specifically any of its studies. <i>This section is mandatory.</i>
4	Data File	A file or digital object holding observation data recorded during one or more assays of the study, typically in tabular form. Multiple data files may be provided per study, and each file can include observations for several observation units and several observed variables.
5	Biological Material*	The biological material being studied (e.g. plants grown from a certain bag or seed, or plants grown in a particular field). The original source of that material (e.g., the seeds or the original plant cloned) is called the material source, which, when held by a material repository, should have its stock identified. <i>This section is mandatory.</i>
	Environment	Environmental parameters that were kept constant throughout the study and did not change between observation units or assays. Environment characteristics that vary over time, i.e. environmental variables, should be recorded as Observed Variables (see below).

File template & Recherche Data Gouv



URGI Plant and Fungi Dataverse URGI - Unité de Recherche Génomique Info
(www.urgj.versailles.inrae.fr)

Recherche Data Gouv > Data INRAE > Omics Dataverse > URGI Plant and Fungi Dataverse >

A multi-site experiment in a network of European fields for assessing the maize yield response to environmental scenarios

Version 4.0



Millet, Emilie J.; Pommier, Cyril; Buy, Mélanie; Nagel, Axel; Kruijer, Willem; Welz-Bolduan, Therese; Lopez, Jeremy; Richard, Cécile; Racz, Ferenc; Tanzi, Franco; Spitkot, Tamas; Canè, Maria-Angela; Negro, Sandra S.; Coupel-Ledru, Aude; Nicolas, Stéphane D.; Palaffre, Carine; Bauland, Cyril; Praud, Sébastien; Ranc, Nicolas; Presterl, Thomas; Bedo, Zoltan; Tuberosa, Roberto; Usadel, Björn; Charcosset, Alain; van Eeuwijk, Fred A.; Draye, Xavier; Tardieu, François; Welcker, Claude, 2019, "A multi-site experiment in a network of European fields for assessing the maize yield response to environmental scenarios", <https://doi.org/10.15454/IASSTN>, Recherche Data Gouv, V4, UNF:6:zS2/ccOQxFrKIUt+1S0Cvg== [fileUNF]

Citer le jeu de données

Pour en apprendre davantage sur le sujet, consulter le document Data Citation Standards [en].

Modalités d'accès au jeu de données
Contact Partager

Statistiques d'utilisation sur les jeux de données
12 624 consultations
5 857 téléchargements
3 citations



<input type="checkbox"/>		10-Info-ObservedVariable.tab Données tabulaires - 21.8 Ko Publié 3 nov. 2022 106 téléchargements 17 Variables, 91 Observations UNF List of phenotypic and environment (https://www.miappe.org/) Observed Variable
<input type="checkbox"/>		11-Info-Study.tab Données tabulaires - 6.4 Ko Publié 3 nov. 2022 87 téléchargements 11 Variables, 19 Observations UNF List of studies, including locations, used in the dataset, following the MIAPPE data standard (https://www.miappe.org/) Study
<input type="checkbox"/>		12a-Info-EIPO-Environmental_Traits.csv Comma Separated Values - 2.3 Ko Publié 3 nov. 2022 85 téléchargements

- Dedicated experimental Information System
- PHIS / SIXTINE

Identification


- Everything can be identified: plants, experiments, sensors, events, etc.
- Persistent, unambiguous, resolvable

Semantics

- Naming Conventions
- Controlled vocabulary
- Formalized relationships between entities
- Data annotation and enrichment

How?

PHIS, an ontology driven
Information System



URI of plant:
<<http://phenome.fr/arch/2017/c17000118>>

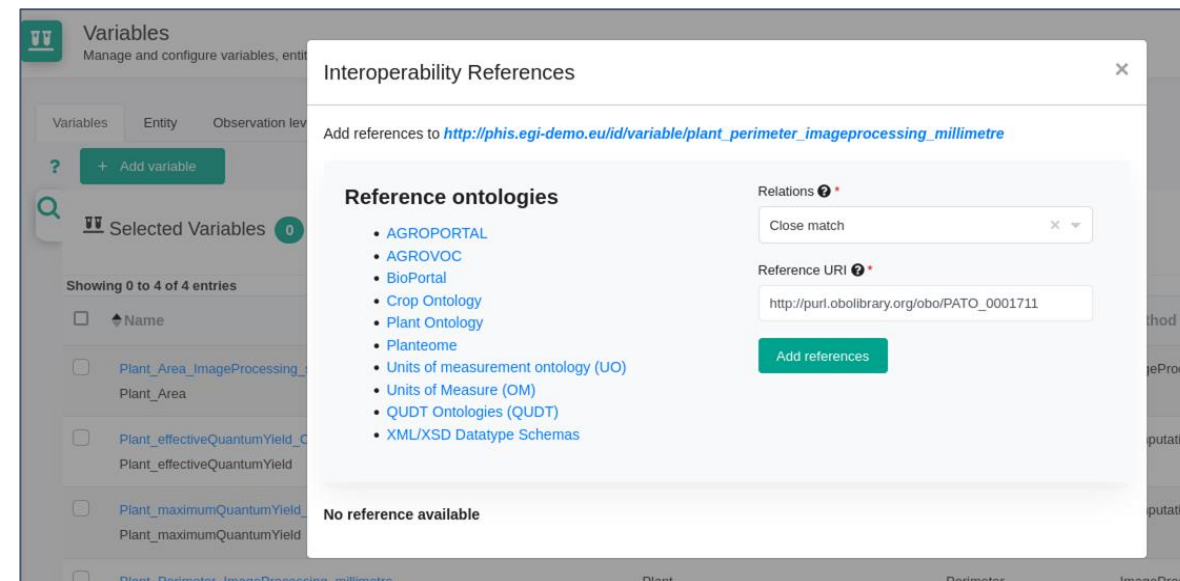
URI of pot:
<<http://phenome.fr/arch/2013/pc13001542>>

URI of cart:
<<http://phenome.fr/arch/2013/ct1300123>>

URI of cabin:
<<http://phenome.fr/arch/2018/ac180015>>

URI of camera:
<<http://phenome.fr/arch/2018/ac180019>>

URI of image: <<http://phenome.fr/arch/2017/ic17002295855>>



Variables
Manage and configure variables, entities, and observations

Variables Entity Observation level

+ Add variable

Selected Variables 0

Showing 0 to 4 of 4 entries

Name
Plant_Area_ImageProcessing_millimetre
Plant_Area
Plant_effectiveQuantumYield_Centimetre
Plant_effectiveQuantumYield
Plant_maximumQuantumYield_Centimetre
Plant_maximumQuantumYield
Plant_Perimeter_ImageProcessing_millimetre

Interoperability References

Add references to http://phis.egi-demo.eu/id/variable/plant_perimeter_imageprocessing_millimetre

