

AgroPortal: a vocabulary and ontology repository for agronomy



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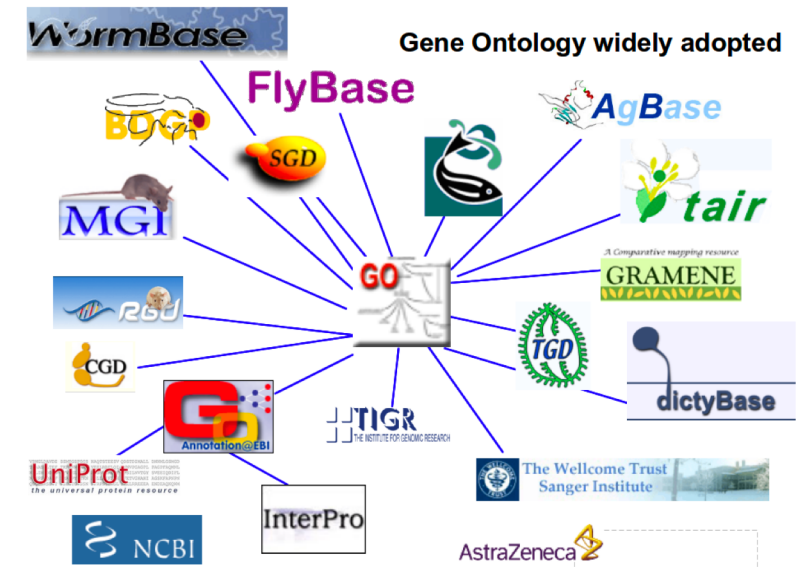
1st July 2020



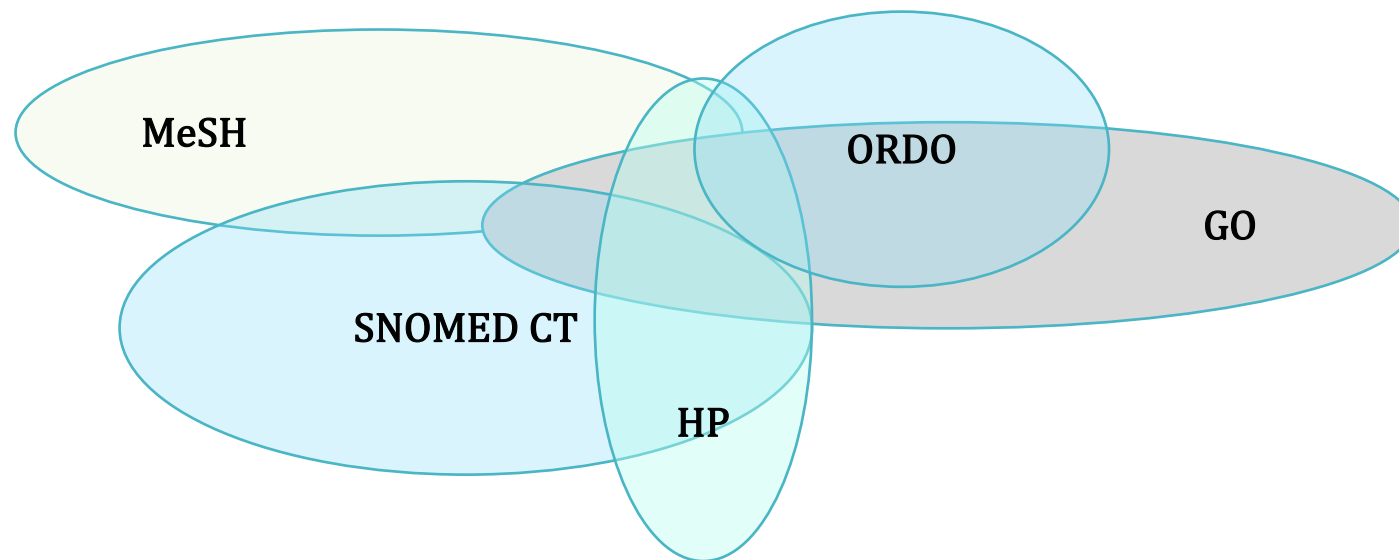
Why ontologies are important in science?



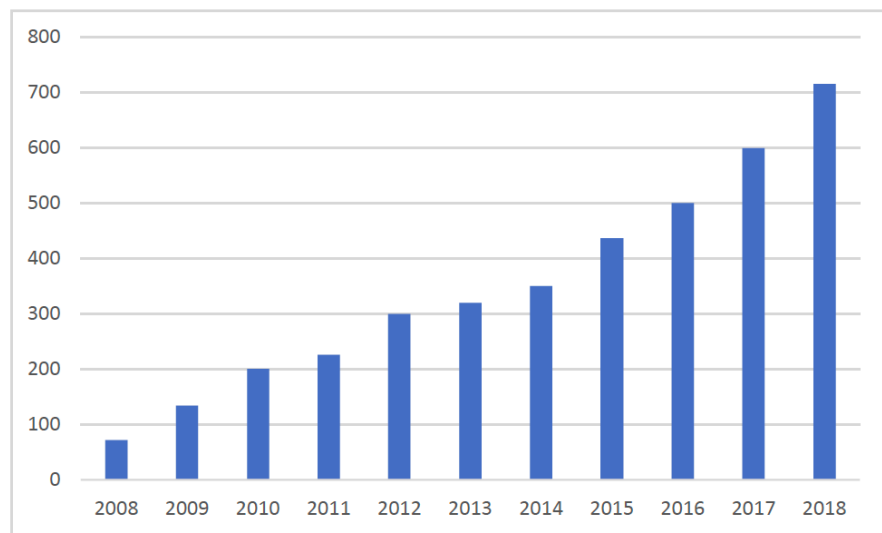
- To provide canonical **representation and sharing** of scientific knowledge
- To **annotate** experimental data to enable interpretation, comparison, and discovery across databases
- To facilitate **knowledge-based applications** for
 - Decision support, reasoning
 - Natural language-processing, text mining
 - Data integration
- But ontologies are: **spread out, in different formats, of different size, with different structures**



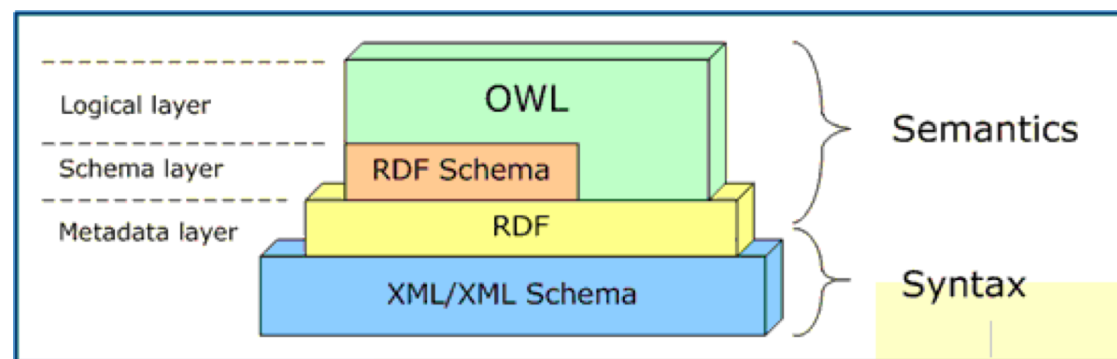
Other issues with ontologies



Overlapping ontologies



Number of ontologies in the NCBO BioPortal



Variety of representation languages

Why ontology repositories are important?

- You've built an ontology, how do you let the world **know**?
- You need an ontology, **where** do you go to get it?
- How do you know whether an ontology is any **good**?
- How do you find **data** resources that are relevant to the domain of the ontology (or to specific terms)?
- How could you leverage your ontology to enable new **science**?
- How could you use ontologies without **managing** them ?



Challenges for ontology repositories

HABILITATION A DIRIGER DES RECHERCHES (HDR)
Spécialité Informatique
École Doctorale Information, Structures, Systèmes

Université de Montpellier

**ONTOLOGY REPOSITORY AND
ONTOLOGY-BASED SERVICES**
Challenges, contributions and applications to
biomedicine & agronomy


Manuscript v4.0 – May 2019

Clement Jonquet
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Jury
(defense May 28th 2019)

Michel Dumontier (professor), Maastricht University (reviewer)		
Nathalie Aussenac-Gilles (DR CNRS), CNRS, Toulouse (reviewer)		
Mathieu D'Aquin (professor), National University of Ireland, Galway (reviewer)		
Fabien Gandon (DR INRIA), INRIA Sophia Antipolis (examiner)		
Juliette Dibie-Barthélemy (professor), AgroParisTech, Paris (examiner)		
Pascal Poncelet (professor), University of Montpellier (examiner)		
Mark A. Musen (professor), Stanford University (invited)		
Stefano A. Cerri (prof. emeritus), University of Montpellier (invited)		

Laboratory of Informatics, Robotics, and Microelectronics of Montpellier (LIRMM),
University of Montpellier & CNRS, France



Ontology metadata, evaluation and selection



Multilingualism



Ontology alignment



Generic ontology-based services
(especially for free text data)



Annotations and linked data



Scalability and interoperability

AgroPortal: a vocabulary and ontology repository for agronomy

<http://agroportal.lirmm.fr>



- Develop and support a reference ontology repository
 - **Primary focus** on the agronomy & close related domains (plant sciences, food and biodiversity)
- Reusing the NCBO BioPortal technology
 - **Avoid to re-implement** what has been done, facilitate interoperability
 - **Reusing** the scientific outcomes, experience & methods of the biomedical domain
- **Enable straightforward use of agronomic related ontologies**
 - Respect the requirements & specificities of the agronomic community
 - Fully semantic web compliant infrastructure
 - Enable **new science**

