O'FAIRe: Ontology FAIRness Evaluator

in the

AgroPortal semantic artefact catalogue

Clement Jonquet

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GO-GAIR Agro Brazil network seminar

October 17th, 2023

INRAE la science pour la vie, l'humain, la terre

Mistea Mathématiques, Informatique et STatistique pour l'Environnement et l'Agronomie

Université de Montpellier

LIRMM Laboratoire d'Informatique, de Robotique et de Microélectronique de Montpellier

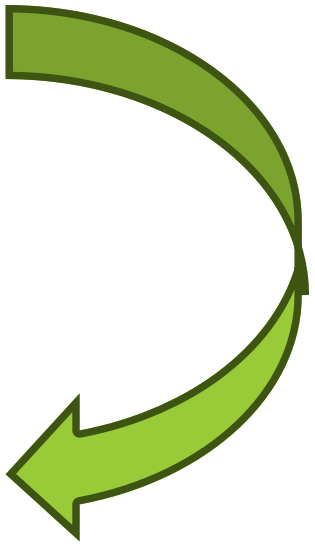
FAIR data requires FAIR ontologies, how do we do?

Clement Jonquet, PhD

Assistant Professor – LIRMM, University of Montpellier

Visiting Scholar at Stanford University

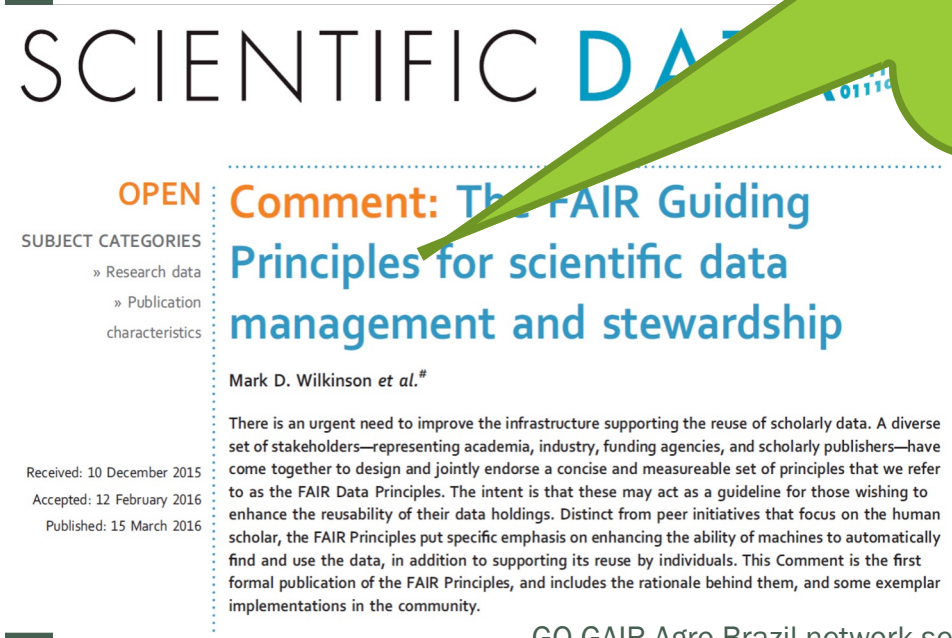
RDA P11 IGAD pre-meeting – Berlin, March 2018



2022: what have we done?

I2. (Meta)data use vocabularies that follow FAIR principles.

How to go from ”principles” to specialized criteria to measure to which level ontologies respect the FAIR Principles?



SCIENTIFIC DA

OPEN

SUBJECT CATEGORIES

» Research data

» Publication characteristics

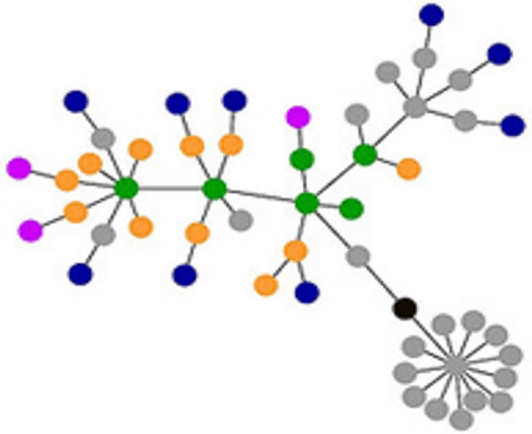
Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson *et al.*[#]

There is an urgent need to improve the infrastructure supporting the reuse of scholarly data. A diverse set of stakeholders—representing academia, industry, funding agencies, and scholarly publishers—have come together to design and jointly endorse a concise and measureable set of principles that we refer to as the FAIR Data Principles. The intent is that these may act as a guideline for those wishing to enhance the reusability of their data holdings. Distinct from peer initiatives that focus on the human scholar, the FAIR Principles put specific emphasis on enhancing the ability of machines to automatically find and use the data, in addition to supporting its reuse by individuals. This Comment is the first formal publication of the FAIR Principles, and includes the rationale behind them, and some exemplar implementations in the community.

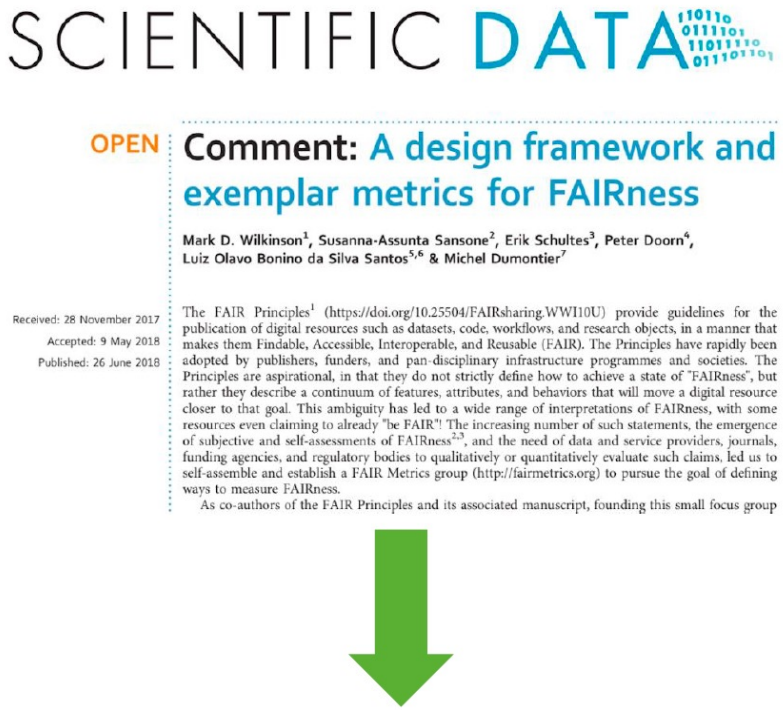
Received: 10 December 2015
Accepted: 12 February 2016
Published: 15 March 2016