Reference ontologies

- AGROPORTAL
- AGROVOC
- BioPortal
- Crop Ontology
- Plant Ontology
- Planteome
- Units of measurement ontology (UO)
- Units of Measure (OM)
- QUDT Ontologies (QUDT)
- XML/XSD Datatype Schemas

Relations

Close match

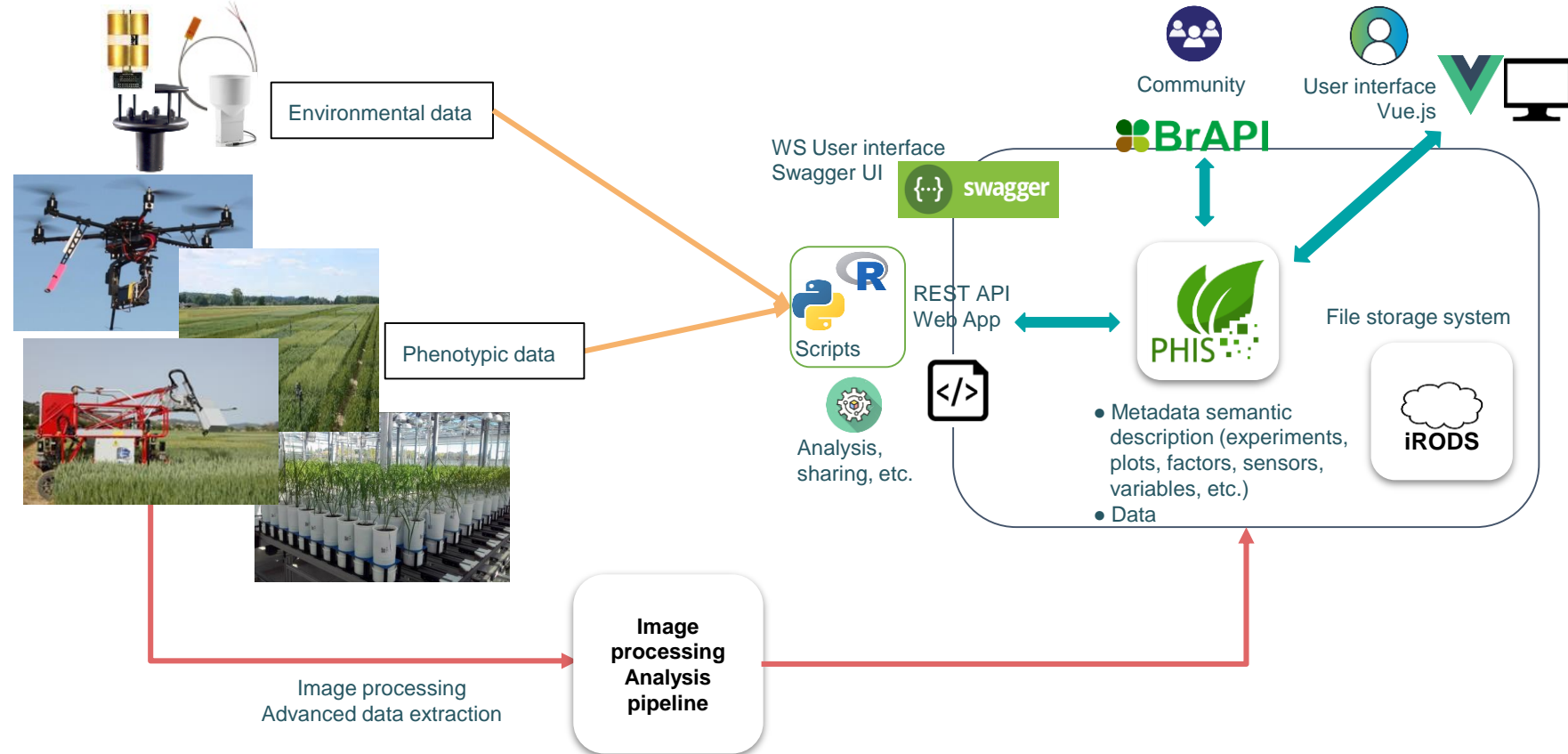