<http://bioportal.bioontology.org>

Ontology Services →

- Search
- Traverse
- Comment
- Download

Mapping Services →

- Create
- Upload
- Download

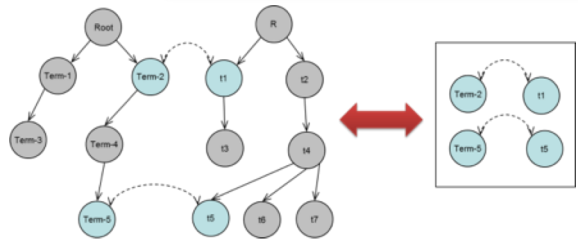
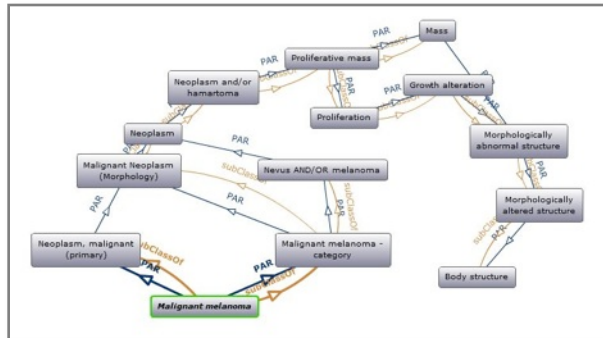
Widgets →

- Tree-view
- Auto-complete
- Graph-view

Annotation → Term recognition

Data Access → Search "data" annotated with a given term

<http://data.bioontology.org>

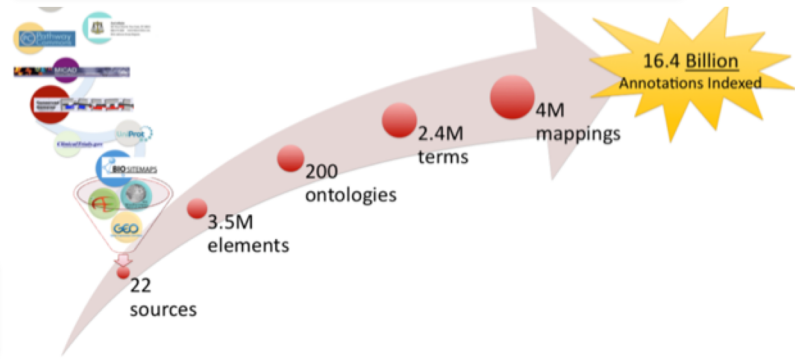


Jump To:

Legend

- Malignant **melanoma** (synonym)
- Amelanotic **melanoma** (preferred name)
- Excision of **melanoma** (preferred name)
- Melanoma** in situ (preferred name)
- Melanoma** vaccine (preferred name)

Expression, Expression of bladder, bladder, smooth, bladder muscle, muscle, smooth muscle, cells, mechanical, mechanical stimulation, stimulation, Chronic, results, bladder overdistension, associated, associated with, with, loss, genes, altered



AgroPortal an ontology repository

for agronomy, food, plant sciences & biodiversity

- ▶ Publish, search, download
- ▶ Browse, visualize
- ▶ Peer review
- ▶ Versioning
- ▶ Annotation
- ▶ Recommendation
- ▶ Mapping
- ▶ Notes
- ▶ Projects

<http://agroportal.lirmm.fr>

- ▶ 122 ontologies, 90 candidates
- ▶ 5 driving use cases
- ▶ ~200 registered users

2016: Five original driving agronomic use cases

- IBC **Rice** Genomics & AgroLD project

- Data integration and knowledge management related to rice (P. Larmande)



- RDA **Wheat** Data Interoperability working group

- Common framework for publishing wheat data (E. Dzalé-Yeumo)



- **LovInra** : INRA Linked Open Vocabularies

- Vocabularies produced by INRA scientists (S. Aubin)



- **Crop** Ontology project

- Ontologies for describing crop germplasm & traits (E. Arnaud)

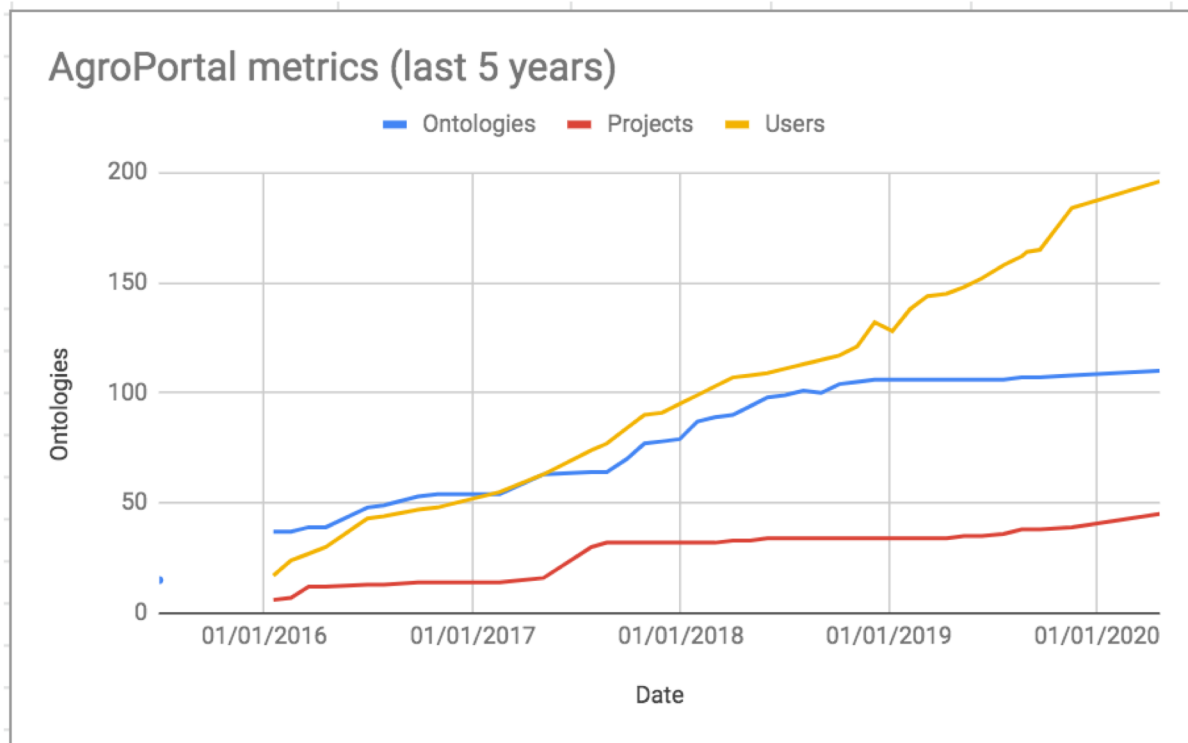


- GODAN global map of **agri-food** data standards

- VEST/AgroPortal MAP of standards (V. Pesce)



A growing interest in the community



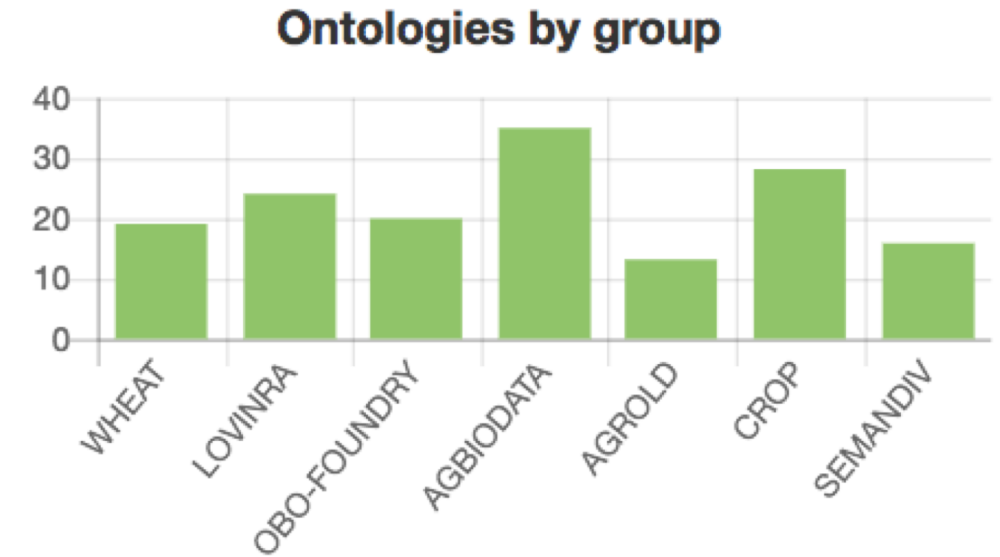
- RDA Agrisemeantics WG
- GO-FAIR Food System Implementation Network
- D2KAB ANR project
- Adoptions by projects e.g. PHIS, AgroLD
- SemanDiv CNRS WG
- AgroHackathons
- Maybe:
 - IC-FOODS initiative
 - ELIXIR F&N community

Examples of ontologies uploaded in AgroPortal

Title	Format	Groups	Size
IBP Rice Trait Ontology (CO_320)	OWL	CROP, RICE	~2K
IBP Wheat Trait Ontology (CO_321)	OWL	CROP, WHEAT	~1K
IBP Wheat Anatomy Ontology (CO_121)	OBO	CROP, WHEAT	~80
IBP Crop Research (CO_715)	OBO	CROP	~250
Multi-Crop Passport Ontology (CO_020)	OBO	CROP	~90
Biorefinery (BIOREFINERY)	OWL	LOVINRA	~300
Matter Transfer (TRANSMAT)	OWL	LOVINRA	~1.1K
Plant Ontology (PO)	OWL	WHEAT, RICE, OBOF	~2K
Plant Trait Ontology (TO)	OWL	WHEAT, RICE, OBOF	~4.4K
Durum Wheat (DURUM_WHEAT)	OWL	LOVINRA	~130
Agricultural Experiments (AEO)	OWL	LOVINRA	~60
Environment Ontology (ENVO)	OWL	WHEAT, OBOF	~6.3K
NCBI Organismal Classification (NCBITAXON)	RRF	WHEAT	~900K
AnaEE Thesaurus (ANAEE)	SKOS	LOVINRA	~3.3K
French Crop Usage (CROPUSAGE)	SKOS	none	~300
Agrovoc (AGROVOC)	SKOS	none	~32K
Food Ontology (FOODON)	OWL	OBOF	~10K
National Agriculture Library Thesaurus (NALT)	SKOS	none	~67K
Global Agricultural Concept Scheme (GACS)	SKOS	none	~585K