W3C Semantic Web



From I1, I2 and I3, ontologies/vocabularies are a key element to achieve the FAIR Principles

The key feature in FAIRness assessment



SCIENTIFIC DATA

OPEN

Comment: A design framework and exemplar metrics for FAIRness

Mark D. Wilkinson[1], Susanna-Assunta Sansone[2], Erik Schultes[3], Peter Doorn[4], Luiz Olavo Bonino da Silva Santos[5,6] & Michel Dumontier[7]

Received: 28 November 2017
Accepted: 9 May 2018
Published: 26 June 2018

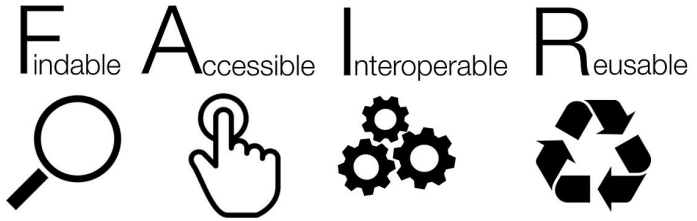
The FAIR Principles[1] (https://doi.org/10.25504/FAIRsharing.WWI10U) provide guidelines for the publication of digital resources such as datasets, code, workflows, and research objects, in a manner that makes them Findable, Accessible, Interoperable, and Reusable (FAIR). The Principles have rapidly been adopted by publishers, funders, and pan-disciplinary infrastructure programmes and societies. The Principles are aspirational, in that they do not strictly define how to achieve a state of "FAIRness", but rather they describe a continuum of features, attributes, and behaviors that will move a digital resource closer to that goal. This ambiguity has led to a wide range of interpretations of FAIRness, with some resources even claiming to already "be FAIR"! The increasing number of such statements, the emergence of subjective and self-assessments of FAIRness[2,3], and the need of data and service providers, journals, funding agencies, and regulatory bodies to qualitatively or quantitatively evaluate such claims, led us to self-assemble and establish a FAIR Metrics group (http://fairmetrics.org) to pursue the goal of defining ways to measure FAIRness.

As co-authors of the FAIR Principles and its associated manuscript, founding this small focus group

Desing FAIRness assessment methods for the community

FAIR metric: objective, measurable, and reproducible

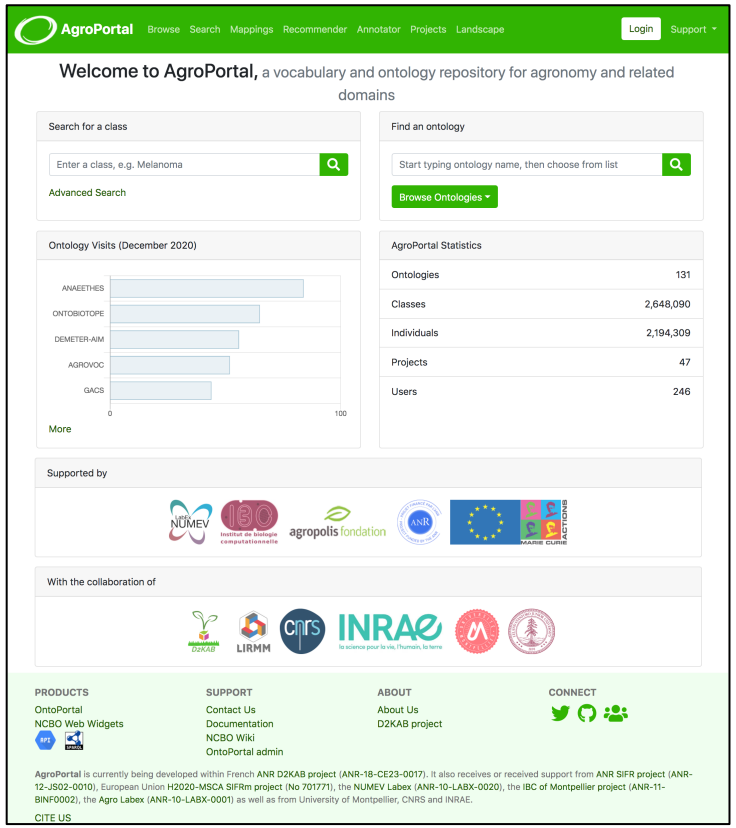
«If you can't measure it, you can't improve it.»- Lord Kelvin



Agenda

- Quick introduction to **AgroPortal** (an OntoPortal-based semantic artefact catalogue)

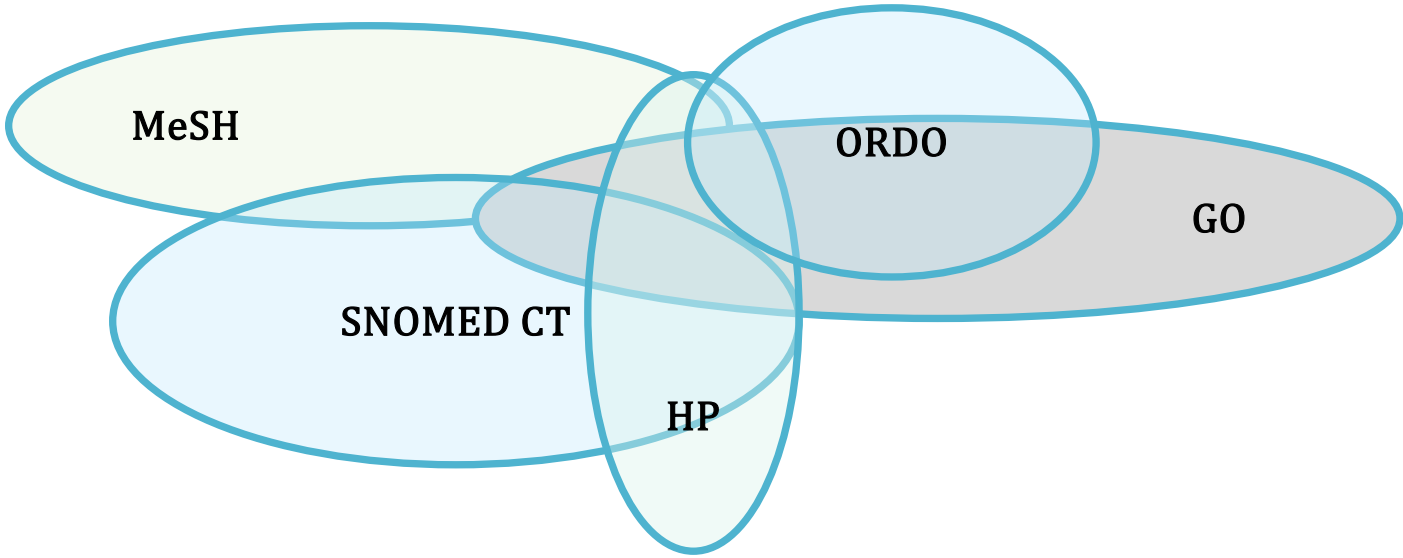
- **Ontology FAIRness Evaluator** (O'FAIRe): a method (almost fully implemented as a tool in AgroPortal)