Reference URI

http://purl.obolibrary.org/obo/PATO_0001711

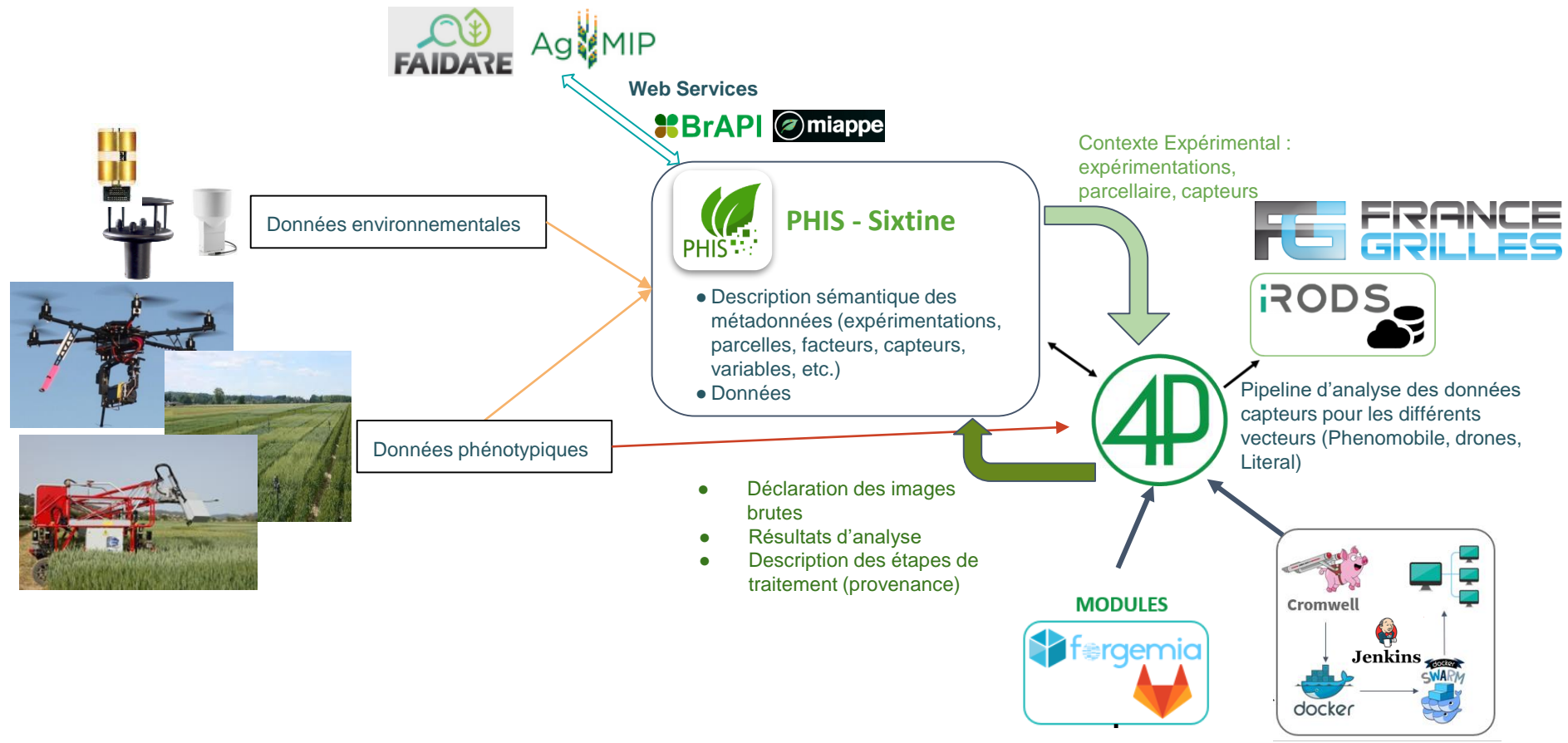
Add references

No reference available

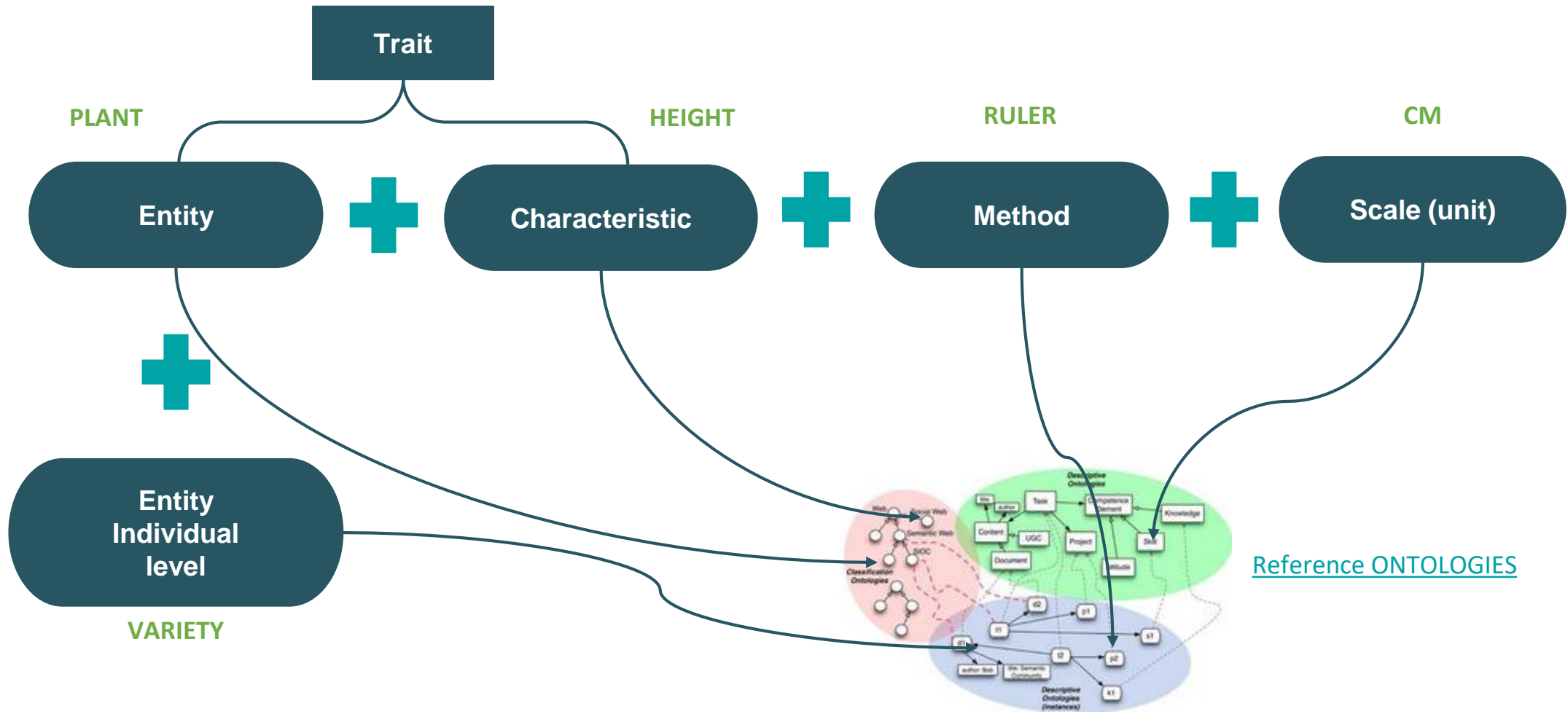
PHIS: an Ontology driven Information System for Plant Phenomics