Ontology groups and categories

Category	Number
Plant Phenotypes and Traits	31
Plant Anatomy and Development	4
Natural Resources, Earth and Environment	12
Animal Science and Animal Products	6
Agricultural Research, Technology and Engineering	15
Breeding and Genetic Improvement	1
Plant Science and Plant Products	7
Plant Genetic Resources	2
Food and Human Nutrition	7
Food Security	2
Taxonomic Classifications of Organisms	6
Farms and Farming Systems	5
Fisheries and Aquaculture	2
Forest Science and Forest Products	2
Biodiversity and Ecology	14



Specific slices display to use only the ontologies of a group

<http://crop.agroportal.lirmm.fr>

<http://inrae.agroportal.lirmm.fr/>

Describe ontologies with semantic metadata

- Display “per ontology”
 - Ontology specific properties => viewable and editable within the ontology specific page
- Everything you need to know about an ontology
- URIs used in the backend to store the information
 - e.g., CC-BY => <https://creativecommons.org/licenses/by-nd/4.0/>
- “Get my metadata back” buttons

The screenshot shows the OntoBiotope ontology page. The 'Details' section includes:

ACRONYM	ONTOBIOTOPE
VISIBILITY	Public
DESCRIPTION	OntoBiotope is an ontology of microorganism habitats. Its modeling principle and its lexicon reflect the biotope classification used by biologists to describe microorganism isolation sites (e.g. GenBank, GOLD, ATCC). OntoBiotope is developed and maintained by the Meta-omics of Microbial Ecosystems (MEM) network in which 30 microbiologists from INRA (French National Institute for Agricultural Research) from all fields of applied microbiology participate. The relevance of OntoBiotope terms is evaluated through the PubMedBiotope semantic search engine. It identifies and categorizes microbial biotopes in all PubMed abstracts by applying the TolMap method (Text to Ontology Mapping) to the OntoBiotope ontology. It also indexes 3.35 millions relations between taxa and their habitats.
STATUS	Production
FORMAT	OBO
CONTACT	Claire Nédellec, claire.nedellec@jouy.inra.fr
HOME PAGE	http://lovinra.inra.fr/
PUBLICATIONS PAGE	https://doi.org/10.1105/1471-2105-16-S10-S1
DOCUMENTATION PAGE	http://lovinra.inra.fr/
CATEGORIES	Natural Resources, Earth and Environment
GROUPS	INRA Linked Open Vocabularies

The 'Additional Metadata' section includes:

NATURAL LANGUAGE	
VERSION	1.2
RELEASE DATE	2015-06-29T00:00:00+00:00
KEYWORDS	information extraction, corpus annotation, natural language processing, ontology building, biology, genetics
KNOWN USAGE	Used by the BioNLP Shared task (Bacteria Biotope task) in 2011, 2013 and 2016
NOTES	OntoBiotope is developed and maintained by the Meta-omics of Microbial Ecosystems (MEM) network in which 30 microbiologists from INRA (French National Institute for Agricultural Research) from all fields of applied microbiology participate.
CREATORS	Claire Nédellec
DESIGNED FOR ONTOLOGY TASK	http://omv.ontoware.org/2005/05/ontology#AnnotationTask
ENDORSED BY	INRA (http://www.inra.fr/)
FUNDED BY	INRA (http://www.inra.fr/)
HAS FORMALITY LEVEL	http://w3id.org/inkos/inkostype#ontology
HAS LICENSE	
ONTOLOGY SYNTAX	http://purl.obolibrary.org/obo/oboformat#spec.html
IS OF TYPE	http://omv.ontoware.org/2005/05/ontology#DomainOntology
PUBLISHER	INRA (http://www.inra.fr/)
IDENTIFIER	doi.org/10.15454/1.4382640528105164E12
COPYRIGHT HOLDER	INRA (http://www.inra.fr/)

The 'Metrics' section shows:

NUMBER OF CLASSES:	2320
NUMBER OF INDIVIDUALS:	0
NUMBER OF PROPERTIES:	0
MAXIMUM DEPTH:	13
MAXIMUM NUMBER OF CHILDREN:	42
AVERAGE NUMBER OF CHILDREN:	3
CLASSES WITH A SINGLE CHILD:	248
CLASSES WITH MORE THAN 25 CHILDREN:	3
CLASSES WITH NO DEFINITION:	2320

The 'Visits' section shows a line graph of visits from Feb 2016 to May 2017, with a peak in April 2017. Below the graph are buttons for 'included in DataCatalog' and 'VEST Registry', and the INRA logo.

The 'Reviews' section shows 'No reviews available.' The 'Submissions' section shows:

SUBMISSION	RELEASE DATE	UPLOAD DATE	DOWNLOADS
1.2 (Planned, Indexed, Metrics, Annotator)	06/29/2015	06/12/2016	OBO CSV RDF/XML
BioNLP-ST 2013 version (Archived)	06/29/2015	06/29/2015	OBO

The 'Views' section shows 'No views available.' The 'Projects Using This Ontology' section shows:

PROJECT	DESCRIPTION	PEOPLE	INSTITUTION
LOVinra - Linked Open Vocabularies	LOVinra est un service proposé par la Délégation à...	Sophie Aubin (sophie.aubin@versailles.inra.fr)	INRA
OntoBiotope	L'ambition pour OntoBiotope est de normaliser la description...	Claire Nédellec (claire.nedellec@jouy.inra.fr)	INRA
VEST-AgroPortal Map of Standards	This VEST-AgroPortal provides a global map of existing...	Valeria Pesce (valeria.pesce@fao.org)	Food & Agriculture Organization

Browse and select ontologies

- Allows to search, order and select ontologies using a **faceted search** approach, based on the metadata
- Filter ontologies in the list, sort the list (by name, released date, number of views).

AgroPortal Browse Search Mappings Recommender Annotator Projects Recently Viewed Sign In Help About Feedback

Browse

Access all ontologies that are available in IBC AgroPortal: You can filter this list by category to display ontologies relevant for a certain domain. You can also filter ontologies by the IBC AgroPortal RSS feed to receive alerts for submissions of new ontologies, new versions of ontologies, new notes, and new projects. You can subscribe to feeds for a specific ontology at the individual ontology page. Add a new ontology to IBC AgroPortal using the Submit New Ontology link (you need to sign in to see this link).

Showing 64 of 66 Sort: Popular

[Submit New Ontology](#)

Entry Type

- Ontology (64)
- Ontology View (2)
- CIMI Model (0)
- NLM Value Set (0)

Uploaded in the Last

Category

- Agricultural Research, Techn...
- Animal Science and Animal P...
- Breeding and Genetic Improv...
- Farms and Farming Systems ...
- Fisheries and Aquaculture (1)
- Food Security (1)
- Food and Human Nutrition ...
- Forest Science and Forest Pro...
- Geographical Locations (0)
- Government, Agricultural La...
- Health and Pathology (0)

Group

- AGRIBIODATA (34)
- AGROLD (14)
- CROP (18)
- LOVINRA (14)
- OBO-FOUNDRY (17)
- WHEAT (19)

Format

- OBO (12)
- OWL (46)
- SKOS (4)
- UMLS (2)

Ontology Content

- Notes (3)
- Reviews (0)
- Projects (60)
- Summary Only (0)

Natural Language

- German (1)
- English (65)
- French (8)
- Italian (1)
- Portuguese (1)
- Spanish (2)

Formality Levels

- Classification scheme (2)
- Dictionary (0)
- Gazetteer (0)
- Glossary (0)
- List (0)
- Name authority list (0)
- Ontology (51)
- Semantic network (1)
- Subject heading scheme (0)
- Synonym ring (0)
- Taxonomv (2)

Is of Type

- Application Ontology (27)
- Core Ontology (0)
- Domain Ontology (22)
- Task Ontology (0)
- Upper Level Ontology (5)
- Vocabulary (0)

AGROVOC (AGROVOC) concepts (681,572)
AGROVOC is a controlled vocabulary covering all areas of interest of the Food and Agriculture Organization (FAO) of the United Nations, including food, nutrition, agriculture, fisheries, forestry, environment etc.
Uploaded: 4/1/17

National Agricultural Library Thesaurus (NALT) concepts (67,311)
The Thesaurus is an online vocabulary of agricultural terms in English and Spanish and is cooperatively produced by the National Agricultural Library, USDA and the Inter-American Institute for Cooperation on Agriculture as well as other Latin American agricultural institutions belonging to the Agriculture Information and Documentation Service of the Americas (SIDALC).
Uploaded: 4/26/17

AnaEE Thesaurus (ANAETHES) projects (1) concepts (3,323)
The AnaEE thesaurus aims to provide a controlled vocabulary for the semantic description of the study of continental ecosystems and their biodiversity.
Uploaded: 3/23/17

IBP Wheat Trait Ontology (CO_321) notes (1) projects (5) classes (1,894)
Wheat Ontology
Uploaded: 5/24/17

Plant Ontology (PO) projects (11) classes (1,964)
The Plant Ontology is a structured vocabulary and database resource that links plant anatomy, morphology and growth and development to plant genomics data.
Uploaded: 2/3/17

Wheat Trait Ontology (WHEATPHENOTYPE) projects (3) classes (466)
WheatPhenotype is an ontology in Obo format that describes the traits of soft wheat (*Triticum aestivum*) and the environmental factors that affect these traits.
Uploaded: 10/9/16

IBP Crop Research Ontology (CO_715) projects (4) classes (256)
Describes experimental design, environmental conditions and methods associated with the crop study/experiment/trial and their evaluation.
Uploaded: 6/26/15

OntoBiotope (ONTOBIOTOPE) projects (3) classes (2,320)
OntoBiotope is an ontology of microorganism habitats
Uploaded: 6/12/16

Protein Ontology (PR) projects (2) classes (83,656)
An ontological representation of protein-related entities
Uploaded: 6/30/15

Plant Trait Ontology (TO) projects (10) classes (4,456)
A controlled vocabulary to describe phenotypic traits in plants
Uploaded: 3/2/17

Experimental Factor Ontology (EFO) projects (2) classes (19,964)
The Experimental Factor Ontology (EFO) provides a systematic description of many experimental variables available in EBI databases, and for external projects such as the NHGRI GWAS catalogue
Uploaded: 5/16/17

Phenotypic Quality Ontology (PATO) projects (8) classes (2,603)
Phenotypic qualities (properties)
Uploaded: 3/22/17