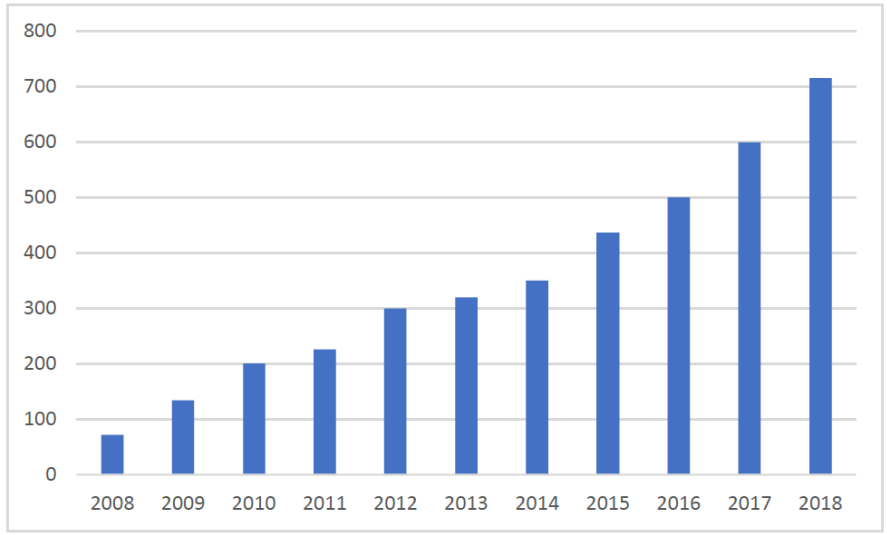
Introduction to AgroPortal

Issues with ontologies…

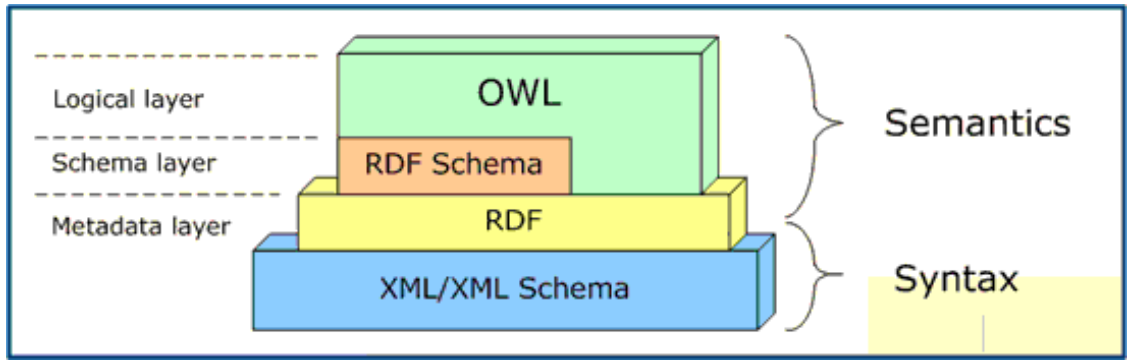
spread out, in different formats, of different size, with different structures



Overlapping ontologies



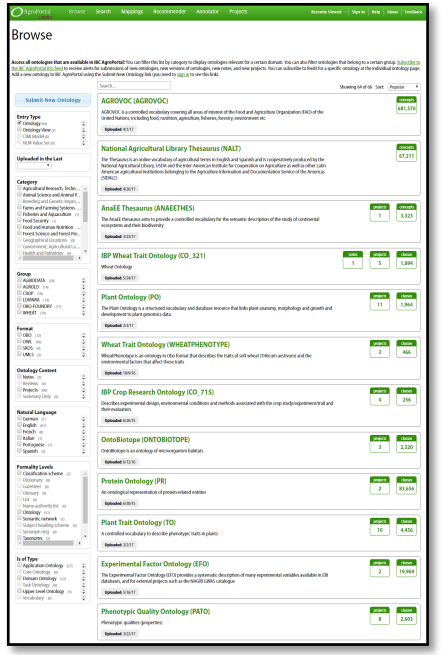
Number of ontologies in the NCBO BioPortal