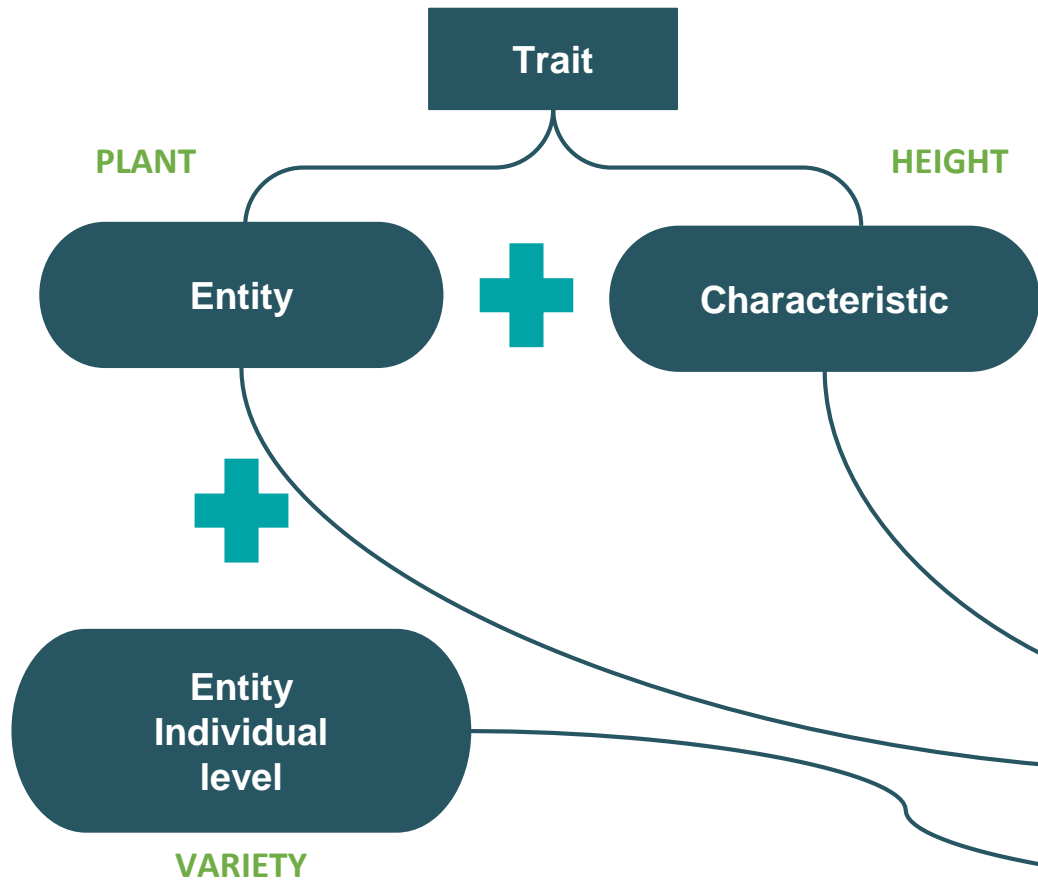


PHIS-4P: example of a connection to a data processing platform



- **Naming conventions**
- Link to **domain ontologies** (Crop Ontology, Agrovoc, etc.) and **standard ontologies** (Dublin Core, Ontology of Annotation, etc.)
- Specific instances for creating, storing, and exporting **sharable resources**
- **Data traceability** protocols
- **Standard Compatibility** (BrAPI, MIAPPE)





Add variable

URI

autogenerated URI

Entity [?]*

Plant x ▾ +

Characteristic [?]*

Height x ▾ +

Method [?]*

Ruler x ▾ +

Unit/Scale [?]*

Centimeter x ▾ +

Observation level [?]

Search and select an observation level ▾ +

Species

Select species ▾

⚠ Trait already existing in an ontology

Name *

Plant_Height_Ruler_centimeter

Alternative name

Plant_Height

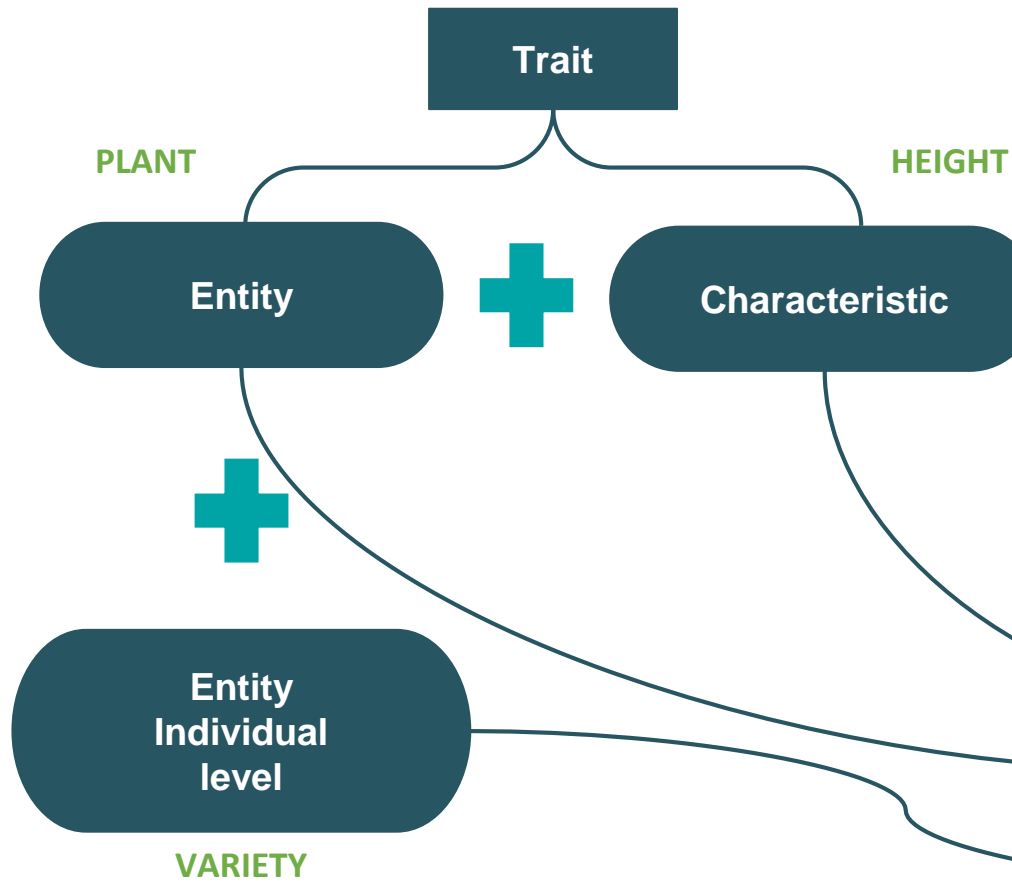
Data type [?]*

Decimal number x ▾

Time interval [?]

Select an interval ▾

Sample interval [?]



The screenshot shows the "Add trait" dialog box in a software interface. The dialog has the following fields and options:

- URI:** A checked checkbox and a text input field containing "Height".
- Trait name:** A text input field containing "http://purl.obolibrary.org/obo/PATO_0000119".
- Entity:** A dropdown menu with "Plant" selected.
- Characteristic:** A dropdown menu with "Height" selected.
- Method:** A dropdown menu with "Ruler" selected.
- Unit/Scale:** A dropdown menu with "Centimeter" selected.
- Name:** A text input field containing "Plant_Height_Ruler_centimeter".
- Alternative name:** A text input field containing "Plant_Height".
- Data type:** A dropdown menu with "Decimal number" selected.
- Time interval:** A dropdown menu with "Select an interval" selected.
- Sample interval:** A dropdown menu with "Select an interval" selected.

Buttons for "Cancel" and "Save" are at the bottom. A message "Trait already existing in an ontology" is displayed in a green box on the right side of the dialog.