Sustainable Development Goals Interface Ontology

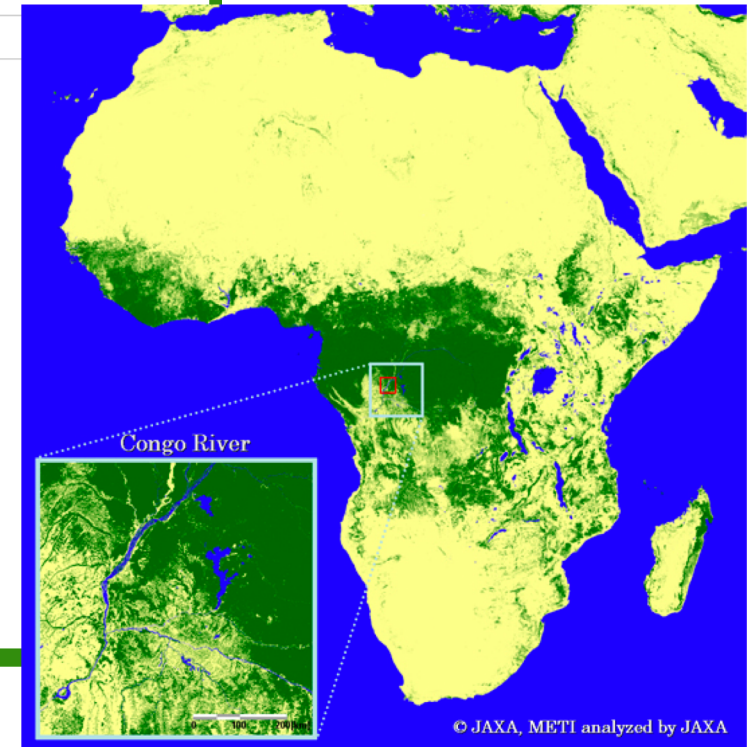
Summary Classes Properties Notes Mappings Widgets

Jump To:

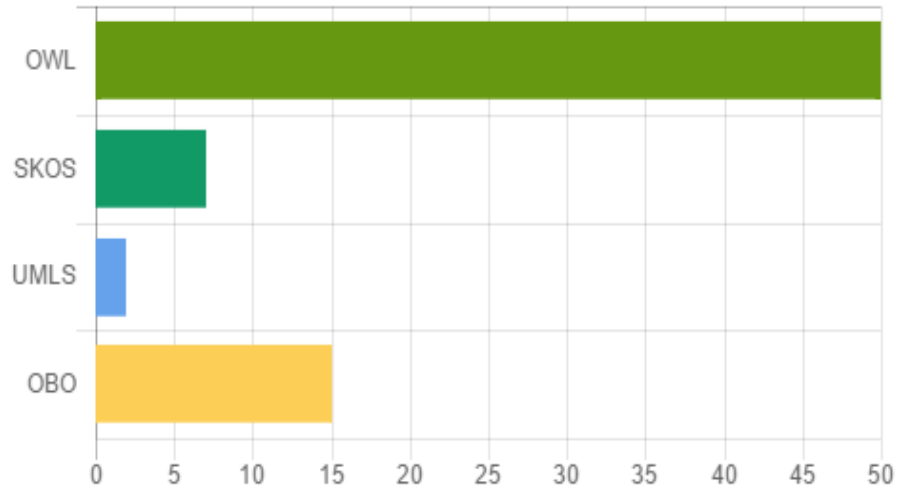
- entity
 - continuant
 - generically dependent continuant
 - information content entity
 - conclusion based on data
 - data item
 - data about an ontology part
 - data set
 - direct material input
 - energy intensity
 - material footprint
 - material footprint per capita
 - material input per capita
 - material intensity
 - material trade balance
 - material trade balance per capita
 - measurement datum
 - net permanent forest loss
 - resource consumption
 - sustainable development goal indicator value
 - Agricultural export subsidies
 - Aid for Trade commitments and disbursements
 - Amount of water- and sanitation-related official developr
 - Average marine acidity (pH) measured at agreed suite of
 - Change in the extent of water-related ecosystems over ti
 - Change in water-use efficiency over time
 - CO2 emission per unit of value added
 - Coverage by protected areas of important sites for mount
 - Death rate due to road traffic injuries
 - Debt service as a proportion of exports of goods and servi
 - Developing countries' and least developed countries' shar
 - Dollar value of financial and technical assistance (includir
 - Extent of use of country-owned results frameworks and pl
 - Extent to which (i) global citizenship education and (ii) ec
 - Financial Soundness Indicators
 - Forest area as a proportion of total land area**
 - Global food loss index

Details	Visualization	Notes (0)	Class Mappings (0)	Access Class JSON
Preferred Name				Forest area as a proportion of total land area
ID				http://purl.unep.org/sdg/SDGIO_00020174
label				Forest area as a proportion of total land area
prefixIRI				sdg:SDGIO_00020174
prefLabel				Forest area as a proportion of total land area
UN SDG Indicator ID				15.1.1
UNSD SDG indicator code				C150101
subClassOf				sustainable development goal indicator value