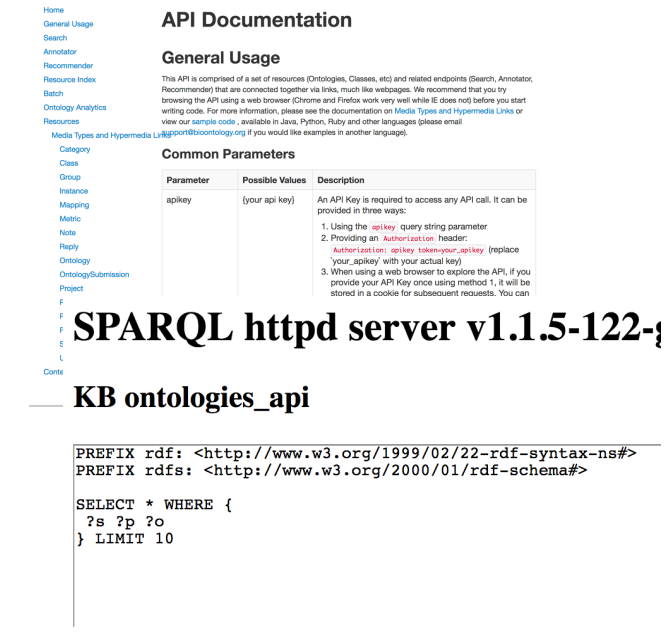


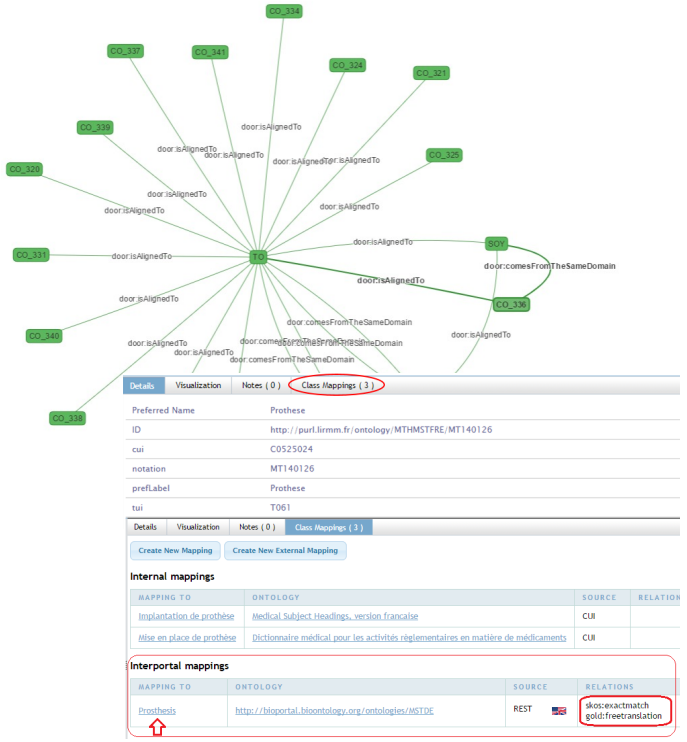
Variety of representation languages

Ontology repositories help to make ontologies FAIR

Findable **A**ccessible **I**nteroperable **R**e-usable





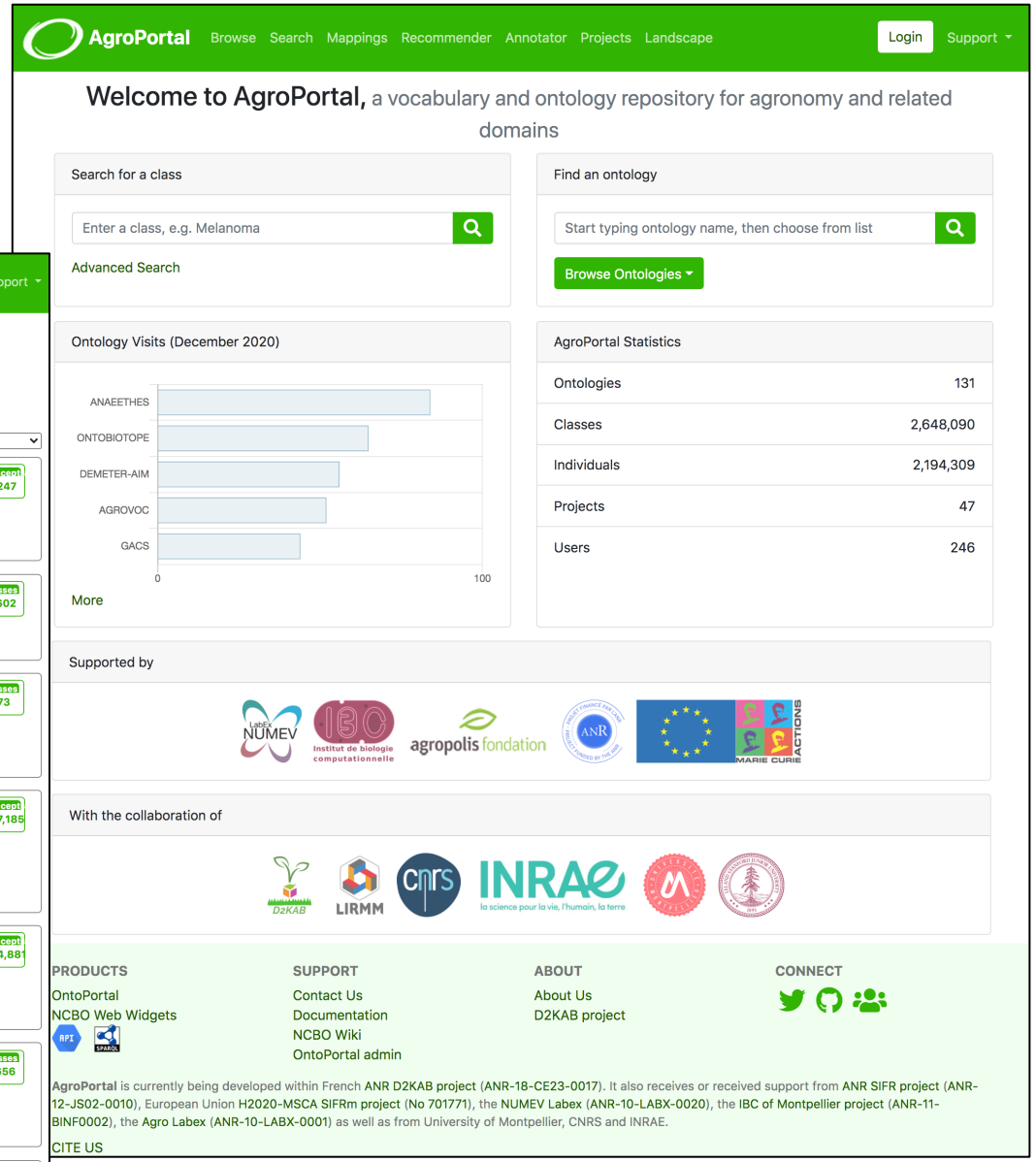


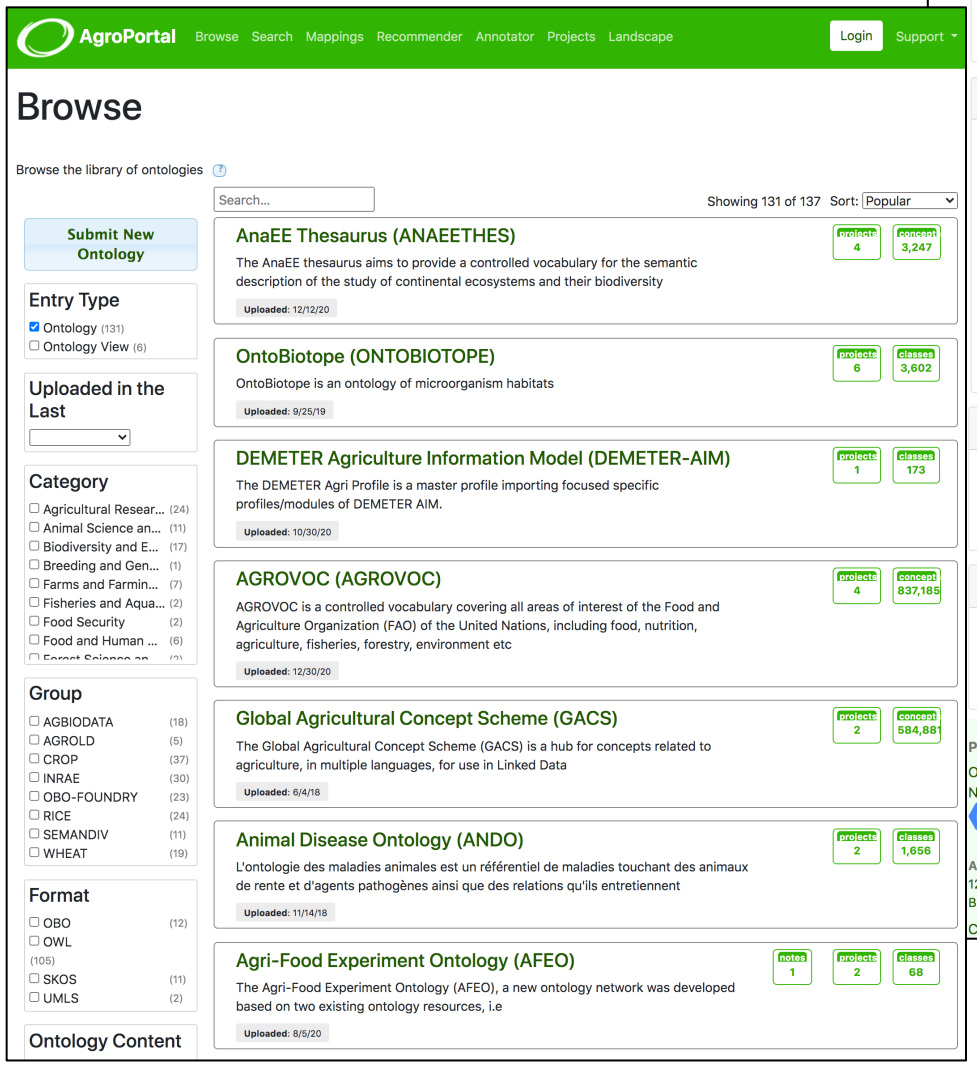
AgroPortal an ontology repository

for agronomy, food, plant sciences & biodiversity

http://agroportal.lirmm.fr

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





- 149 ontologies, 110 candidates
- 5 original driving use cases
- ~330 registered users