● Variables

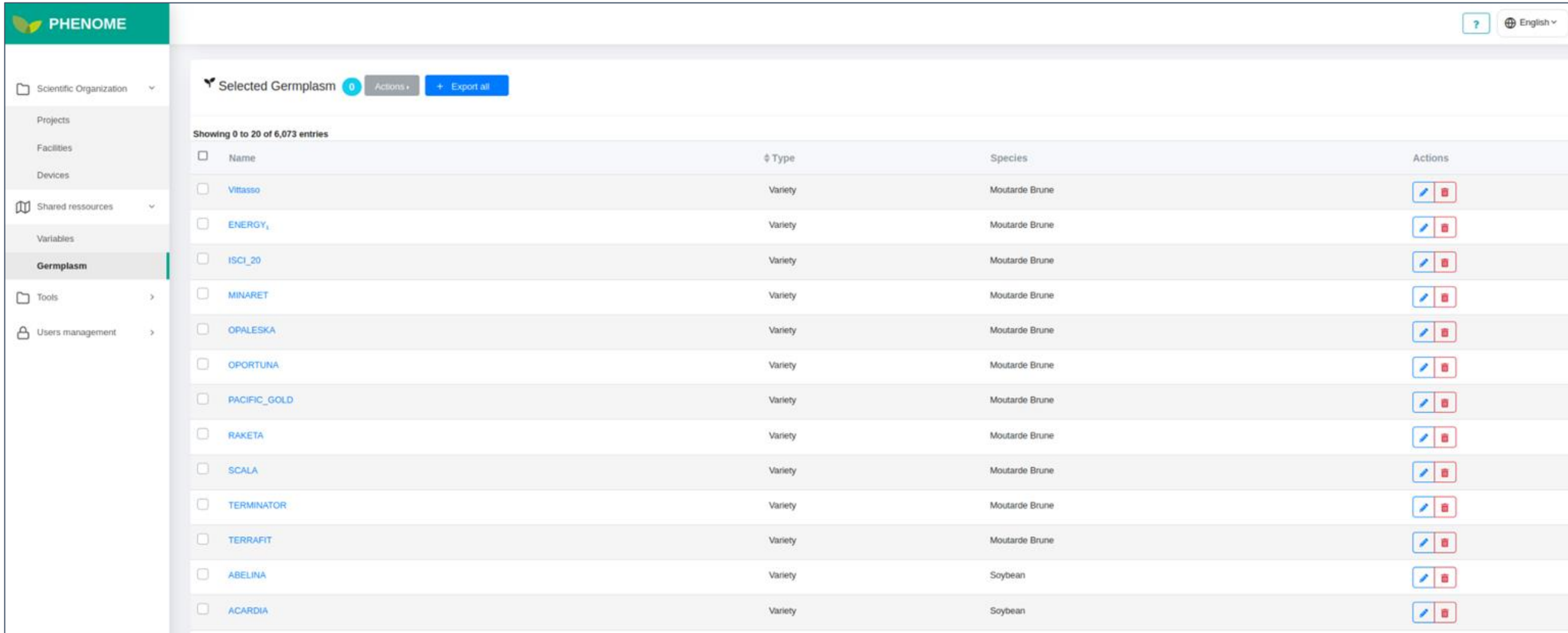
PHENOME								?	English	Admin OpenSilex (Admin)
Scientific Organization	Selected Variables 0 Actions									
Projects	Showing 0 to 20 of 49 entries									
Facilities	<input type="checkbox"/>	Name	Entity	Entity of interest	Characteristic	Method	Unit/Scale	Actions		
Devices	<input type="checkbox"/>	Canopy_ChlorophyllContent_PhysicalModel_GramPerSquare...	canopy		Chlorophyll content	PhysicalModel	microgram per square metre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shared resources	<input type="checkbox"/>	Canopy_Ci850nm570nm_BandCombination_Unitless	canopy		Ci850nm570nm	Wave band combination	unitless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Variables	<input type="checkbox"/>	Canopy_Ci850nm710nm_BandCombination_Unitless	canopy		Ci850nm710nm	Wave band combination	unitless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Germplasm	<input type="checkbox"/>	Canopy_Ci850nm730nm_BandCombination_Unitless	canopy		Ci850nm730nm	Wave band combination	unitless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tools	<input type="checkbox"/>	Canopy_CoverFraction0deg_ImageSegmentation_Unitless	canopy		CoverFraction0deg	Image segmentation	unitless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Users management	<input type="checkbox"/>	Canopy_CoverFraction45deg_ImageSegmentation_Unitless	canopy		CoverFraction45deg	Image segmentation	unitless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	Canopy_Height_LIDAR_Meter	canopy		height	LIDAR	metre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	Canopy_Height_Photogrammetry_metre	canopy		height	Photogrammetry	metre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	Canopy_HeightFlag_Photogrammetry_Unitless	canopy		HeightFlag	Photogrammetry	unitless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	Canopy_HeightStd_Photogrammetry_Meter	canopy		HeightStd	Photogrammetry	metre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Variables



























The screenshot displays the PHIS Variables management interface. On the left is a sidebar with navigation options: Scientific Organization, Scientific Information, Variables (selected), Germplasm, Documents, Scientific Objects, Data, Vocabulary, Administration, Tools, and Web API. The main content area is titled 'Variables' and includes a sub-header 'Manage and configure variables, entities, characteristics, methods and units'. Below this are tabs for 'Variables', 'Entity', 'Entity of interest', 'Characteristic', 'Method', 'Unit/Scale', and 'Group of variables'. A '+ Add variable' button is visible. A form for adding a variable includes fields for Source (PHENOME), Name (Enter variable name), Entity (Select one entity), Characteristic (Select one characteristic), and Group of variables (Select one group of variables). An 'Advanced Search' section with 'Reset' and 'Search' buttons is also present. On the right, a 'Selected Variables' section shows a table with 3 selected items. A dropdown menu is open over the table, offering actions like 'Add to an existing group of variables', 'Add to a new group of variables', 'Export variable list', 'Export detailed variable list', and 'Import from the shared source'. The table columns are Name, Entity, Entity of interest, and Characteristic.

<input type="checkbox"/>	Name	Entity	Entity of interest	Characteristic
<input checked="" type="checkbox"/>	air_humidity_averageDailyComputation_percent	air		Humidity
<input checked="" type="checkbox"/>	air_humidity_durationBetween80pcAnd90pcHourlyComputation...	air		Humidity
<input checked="" type="checkbox"/>	air_humidity_durationOver80pcDailyComputation_decimalHour	air		Humidity
<input type="checkbox"/>	air_humidity_durationOver90pcDailyComputation_decimalHour	air		Humidity
<input type="checkbox"/>	air_humidity_durationOver90pcHourlyComputation_decimalHour	air		Humidity
<input type="checkbox"/>	air_humidity_durationUnder40pcDailyComputation_decimalHour	air		Humidity

- Germplasm



The screenshot shows the PHENOME web interface. On the left is a navigation sidebar with categories: Scientific Organization, Projects, Facilities, Devices, Shared resources, Variables, Germplasm (highlighted), Tools, and Users management. The main content area is titled "Selected Germplasm" and shows a table of 14 entries. The table has columns for Name, Type, Species, and Actions. Each entry includes a checkbox, a name, a type (all are "Variety"), a species (mostly "Moutarde Brune", with "Soybean" for the last two), and a set of edit and delete icons.

<input type="checkbox"/>	Name	Type	Species	Actions
<input type="checkbox"/>	Vittasso	Variety	Moutarde Brune	 
<input type="checkbox"/>	ENERGY ₁	Variety	Moutarde Brune	 
<input type="checkbox"/>	ISCI_20	Variety	Moutarde Brune	 
<input type="checkbox"/>	MINARET	Variety	Moutarde Brune	 
<input type="checkbox"/>	OPALESKA	Variety	Moutarde Brune	 
<input type="checkbox"/>	OPORTUNA	Variety	Moutarde Brune	 
<input type="checkbox"/>	PACIFIC_GOLD	Variety	Moutarde Brune	 
<input type="checkbox"/>	RAKETA	Variety	Moutarde Brune	 
<input type="checkbox"/>	SCALA	Variety	Moutarde Brune	 
<input type="checkbox"/>	TERMINATOR	Variety	Moutarde Brune	 
<input type="checkbox"/>	TERRAFIT	Variety	Moutarde Brune	 
<input type="checkbox"/>	ABELINA	Variety	Soybean	 
<input type="checkbox"/>	ACARDIA	Variety	Soybean	 

What is Provenance ?