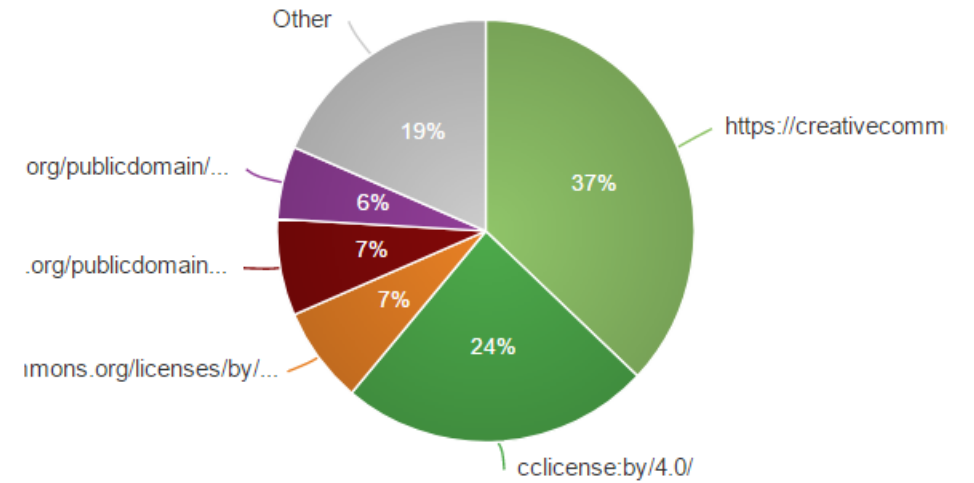
Identify concepts to describe your data



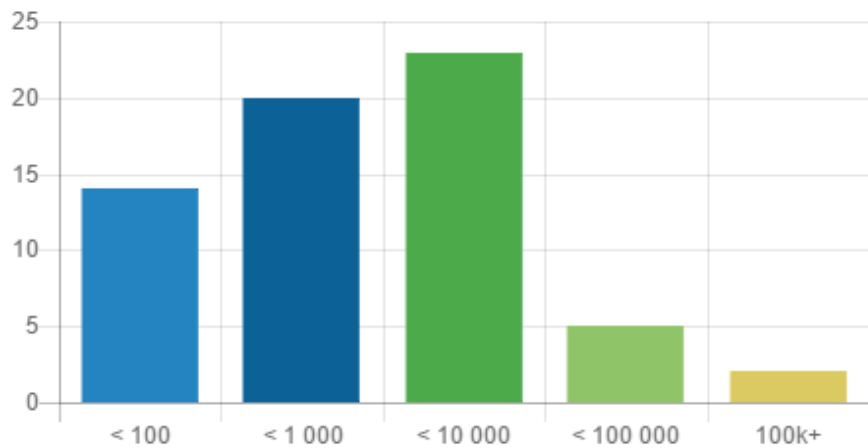
Format



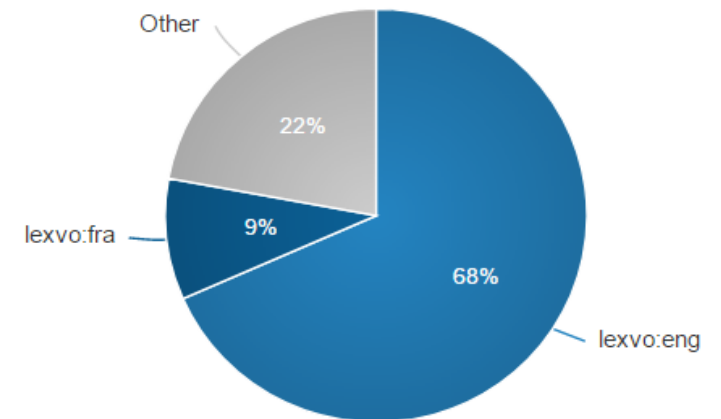
License



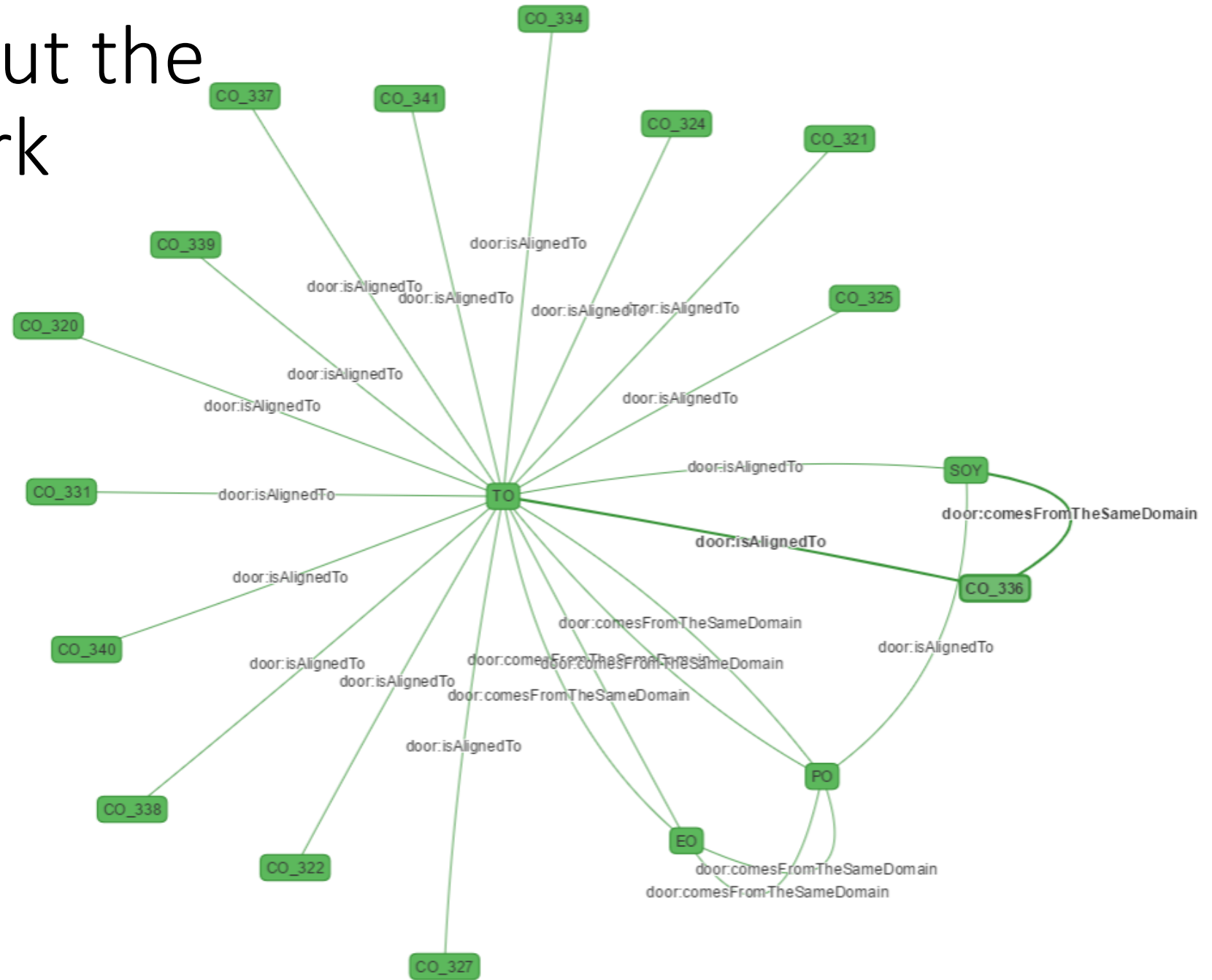
Size



Language



Information about the ontology network



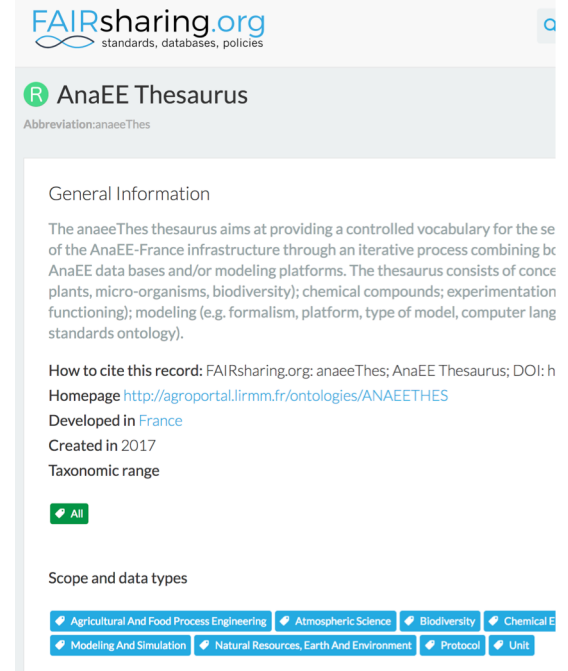
Our objective now: automatic FAIRness assessment of an ontology

1. within AgroPortal
2. outside of AgroPortal

- Enhance the level FAIRness of ontologies.
- Help users respect the I2 FAIR principle.
- Help users in identifying FAIR ontologies.
- Provide useful analysis of the semantic agronomic landscape.



Harvesting AgroPortal ontologies and vocabularies into FAIRsharing



Both manually curate the metadata ... better synchronization of the fields to come...

AgroPortal has a new metadata model of 127 properties to describe ontologies & vocabularies

Annotator

The IBC AgroPortal Annotator processes text submitted by users, recognizes relevant ontology terms in the text and returns the annotations to the user. Use the interface below to submit sample text to get ontology-based annotations. Hover the mouse pointer on any button to see what it does. Click on the (?) to see a detailed help panel.

Subscribe to the [NCBO Annotator Users Google group](#) to learn more about who and how the Annotator is being used in different projects.

Plant height is a whole plant morphology trait which is the height of a whole plant. Plant height is sometime measured as height from ground level to the top of canopy at harvest.

[insert sample text](#)

Ontology filters

Select Ontologies

PO x TO x

[clear selection](#) [select from list](#)

Select UMLS Semantic Types (?)

Type here to select UMLS semantic types

Select UMLS Semantic Groups (?)

Type here to select UMLS semantic groups

Matching parameters

- Match Longest Only
- Match Partial Words
- Include Mappings
- Exclude Numbers
- Exclude Synonyms

NegEx / ConText

- Detect negation (?)
- Detect temporality (?)

Include Ancestors Up To Level: None | Include Score: cvalue

[Get Annotations](#)



total results 7 (direct 7 / ancestor 0 / mapping 0)

CLASS <small>filter</small>	ONTOLOGY <small>filter</small>	TYPE <small>filter</small>	CONTEXT	MATCHED CLASS <small>filter</small>	MATCHED ONTOLOGY <small>filter</small>	SCORE <small>▼</small>
whole plant	Plant Trait Ontology	direct	... of a whole plant . Plant height is ...	whole plant	Plant Trait Ontology	10.000
plant height	Plant Trait Ontology	direct	Plant height is a whole ...	plant height	Plant Trait Ontology	8.644
plant height	Plant Trait Ontology	direct	... whole plant. Plant height is sometime measured ...	plant height	Plant Trait Ontology	8.644
whole plant morphology trait	Plant Trait Ontology	direct	... is a whole plant morphology trait which is the ...	whole plant morphology trait	Plant Trait Ontology	6.644
whole plant	Plant Ontology	direct	... of a whole plant . Plant height is ...	whole plant	Plant Ontology	6.644
height	Plant Trait Ontology	direct	... is the height of a whole ...	height	Plant Trait Ontology	4.322
height	Plant Trait Ontology	direct	... measured as height from ground level ...	height	Plant Trait Ontology	4.322

Format Results As: JSON

AgroPortal Annotator

identifies ontology concepts within plain text for semantic indexing

Sprouting
 Initial Vigor
 Color of unexpanded apical root leaves
 Color of first fully expanded leaf
 Leaf vein color
 Apical Pubescence
 Length of stipules
 Number of leaf lobes
 Leaf lobe position
 Angle of petiole insertion
 Petiole length
 Petiole color
 Anthocyanin pigmentation
 Growth habit of young stem
 Pubescence of young stem
 Stem color
 Leaf scar prominence
 Apical branching
 Branching levels
 Branching Angle
 Height of first apical branch
 Height of plant
 Total fresh weight foliage and stems
 Total fresh weight foliage and stems
 Number harvested

Root number
 Fresh weight of storage
 Fresh root yield
 Dry yield
 Harvest index
 Proportion of lodged plants
 Leaf retention
 Plant architecture
 Flowers (50%)
 Sepal Color
 Disc Color
 Sigma color
 Ovary color
 Anther color
 Female stamenoids
 Male Sterile
 Days to Flower
 Fruit set
 Fruit Exocarp
 Ploidy
 Seed oclor



Annotator

The IBC AgroPortal Annotator processes text submitted by user on any button to see what it does. Click on the (?) to see a detail

Subscribe to the [NCBO Annotator Users Google group](#) to learn !

- Plant architecture
- Flowers (50%)
- Sepal Color
- Disc Color

Cassava Trait Ontology

Ontology filters

Select Ontologies

CO_334 x

[clear selection](#) [select from list](#)

```

- {
-   annotatedClass: {
-     @id: "http://www.cropontology.org/rdf/CO_334:0000386",
-     @type: "http://www.w3.org/2002/07/owl#Class"
-   },
-   hierarchy: [ ],
-   annotations: [
-     - {
-       from: 11,
-       to: 23,
-       matchType: "PREF",
-       text: "INITIAL VIGOR"
-     }
-   ]
- }
  
```

Cassava Trait Ontology

Summary Classes Properties Notes Mappings Widgets

Jump To:

- Cassava trait
 - Agronomical trait
 - Anthocyanin Pigmentation
 - Ease of Harvest
 - Female Stamenoids
 - Fresh Shoot Weight
 - Fruit Exocarp Texture
 - Fruit set presence
 - Initial Vigor**
 - Leaf weight
 - Male Sterile
 - Marketable root number

Preferred Name	Initial Vigor
Synonyms	Initial plant vigor
Definitions	Initial plant vigor at one month after planting

Ontology Recommender

Get recommendations for the most relevant ontologies based on an excerpt from a biomedical text or a list of keywords [?](#)

Input

Text Keywords (separated by commas)

Output

Ontologies Ontology sets

[insert sample input](#)

Some useful technical specifications for timber purchase. For example, the following criteria can be used in the technical specifications of a contract that is sustainable in environmental terms:

- the assurance that the rate of harvesting of timber does not exceed levels that can be permanently sustained;
- use of environment-friendly non-chemical methods of pest control, and the avoidance of use of chemical pesticides.

[advanced options](#)

[Get Recommendations](#)

Ontology Recommender

Get recommendations for the most relevant ontologies based on an excerpt from a biomedical text or a list of keywords [?](#)

Input

Text Keywords (separated by commas)

Output

Ontologies Ontology sets

[insert sample input](#)

Some useful technical specifications for timber purchase. For example, the following criteria can be used in the technical specifications of a contract that is sustainable in environmental terms: - the assurance that the **rate** of harvesting of timber does not exceed levels that can be permanently sustained; - use of environment-friendly non-chemical methods of **pest** control, and the avoidance of use of chemical **pesticides**.