C. Jonquet, A. Toulet, (...) P. Larmande. **AgroPortal: an ontology repository for agronomy**, *Computers and Electronics in Agriculture*. Jan 2018. 144, pp.126-143. Elsevier.

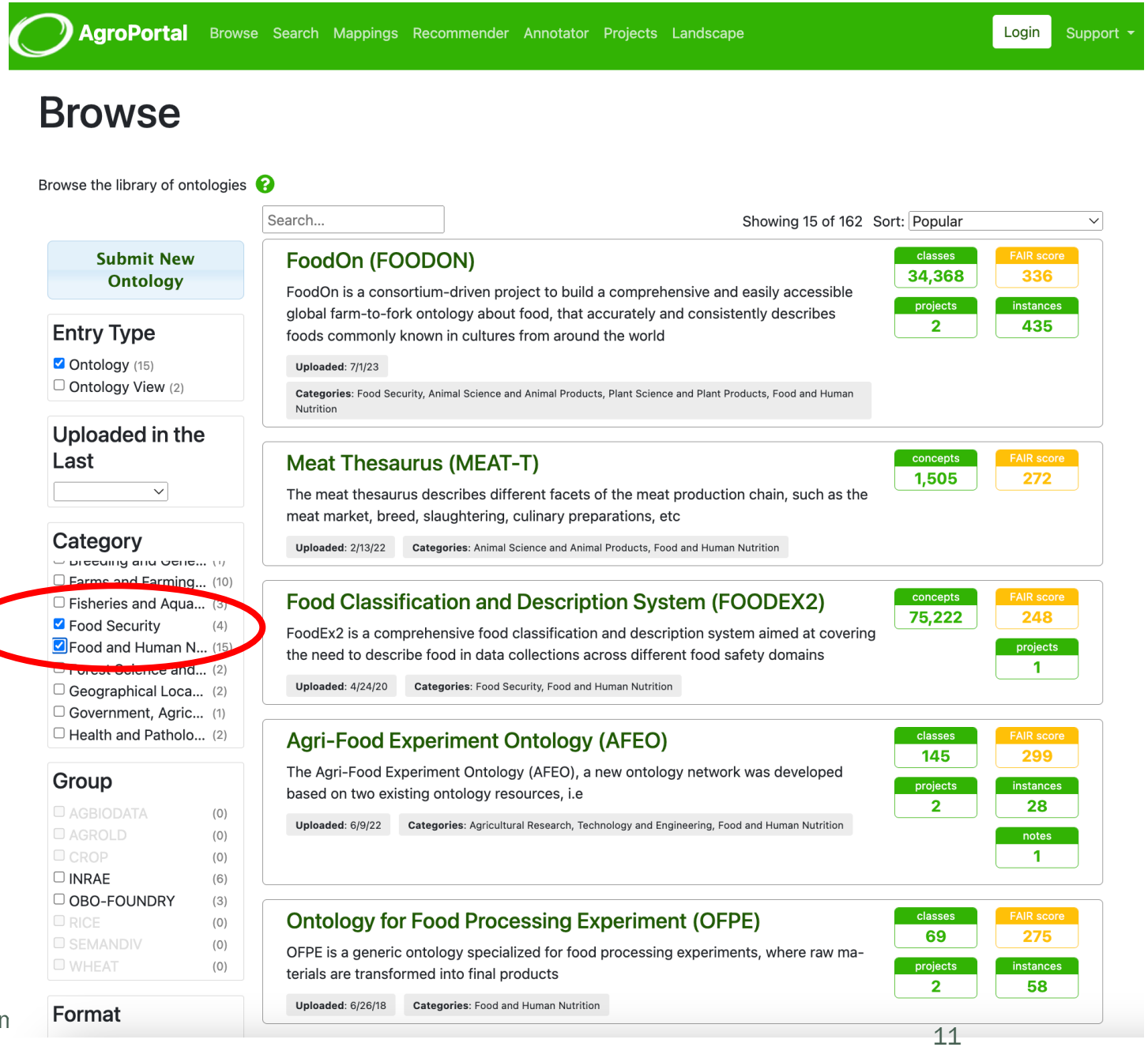
AgroPortal: a vocabulary and ontology repository for agronomy

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*

Browse and select ontologies

- Allows to search, order and select ontologies using a facetted search approach, based on the metadata



Class Search

leaf area index

Enter a class, e.g. Melanoma help

Show advanced options

Search

Matches in 29 ontologies

leaf area index - AGROVOC (AGROVOC)
http://aims.fao.org/aos/agrovoc/c_35196
http://aims.fao.org/aos/agrovoc/xDef_012441f5
details - visualize - 2 more from this ontology

leaf area index - AnaEE Thesaurus (ANAEETHES)
http://opendata.inra.fr/anaeeThes/c3_2317
leaf area index. http://opendata.inra.fr/anaeeThes/c1_def_en_34ee941a. http://opendata.inra.
details - visualize - 8 more from this ontology

Leaf area index - Wheat Ontology (CO_321)
https://cropontology.org/rdf/CO_321:0000184
It is a dimensionless quantity that characterizes plant canopies and defined as the leaf area p
details - visualize - 5 more from this ontology

leaf area index - Plant Trait Ontology (TO)
http://purl.obolibrary.org/obo/TO_0012001
Leaf Area Index (LAI) is the ratio of total upper leaf surface of vegetation divided by the surfa
used to predict photosynthetic primary production and ...
details - visualize - 7 more from this ontology

Reuses in other ontologies

leaf area index - Agronomy Ontology (AGRO)
http://purl.obolibrary.org/obo/TO_0012001
Leaf Area Index (LAI) is the ratio of total upper leaf surface of vegetation divided by the surface area of the land on which the vegetation grows.
details - visualize - 2 more from this ontology

Green Area Index - Wheat Trait and Phenotype Ontology (WHEATPHENOTYPE)
http://purl.obolibrary.org/obo/WTO_0000061
details - visualize - 1 more from this ontology