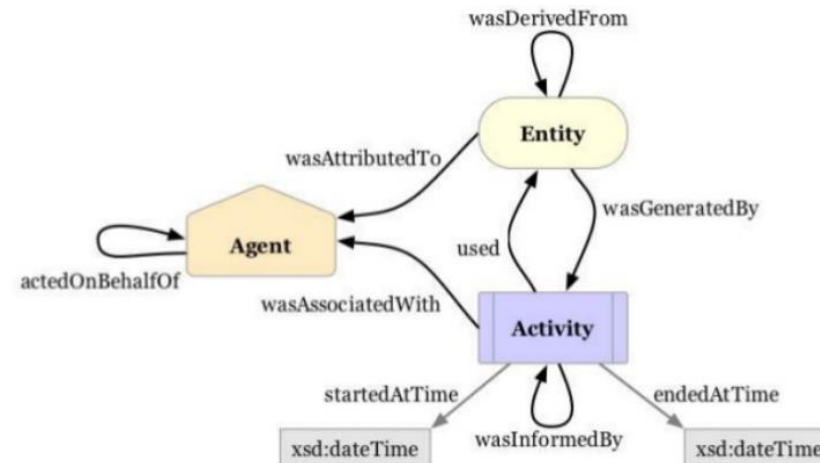
That is metadata to know

- Who played a role in data generation at different scale?
- Who is the main responsible?
- How data was transformed?
- Which tools were used?
- When and how data were produced?
- etc.



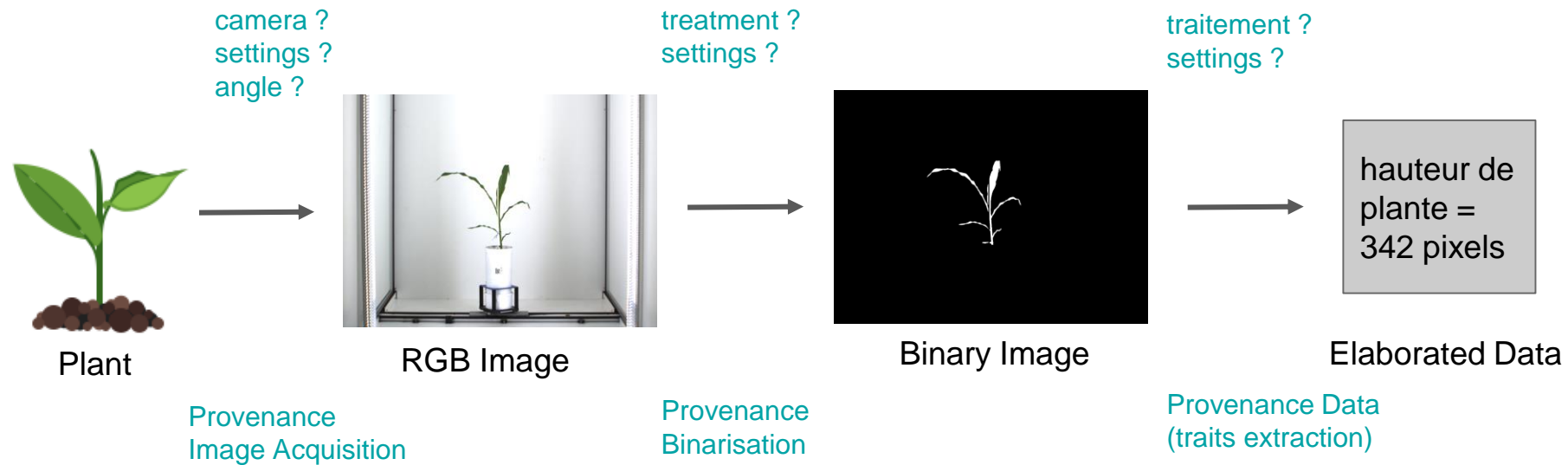
- **Entity:** data, data sources, documents, results, etc.
Entity can be input or output
- **Agent:** person, software, Web Services, institution, company, etc.
Agent bears the responsibility
- **Activity:** generating, transforming, modifying, processing, etc
Activity occurs over a period of time and acts upon or with entities

Representation model for
provenance (PROV-O)



Exemple : PhenoArch

Greenhouse experiment



Resource Sharing - Data traceability - Provenance

URI or URL

opensilex-sandbox:id/provenance/rgbmorpho_sweetpotato

Name *

RGBMorpho_SweetPotato

Description

Describe provenance

Activity

Type *

Image Analysis

Start Date

07/16/2018 11:34

End Date

07/30/2018 11:34

Url

+ CSV Import Export

Variable(s)

Select one or more variables >>

Experiment(s)

Select one or more Experiments

Begin

MM/DD/YYYY hh:mm

End

MM/DD/YYYY hh:mm

Scientific object(s)

Select scientific objects >>

Target(s)

Provenance

RGBMorpho_SweetPotato

Reset Search

Showing 0 to 20 of 960 entries

Target	Date	Variable	Value	Provenance
SP004018 (plant)	2018-07-30T20:07:00.000Z	plant_Perimeter_ImageProcessing_millimetre	1116.162359	RGBMorpho_SweetPotato
SP004017 (plant)	2018-07-30T20:07:00.000Z	plant_Perimeter_ImageProcessing_millimetre	1148.568473	RGBMorpho_SweetPotato
SP004016 (plant)	2018-07-30T20:07:00.000Z	plant_Perimeter_ImageProcessing_millimetre	831.9885103	RGBMorpho_SweetPotato
SP004015 (plant)	2018-07-30T20:07:00.000Z	plant_Perimeter_ImageProcessing_millimetre	1021.794993	RGBMorpho_SweetPotato
SP004014 (plant)	2018-07-30T20:07:00.000Z	plant_Perimeter_ImageProcessing_millimetre	1120.25216	RGBMorpho_SweetPotato
SP004013 (plant)	2018-07-30T20:07:00.000Z	plant_Perimeter_ImageProcessing_millimetre	1639.445134	RGBMorpho_SweetPotato
SP004018 (plant)	2018-07-30T20:07:00.000Z	plant_Area_ImageProcessing_squareMillimetre	14720.98925	RGBMorpho_SweetPotato
SP004017 (plant)	2018-07-30T20:07:00.000Z	plant_Area_ImageProcessing_squareMillimetre	13003.48473	RGBMorpho_SweetPotato
SP004016 (plant)	2018-07-30T20:07:00.000Z	plant_Area_ImageProcessing_squareMillimetre	6377.689964	RGBMorpho_SweetPotato
SP004015 (plant)	2018-07-30T20:07:00.000Z	plant_Area_ImageProcessing_squareMillimetre	9149.182598	RGBMorpho_SweetPotato
SP004014 (plant)	2018-07-30T20:07:00.000Z	plant_Area_ImageProcessing_squareMillimetre	11588.33704	RGBMorpho_SweetPotato
SP004013 (plant)	2018-07-30T20:07:00.000Z	plant_Area_ImageProcessing_squareMillimetre	14595.79916	RGBMorpho_SweetPotato
SP004006 (plant)	2018-07-30T20:03:00.000Z	plant_Perimeter_ImageProcessing_millimetre	1296.097323	RGBMorpho_SweetPotato