[advanced options](#)

[Edit Input](#)

Recommended ontologies

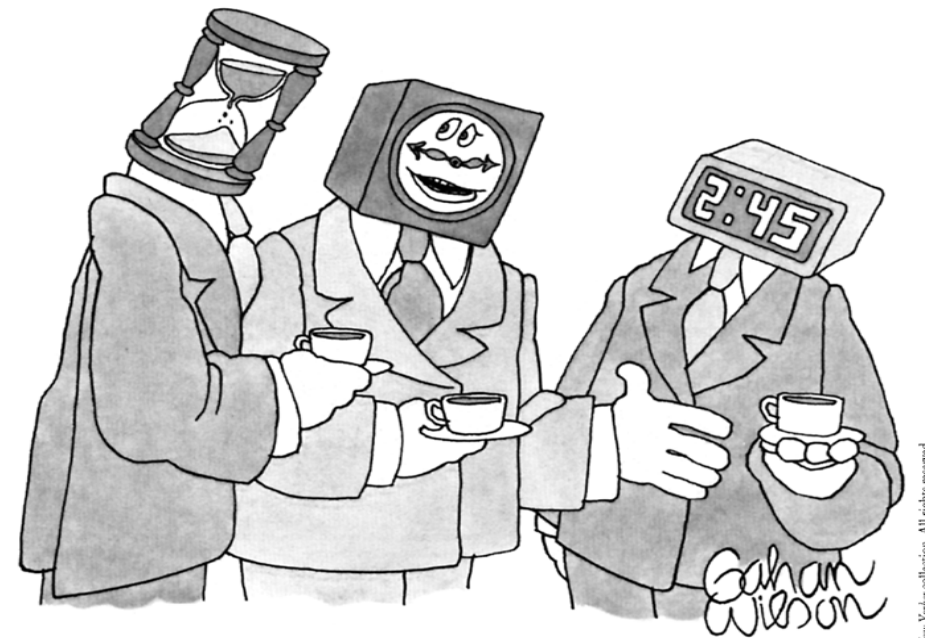
POS.	ONTOLOGY	FINAL SCORE	COVERAGE SCORE	ACCEPTANCE SCORE	DETAIL SCORE	SPECIALIZATION SCORE	ANNOTATIONS	HIGHLIGHT ANNOTATIONS	
1	ANAEETHES	29.5	26.3	0.0	0.0	100.0	3		<input checked="" type="checkbox"/>
2	WHEATPHENOTYPE	22.8	31.6	0.0	13.7	22.6	3		<input type="checkbox"/>
3	TO	17.2	15.8	0.0	45.1	11.9	2		<input type="checkbox"/>
4	EFO	16.4	21.1	0.0	20.6	9.0	2		<input type="checkbox"/>
5	ENVO	15.8	15.8	0.0	35.9	10.4	2		<input type="checkbox"/>
6	STY	15.4	21.1	0.0	7.8	18.3	2		<input type="checkbox"/>
7	NCBITAXON	13.7	21.1	0.0	7.8	6.5	2		<input type="checkbox"/>
8	SIO	8.8	10.5	0.0	13.7	6.8	1		<input type="checkbox"/>
9	PATO	8.4	10.5	0.0	7.8	9.5	1		<input type="checkbox"/>
10	AEO	7.9	10.5	0.0	5.9	8.3	1		<input type="checkbox"/>
11	AFEO	7.7	10.5	0.0	5.9	6.6	1		<input type="checkbox"/>
12	PCO	7.7	10.5	0.0	7.8	5.3	1		<input type="checkbox"/>

AgroPortal Recommender

get the most relevant ontologies for your data

Ontology alignment

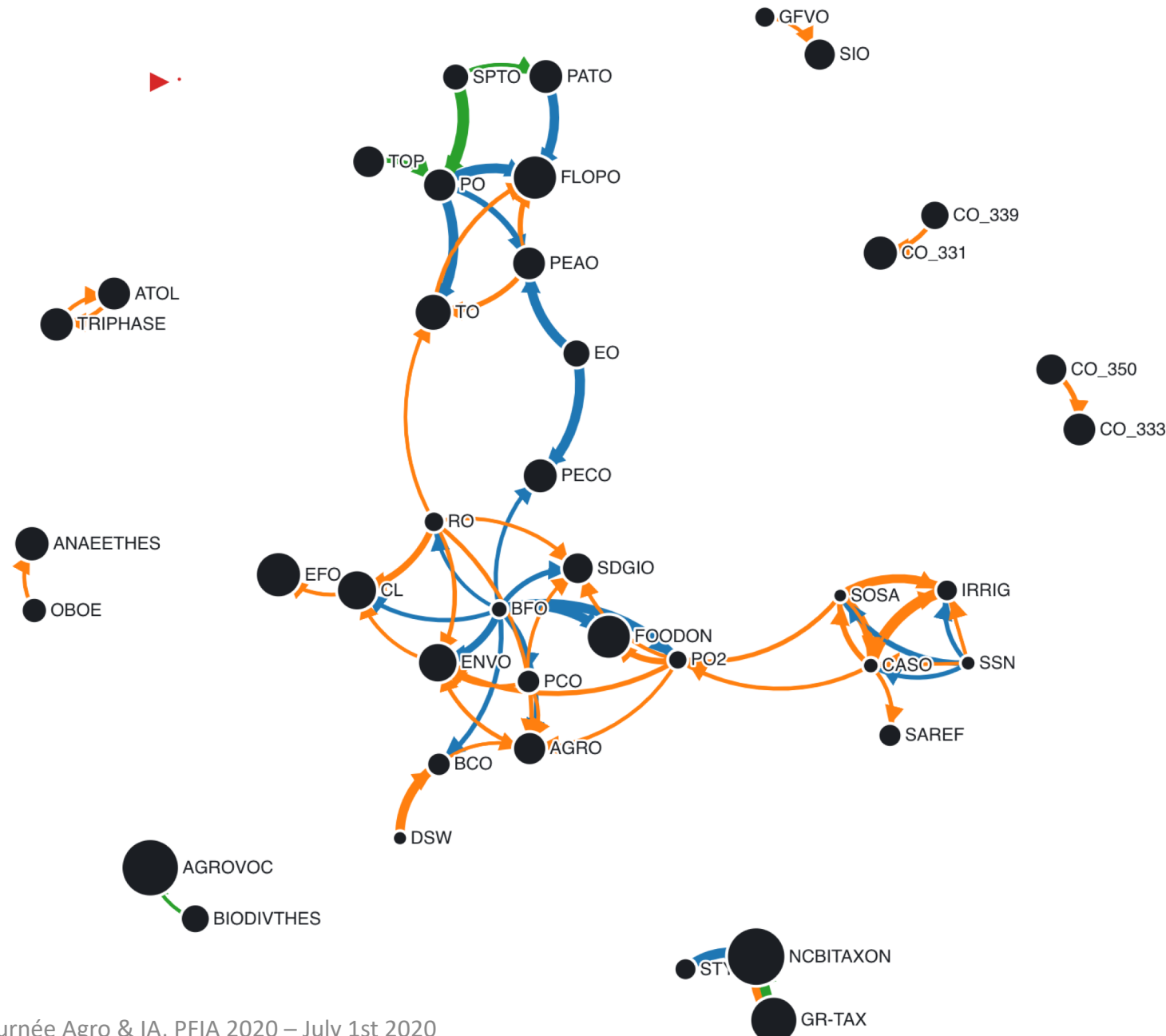
- Ontologies, vocabularies, and terminologies inevitably **overlap** in coverage
- Mappings do not always belong to an ontology
 - The community needs a place to **store and retrieve** them
 - That's the role of the ontology repository
- Dealing with mappings is a technical, data and scientific challenge
 - Capture the **whole mapping lifecycle**
 - Semantically described with plenty of **provenance information**



“Basically, we’re all trying to say the same thing.”

© The New Yorker collection. All rights reserved.
From The New Yorker Book of Technology Cartoons.

Term reuse, term overlap and extracted mappings



Align ontologies one another

AgroPortal [Browse](#) [Search](#) [Mappings](#) [Recommender](#) [Annotator](#) [Projects](#) [Admin](#) Recently Viewed | antool

AnaEE Thesaurus

[Summary](#) [Classes](#) [Properties](#) [Notes](#) [Mappings](#) [Widgets](#) [Edit ontology information](#) [Add submission](#) [Edit submission information \(1.0\)](#)

Jump To:

- abiotic environment
- AnaEE-France service identification and partners
- biotic environment
- chemical compound
- carbon forms
 - carbon dioxide**
 - carbonate
 - Dissolved organic carbon
 - inorganic carbon
 - insoluble organic carbon
 - organic carbon
 - Particulate organic carbon
 - total carbon
 - total organic carbon
- chemical elements
 - chloride
 - ions
 - metals
 - molecule
 - nitrogen forms
 - organic matter
 - organic molecules
 - oxygen forms
 - pesticide
 - phosphorus forms
 - pollutant
 - reactive oxygen species

concept by concept

Details Visualization Notes (0) **Class Mappings (4)**

[Create New Mapping](#) [Create New External Mapping](#)

Internal mappings

MAPPING TO	ONTOLOGY	SOURCE	RELATION
carbon dioxide	Environment Ontology	LOOM	
carbon dioxide	Experimental Factor Ontology	LOOM	
CarbonDioxide	XEML Environment Ontology	LOOM	
Carbon dioxide	Biorefinery	LOOM	

Interportal mappings

MAPPING TO	ONTOLOGY	SOURCE	RELATION
There are currently no interportal mappings for this class.			

External mappings

MAPPING TO	ONTOLOGY	SOURCE	RELATION
There are currently no external mappings for this class.			