Tree Widget

Display a class tree with a search field for TO

Get code

leaf are

leaf area index
leaf area trait
leaf area to spikelet number ratio
leaf area duration
specific **leaf area**
relative **leaf area**
large vascular bundle number to **leaf area** ratio
flag **leaf area**

Agronomy Ontology

Last uploaded: November 5, 2021

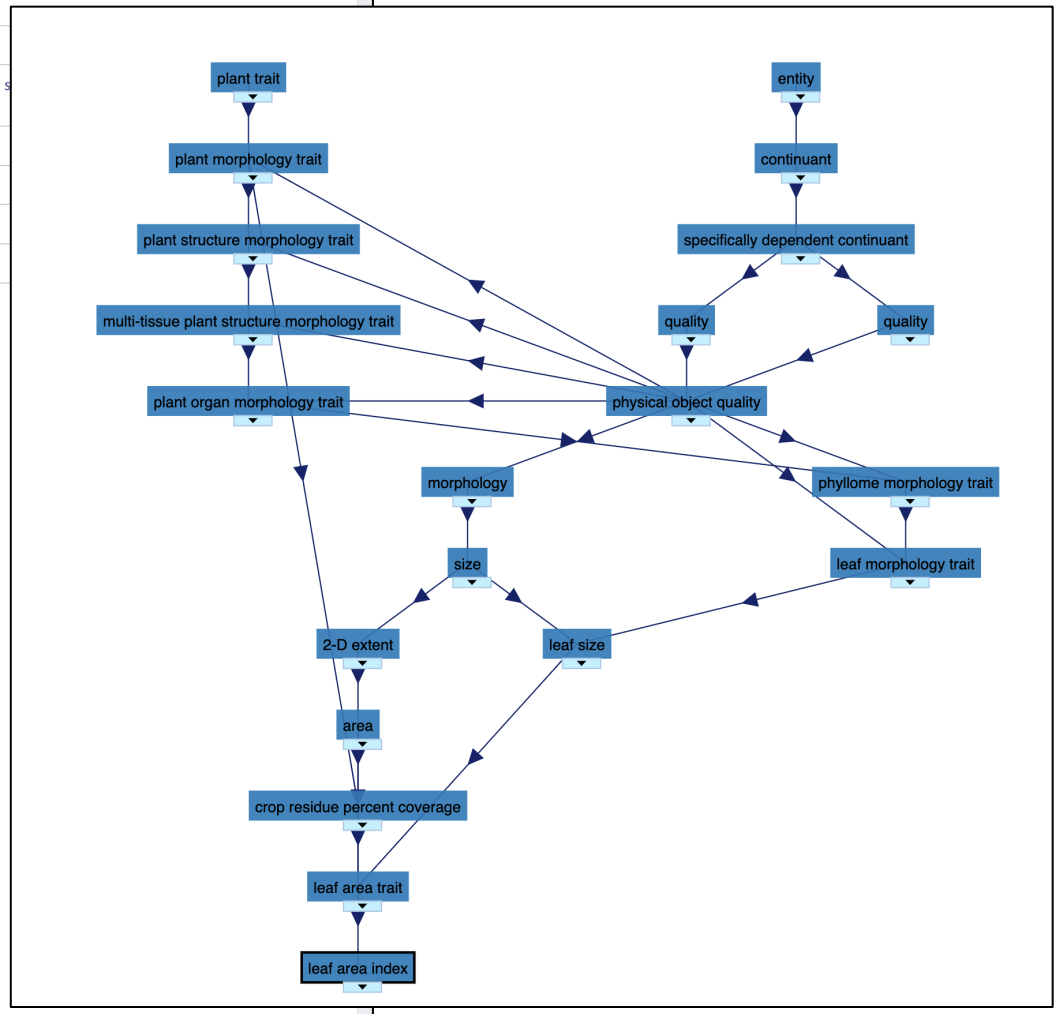
Summary | Classes | Properties | Instances | Notes | Mappings | Widgets

Jump to:

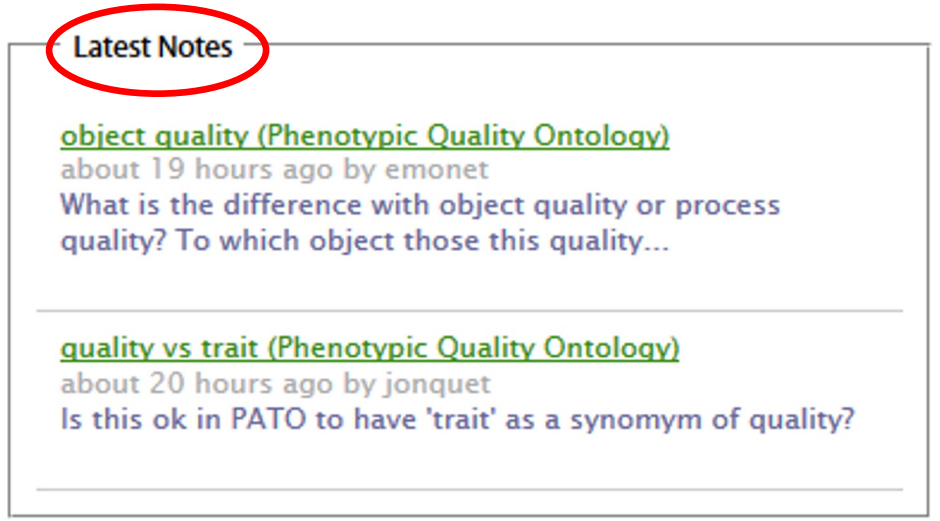
- entity
  - continuant
    - generically dependent continuant
    - independent continuant
    - specifically dependent continuant
      - quality
        - enzyme activity trait
        - physical object quality
          - berry fruit morphology trait
          - branch morphology trait
          - cardinal organ part morphology trait
          - cardinal part of a multi-tissue plant structu
          - carpel morphology trait
          - caryopsis fruit morphology trait
          - collective phyllome structure morphology
          - collective plant organ structure morpholoc
          - collective plant structure morphology trait
          - decreased object quality
          - ear inflorescence morphology trait
          - ear infructescence morphology trait
          - floral organ morphology trait
          - flower morphology trait
          - fruit morphology trait
          - geodiversity
          - has number of
          - increased object quality
          - inflorescence axis morphology trait
          - inflorescence morphology trait
          - infructescence axis morphology trait
          - infructescence morphology trait
          - leaf morphology trait
          - legume fruit morphology trait
          - megasporophyll morphology trait
          - molecular quality
          - morphology
            - amorphous
            - color
            - shape
            - size
              - 1-D extent
              - 2-D extent
                - area
                  - cob area
                  - crop residue percent coverage
                    - cob area
                    - leaf area trait
                      - **leaf area index**
                  - farm area
                  - field area
                  - harvested surface area
                  - leaf area trait
                  - mulch percent coverage
                  - plot area