Provenance agents

Add an agent

Agent type

Software

Agent

Plantscreen Data Analyser

Agent type

SensingDevice

Agent

Compact_TopView_RGB2

Data are linked to a provenance

- **BrAPI** - <https://brapi.org/> 
- Standardized RESTful web service API specification for communicating plant breeding data
- **PHIS**: BrAPI WebServices implemented (v1.3)



=> Makes **indexing of PHIS data by FAIDARE** possible!

- **MIAPPE** - <https://www.miappe.org/> 
- Minimum Information About Plant Phenotyping Experiments
- Open, community driven, data standard designed to harmonize data from plant phenotyping experiments
- Mapping with other standards (ISA-Tools , BrAPI)
- **PHIS is MIAPPE-compliant**


swagger

OpenSilex API


BRAPI

GET	/brapi/v1/calls
GET	/brapi/v1/germplasm
GET	/brapi/v1/studies
GET	/brapi/v1/studies-search
GET	/brapi/v1/studies/{studyDbId}
GET	/brapi/v1/studies/{studyDbId}/observations
GET	/brapi/v1/studies/{studyDbId}/observationunits
GET	/brapi/v1/studies/{studyDbId}/observationvariables
GET	/brapi/v1/variables <small>Call to retrieval</small>
GET	/brapi/v1/variables/{observationVariableDbId}

Declaration of the experimental context

 SweetPotatoViruses_2018
Experiment ? 🌐 🏠 👤

← Details Factors ↓ Scientific objects Data 42K+ Visualization Map Annotations Documents ↓

 Description ★ ✎

Name SweetPotatoViruses_2018


State 📁 Finished 👤 Public

Period 2018-07-01 - 2018-07-30 (29 days)

URI opensilex-sandbox.id/experiment/sweetpotatoviruses_2018

Objective
Phenotyping viral infection in sweetpotato using a high-throughput chlorophyll fluorescence and thermal imaging platform

Description
Virus diseases caused by co-infection with Sweet potato feathery mottle virus (SPFMV) and Sweetpotato chlorotic stunt virus (SPCSV) are a severe problem in the production of sweetpotato (*Ipomoea batatas* L.). Traditional molecular virus detection methods include nucleic acid-based and serological tests. In this study, we aimed to validate the use of a non-destructive imaging-based plant phenotype platform to study plant-virus synergism in sweetpotato by comparing four virus treatments with two healthy controls.

 Context

Projects [NextGen Phytosanitation](#)


Organizations [National Plant Phenotyping Infrastructure](#) , [University of Helsinki](#)

Facilities [PlantScreen™ Compact System](#)

Species [sweetpotato](#)

Factors [Viral Disease](#)

Groups [NaPPI Team](#)

 Contacts

Scientific supervisors [Jari Valkonen](#) , [Linping Wang](#) , [Sylvain Poque](#)

Technical supervisors [Sylvain Poque](#)

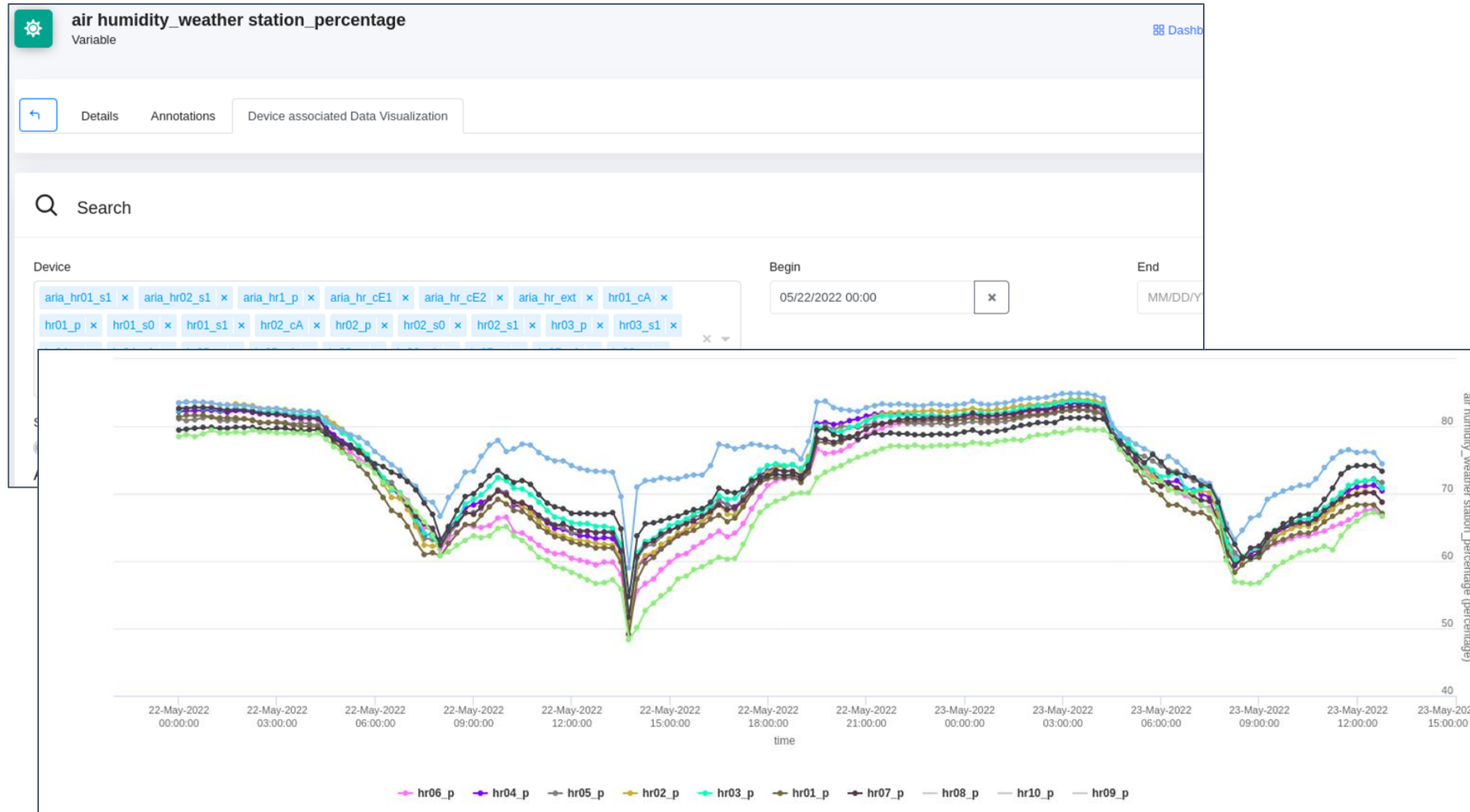
Declared by [admin](#) [admin](#)