Mappings

ONTOLOGY	MAPPINGS
Agri-Food Experiment Ontology	1
Agricultural Experiments Ontology	5
Banana Anatomy	2
Basic Formal Ontology	1
Biorefinery	13
Cell Ontology	4
Chickpea Ontology	14
Comparative Data Analysis Ontology	3
Durum Wheat	2
EDAM bioinformatics operations, data types, formats, identifiers and topics	25
Environment Ontology	72
Environment Ontology for Livestock	10
Experimental Factor Ontology	93
Gene Ontology	5
GENO Ontology	5
Genomic Feature and Variation Ontology	5
Gramene Taxonomy Ontology	3
Groundnut Ontology	16
IBP Cassava Trait Ontology	23
IBP Cowpea Trait Ontology	25
IBP Crop Research Ontology	22

Enable to store external mappings i.e., mappings that only one part is in BioPortal

Banana Anatomy

Summary Classes Properties Notes

Jump To:

- CGIAR_Musa_anatomy
 - plant part
 - corm
 - inflorescence**
 - leaf
 - pseudostem
 - root
 - sucker
 - CGIAR_Musa_development

Details Visualization Notes (2) **Class Mappings (4)**

Create New Mapping

Create New External Mapping

Internal mappings

MAPPING TO	ONTOLOGY	SOURCE	RELATIONS
inflorescence	Experimental Factor Ontology	LOOM	
inflorescence	Plant Ontology	LOOM	
inflorescence	Plant Trait Ontology	LOOM	

Interportal mappings

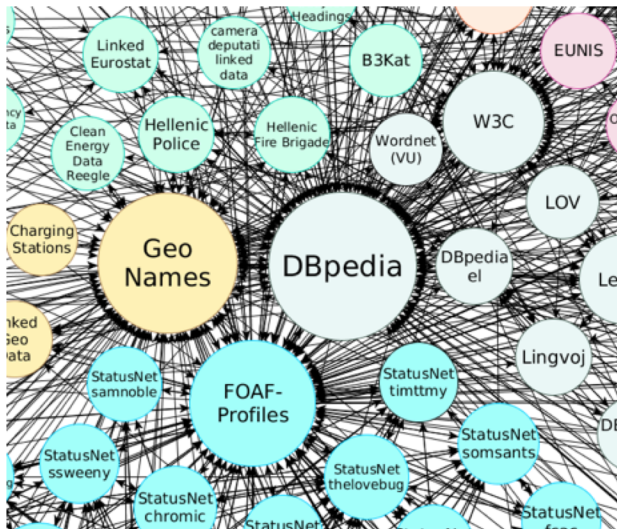
MAPPING TO	ONTOLOGY	SOURCE	RELATIONS
There are currently no interportal mappings for this class.			

External mappings

MAPPING TO	ONTOLOGY	SOURCE	RELATIONS
Spadice	http://dbpedia.org/ontology/	REST	skos:broadmatch

Mappings to external resources were also extracted

- e.g.,



What to do now: analysis and feedback to community to improve the dataset

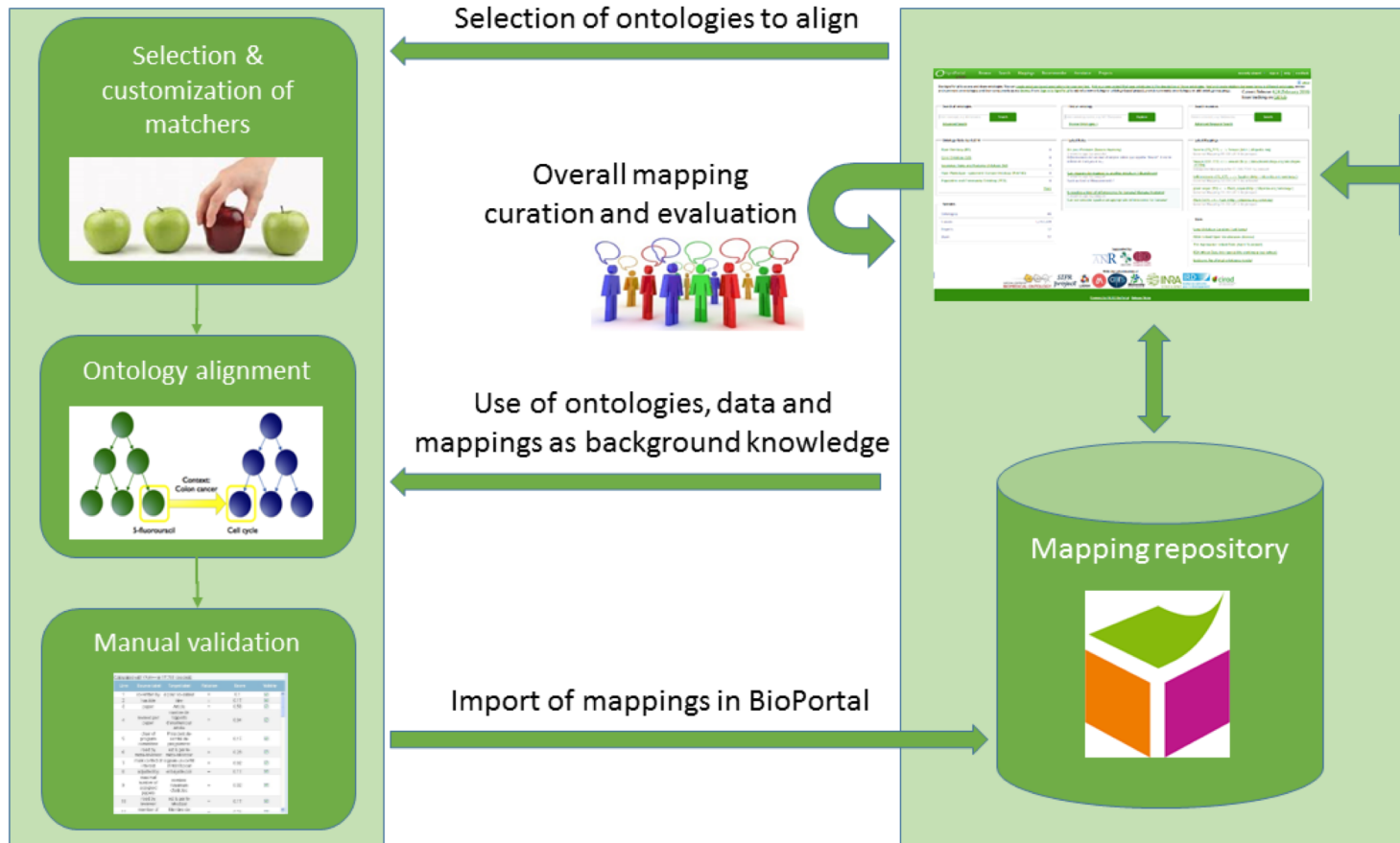
AGROVOC - AGROVOC (84,030)

Table Visualization

ONTOLOGY	MAPPINGS
Agri-Food Experiment Ontology	1
Agricultural and Nutrition Technology Ontology	2
Agriculture and Forestry Ontology	22
AGRORDF	2
AnaEE Thesaurus	333
Animal Disease Ontology	17
Animal Trait Ontology for Livestock	3
Biodiversity Thesaurus	255
Biological Collections Ontology	1
Biorefinery	2
Brachiaria Ontology	1
Brassica Ontology	2
Cassava Trait Ontology	1
Castor Bean Ontology	1
Cell Ontology	19
Chickpea Ontology	2
Common bean Ontology	1
Cowpea Trait Ontology	1
Darwin-SW	1
EDAM bioinformatics operations, data types, formats, identifiers and topics	6
Environment Ontology	29
Experimental Factor Ontology	85
External Mappings	47,809
Flora Phenotype Ontology	5
FoodOn	192

What's next for ontology alignment?

YAM++

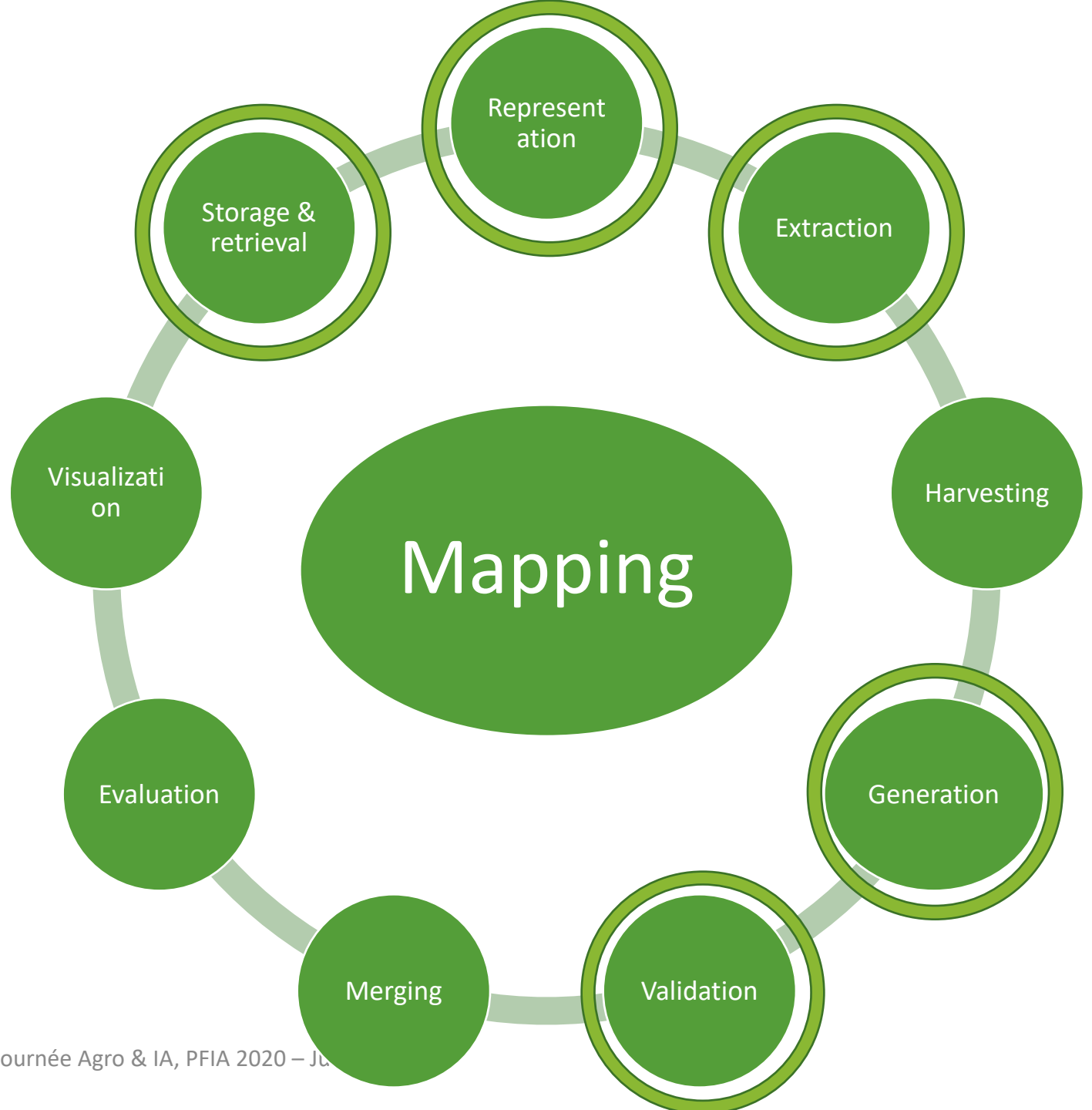


- **Align** the ontologies within AgroPortal

- Developing a state-of-the-art **ontology alignment framework** (all aspects)