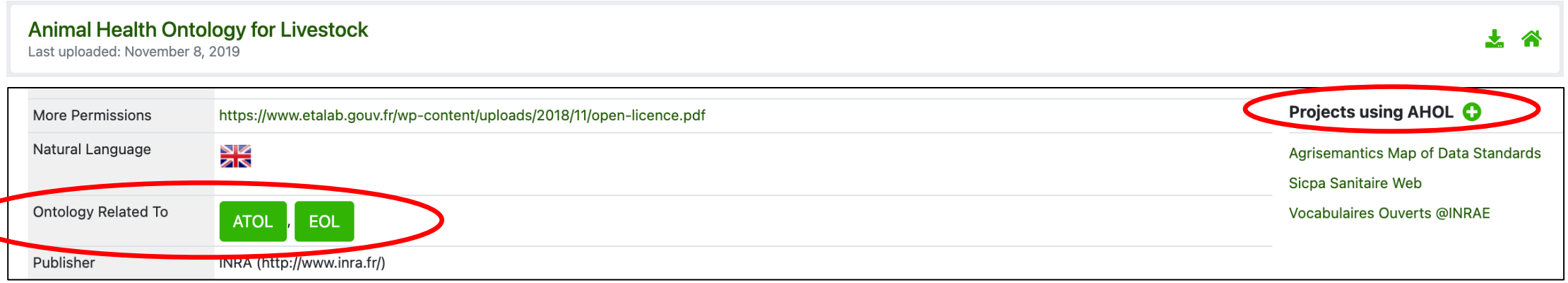
Details | Instances (0) | Visualization | Notes (0) | Class Mappings (32) | Access Class JSON

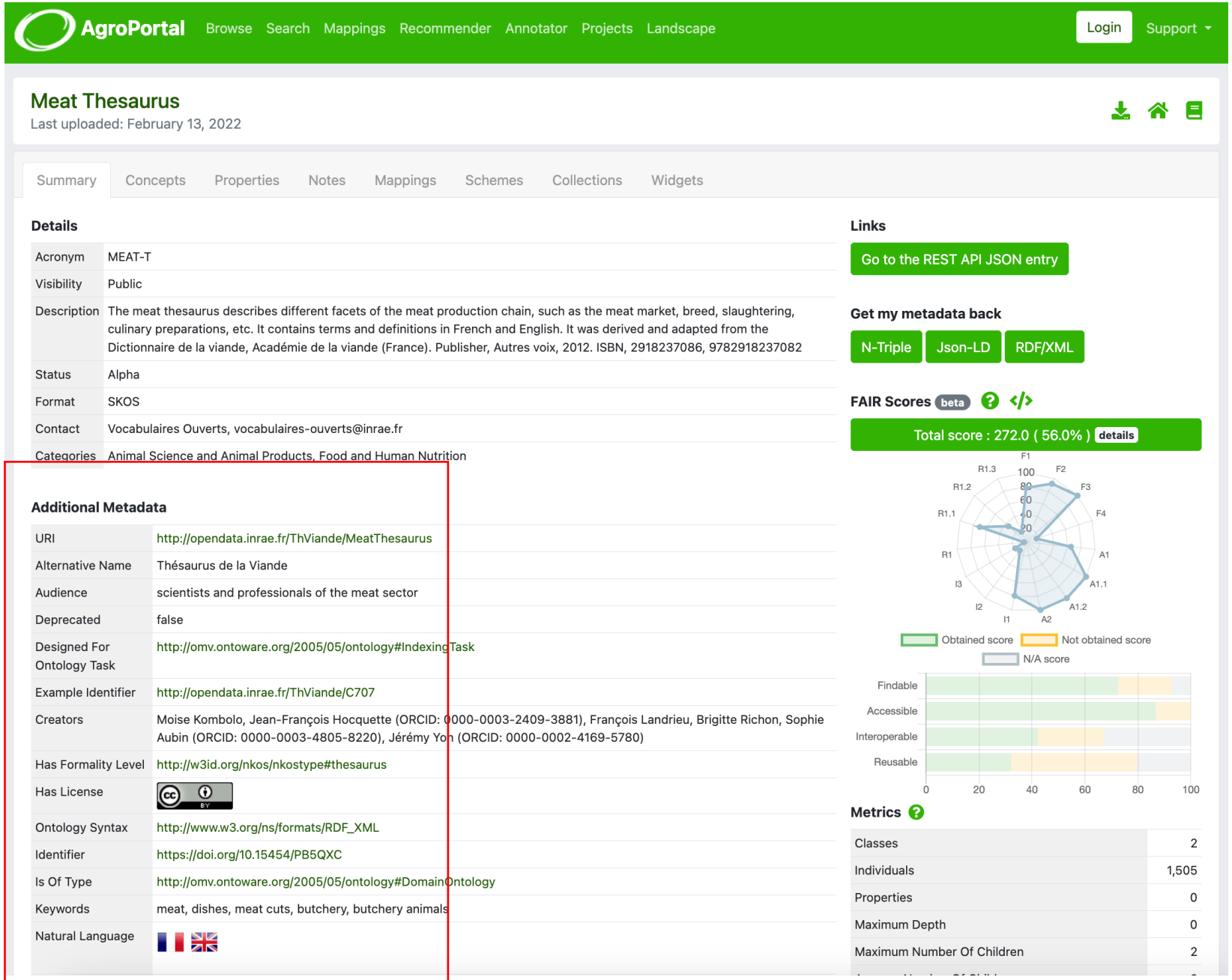
Preferred Name	leaf area index
Definitions	Leaf Area Index (LAI) is the ratio of total upper leaf surface of vegetation divided by the surface area of the land on which the vegetation grows.
ID	http://purl.obolibrary.org/obo/TO_0012001
definition	Leaf Area Index (LAI) is the ratio of total upper leaf surface of vegetation divided by the s vegetation grows.
label	leaf area index
prefixIRI	obo1:TO_0012001
prefLabel	leaf area index
subClassOf	leaf area trait