Declaration of the Devices

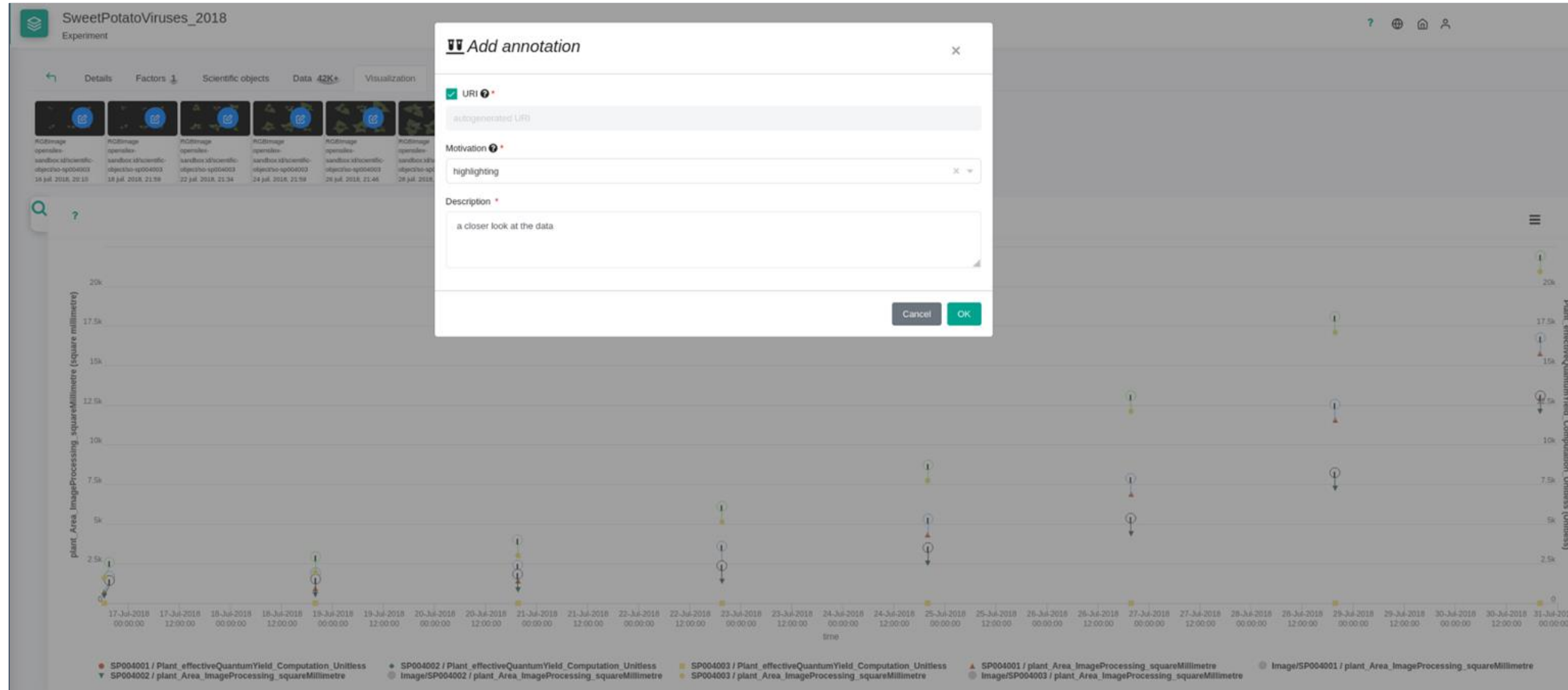
The screenshot displays the 'Device' management interface in OpenSILEX. The left sidebar contains navigation options: Scientific Organization, Organizations, Projects, Experiments, Facilities, **Devices**, Events, Scientific Information, Data, Vocabulary, Administration, Tools, and Web API. The main content area is titled 'Device' and 'Manage Device'. It features two buttons: '+ Add device' and '+ CSV Import'. Below these are input fields for 'Name', 'Type' (set to 'RGB camera'), 'Variable(s)', 'Start up' (with 'Enter year'), 'Facility', 'Brand', and 'Constructor model'. The right panel shows 'Selected devices' with a count of 0 and buttons for 'Display' and 'Actions'. A table lists 6 entries, all of type 'RGB camera':

Name	Device Type
<input type="checkbox"/> camera_rgb_phenobean	RGB camera
<input type="checkbox"/> Compact_TopView_RGB2	RGB camera
<input type="checkbox"/> sideRGBcamera_01	RGB camera
<input type="checkbox"/> sideRGBcamera_02	RGB camera
<input type="checkbox"/> topRGBcamera_01	RGB camera
<input type="checkbox"/> topRGBcamera_02	RGB camera

Data Visualization - Environmental data



Data Visualization to raw image provenance





Phenome Platforms

- M3P - PhenoArch
- Pheno3c
- Phenotoul
- Diaphen
- New users:
 - Phenotic
 - 4PMI



Emphasis community

- UCL
- University of Helsinki
- University of Copenhagen
- WUR NPEC



- A **new generation of information systems** (e.g. PHIS) is needed
 - Giving value to complex data requires **structuring according to FAIR principles**
 - A better formalization of concepts (using ontologies) and data is required for **interdisciplinary research**
Advanced data management makes **data available for AI and data analytics**
- **PHIS**: used in several phenotyping platforms
- Work in conjunction with **standards** (BrAPI - MIAPPE) and offer shared resources (variables/genetic)
- Successfully linked to an image analyses platform using FAIR principles for its input and output data
- **Ongoing developments**
 - New features / enhanced ergonomoy
 - Adaptation to the needs / evolution of research
 - Support
 - Link with research teams
- **OpenSILEX**: opening to **other communities**
- Support and training available!





● OpenSILEX

- OpenSILEX website: <http://opensilex.org/>
- OpenSILEX demo: <http://opensilex.org/sandbox/app/>
- How to contribute to OpenSILEX?
 - Github repository: <https://github.com/OpenSILEX/>
 - Developer documentation: <https://opensilex.github.io/docs-community-dev/>
 - OpenSILEX Docker: <https://github.com/OpenSILEX/opensilex-docker-compose>
 - User documentation: <https://opensilex.github.io/phis-docs-community/>



● PHIS

- PHIS website: <http://phis.inrae.fr/>
- Research paper: <https://nph.onlinelibrary.wiley.com/doi/full/10.1111/nph.15385>
- Variables declaration tutorial: https://www.youtube.com/watch?v=Pvz9o-b_Mok