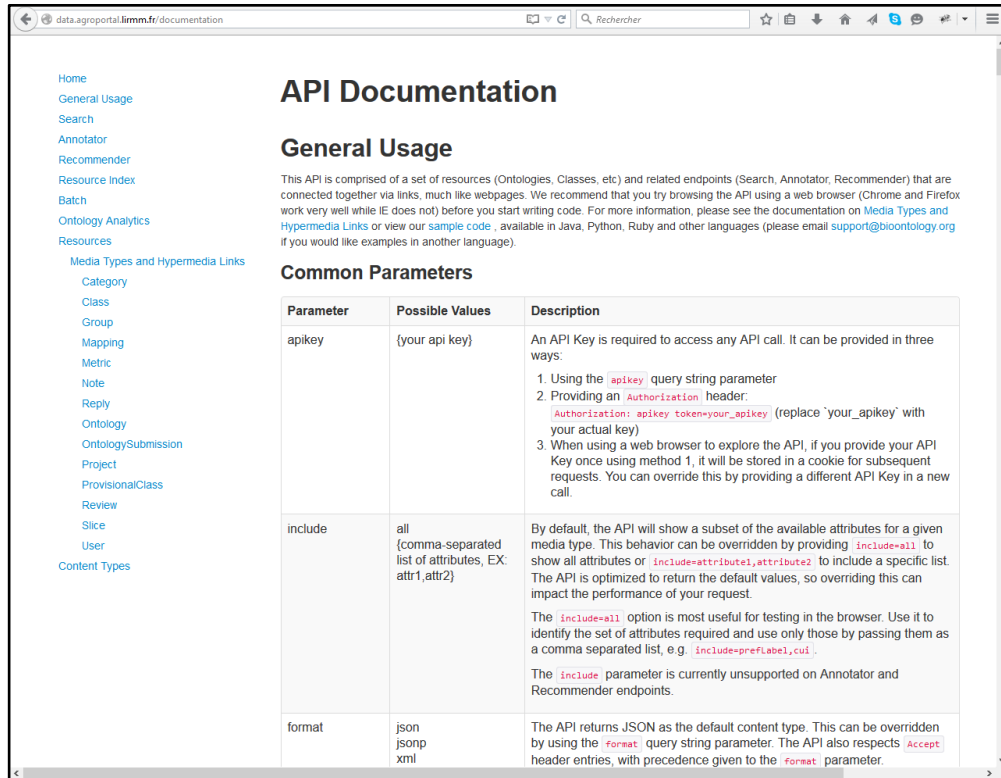
- Use property graphs (e.g., Neo4J) for mapping exploitation

All aspects of ontology alignments



REST Service API:

<http://data.agroportal.lirmm.fr/documentation>



Parameter	Possible Values	Description
apikey	{your api key}	An API Key is required to access any API call. It can be provided in three ways: 1. Using the <code>apikey</code> query string parameter 2. Providing an <code>Authorization</code> header: <code>Authorization: apikey token=your_apikey</code> (replace 'your_apikey' with your actual key) 3. When using a web browser to explore the API, if you provide your API Key once using method 1, it will be stored in a cookie for subsequent requests. You can override this by providing a different API Key in a new call.
include	all (comma-separated list of attributes, EX: attr1,attr2)	By default, the API will show a subset of the available attributes for a given media type. This behavior can be overridden by providing <code>include=all</code> to show all attributes or <code>include=attribute1,attribute2</code> to include a specific list. The API is optimized to return the default values, so overriding this can impact the performance of your request. The <code>include=all</code> option is most useful for testing in the browser. Use it to identify the set of attributes required and use only those by passing them as a comma separated list, e.g. <code>include=prefLabel,cui</code> . The <code>include</code> parameter is currently unsupported on Annotator and Recommender endpoints.
format	json jsonp xml	The API returns JSON as the default content type. This can be overridden by using the <code>Format</code> query string parameter. The API also respects <code>Accept</code> header entries, with precedence given to the <code>format</code> parameter.

SPARQL endpoint:

<http://sparql.agroportal.lirmm.fr>



```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT * WHERE {
  ?s ?p ?o
} LIMIT 10
```



Conclusions



ANR Project D2KAB: Data to Knowledge in Agronomy and Biodiversity (2019-2023)



Create a framework to **turn agronomy and biodiversity data into knowledge –semantically described, interoperable, actionable, open–** and investigate scientific methods and tools to exploit this knowledge for applications in science & agriculture

- How: Ontologies & Linked Open Data

- 1 work-package on building and harnessing **knowledge graphs**
- 2 work-packages of **driving ag & biodiv projects** (food packaging, agro-agri linked data, wheat phenotype, ecosystems & plant biogeography)





We all develop and maintain ontology repositories in the OntoPortal Alliance



BioPortal



AgroPortal



EcoPortal

Welcome to BioPortal, the world's most comprehensive repository of biomedical ontologies

Search for a class: Enter a class, e.g. Melanoma

Find an ontology: Start entering ontology name, e.g. Cancer, then choose from list

Ontology Visits (July 2017): Bar chart showing visits for CPT, RINORR, MEDORA, SNOMEDCT, NDOF.

BioPortal Statistics:

Ontologies	596
Classes	8,173,420
Resources Indexed	48
Indexed Records	39,537,360
Direct Annotations	95,468,433,792
Direct Plus Expanded Annotations	144,789,582,932

PRODUCTS: BioPortal, BioPortal REST API, BioPortal Virtual Appliance, NCBO Web Widgets

SUPPORT: Contact Us, Documentation, NCBO Wiki

ABOUT: About Us, Mission & Vision, Team, Projects

CONNECT: f, t, g+

The National Center for Biomedical Ontology was founded as one of the National Centers for Biomedical Computing, supported by the NIGMS, the NHLBI, and the NIH Common Fund under grant USA-HQ004028.
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<http://bioportal.bioontology.org>

Use the AgroPortal to access and share ontologies. You can create ontology based annotations for your own text, link your own project that uses ontologies to the description of those ontologies, find and create relations between terms in different ontologies, review and comment on ontologies and their components as you browse them. Sign up to AgroPortal to submit a new ontology or ontology based project, provide comments on ontologies or add ontology mappings.

Current Release: 4.24 (February 2016)
Issue tracking on GitHub

Search all ontologies: Enter concept, e.g. Melanoma

Find an ontology: Enter ontology name, e.g. NCI Thesaurus

Ontology Visits (April 2017):

AGROVOC (AGROVOC)	112
ANAT Thesaurus (ANATHESES)	95
National Agricultural Library Thesaurus (NAL)	47
Ontobioport (ONTOBIOPORT)	39
Protein Ontology (PRO)	36

Statistics:

Ontologies	63
Classes	1,194,372
Individuals	1,373,617
Projects	16
Users	63

Recent Mappings:

- metabolic pathway (SP) ↔ Metabolic Pathway (http://www.southgreen.fr/agroportal/resource) External Mapping 04/06/2017 by harmande
- OTL (SO) ↔ OTL (http://www.southgreen.fr/agroportal/resource) External Mapping 04/06/2017 by harmande
- EST_match (SO) ↔ EST_match (http://www.southgreen.fr/agroportal/resource) External Mapping 04/06/2017 by harmande
- cDNA_match (SO) ↔ cDNA_match (http://www.southgreen.fr/agroportal/resource) External Mapping 04/06/2017 by harmande

<http://agroportal.lirmm.fr>

Journée Agro & IA, PFIA 2020 – July 1st 2020

Search for a class: Enter a class, e.g. Shape, Trait, etc...

Find a semantic resource (ontology, thesaurus, etc.): Start entering ontology name, e.g. PhyloTraits, then choose from list

Ontology Visits (June 2019): Bar chart showing visits for various ontologies.

Ecoportal Statistics:

Ontologies	6
Classes	137

PRODUCTS: EcoPortal REST API

SUPPORT: Contact Us, Help

ABOUT: About Us, Team, Projects

CONNECT: f, t, g+

LifeWatch ERIC logo

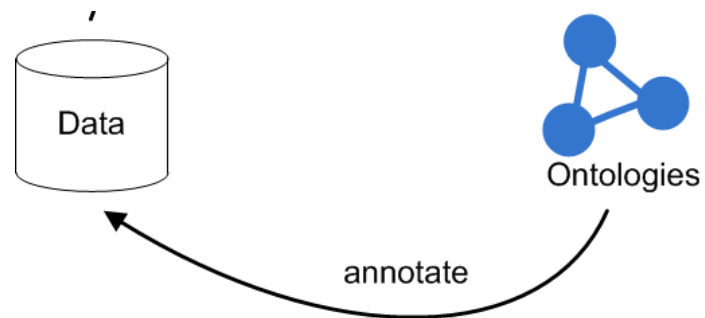
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Powered by NCBO BioPortal

<http://ecoportal.lifewatchitaly.eu>



Take home message



Findable **A**ccessible **I**nteroperable **R**eusable



Credits (people & support)

- LIRMM

- Vincent Emonet
- Anne Toulet
- Andon Tchechmedjiev
- Amine Abdaoui
- Juan-Antonio Lossio
- Elcio Abrahao
- Amir Laadhar
- Emna Amdouni
- Jerome Lamarque
- Zohra Bellahsene
- Amina Annane (ESI Algeria)
- Mathieu Roche (CIRAD)
- Sandra Bringay
- Few MSc students / year

- Collaborators

- Pierre Larmande (IRD)
- Mark Musen (Stanford)
- John Graybeal (Stanford)
- Stefan Darmoni (CISMEF)
- Maguelonne Teisseire (IRSTEA)
- Sebastien Harispe (LGI2P)
- Adrien Coulet (LORIA)
- Elizabeth Arnaud (CGIAR)
- S. Aubin, O. Hologne, E. Dzalé, P. Neveu, C. Pommier, C. Nédellec ... (INRAE)
-



agropolis fondation





Questions ?

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jonquet@lirmm.fr