Community based functionalities



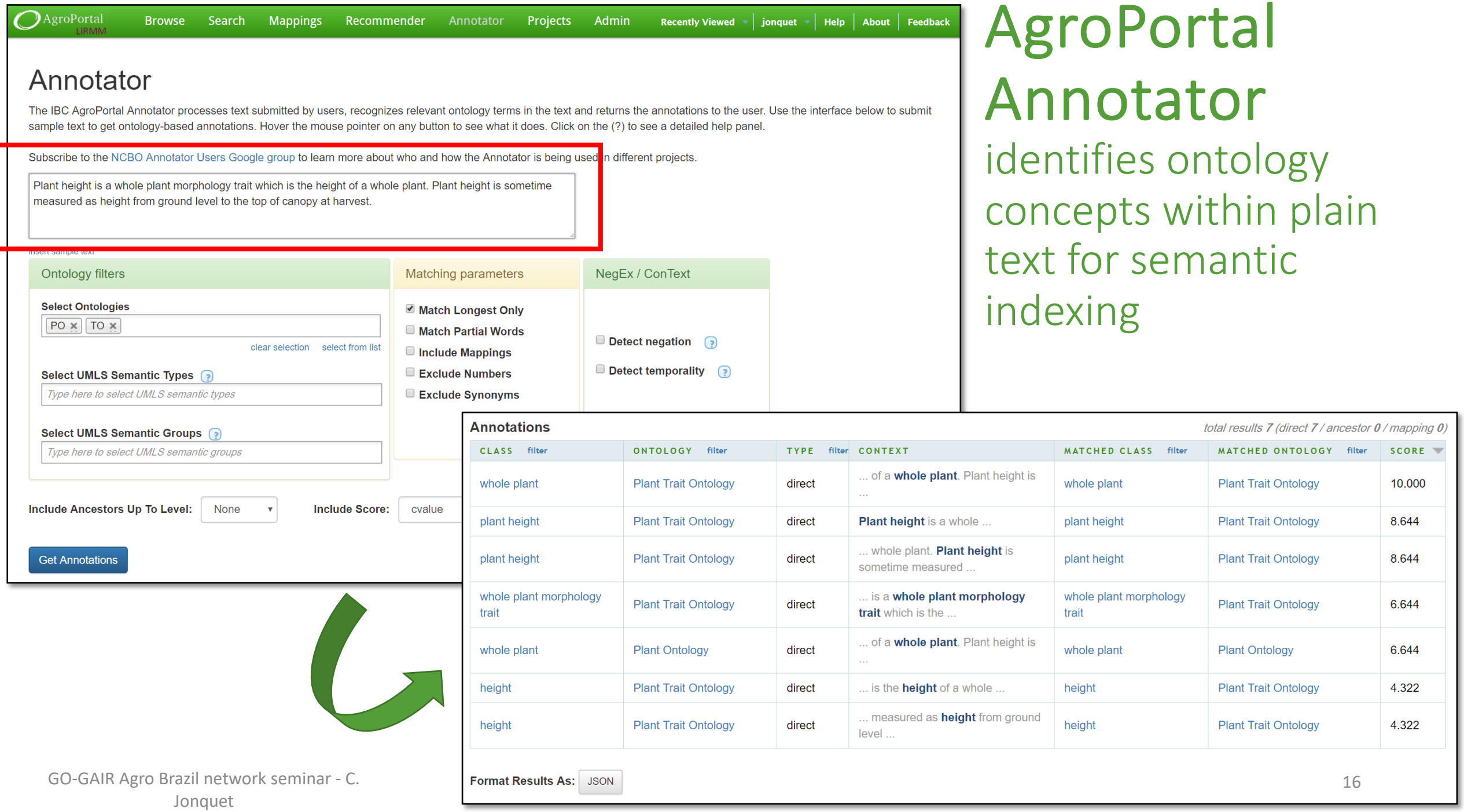




Describe the ontologies with many metadata

AgroPortal Annotator

identifies ontology concepts within plain text for semantic indexing



Sprouting
Initial Vigor
Color of unexpanded apical 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 root
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

AgroPortal LIRMM Browse Search Mappings

Annotator

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

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 ×

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"
      }
    ],
```

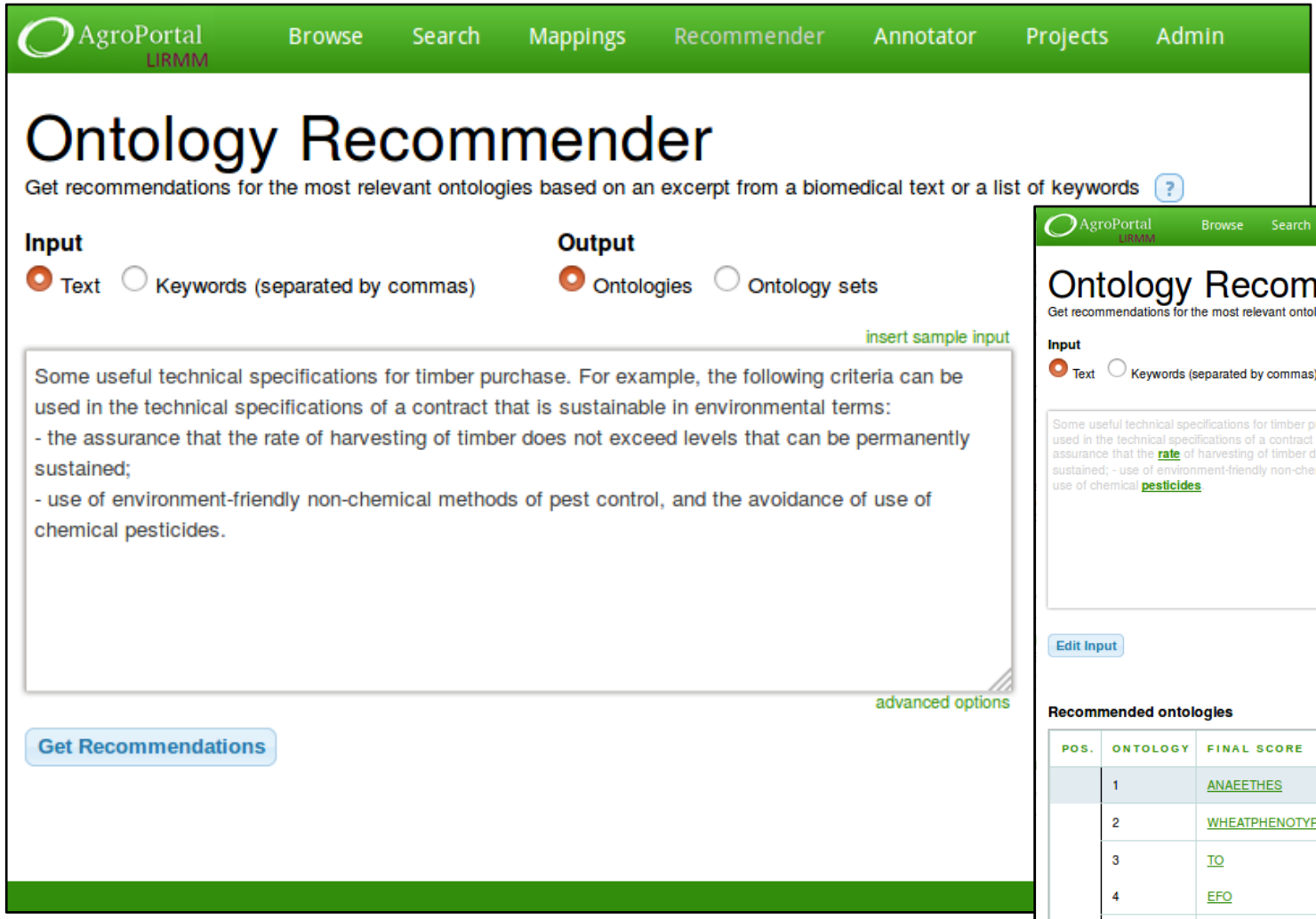

Cassava Trait Ontology

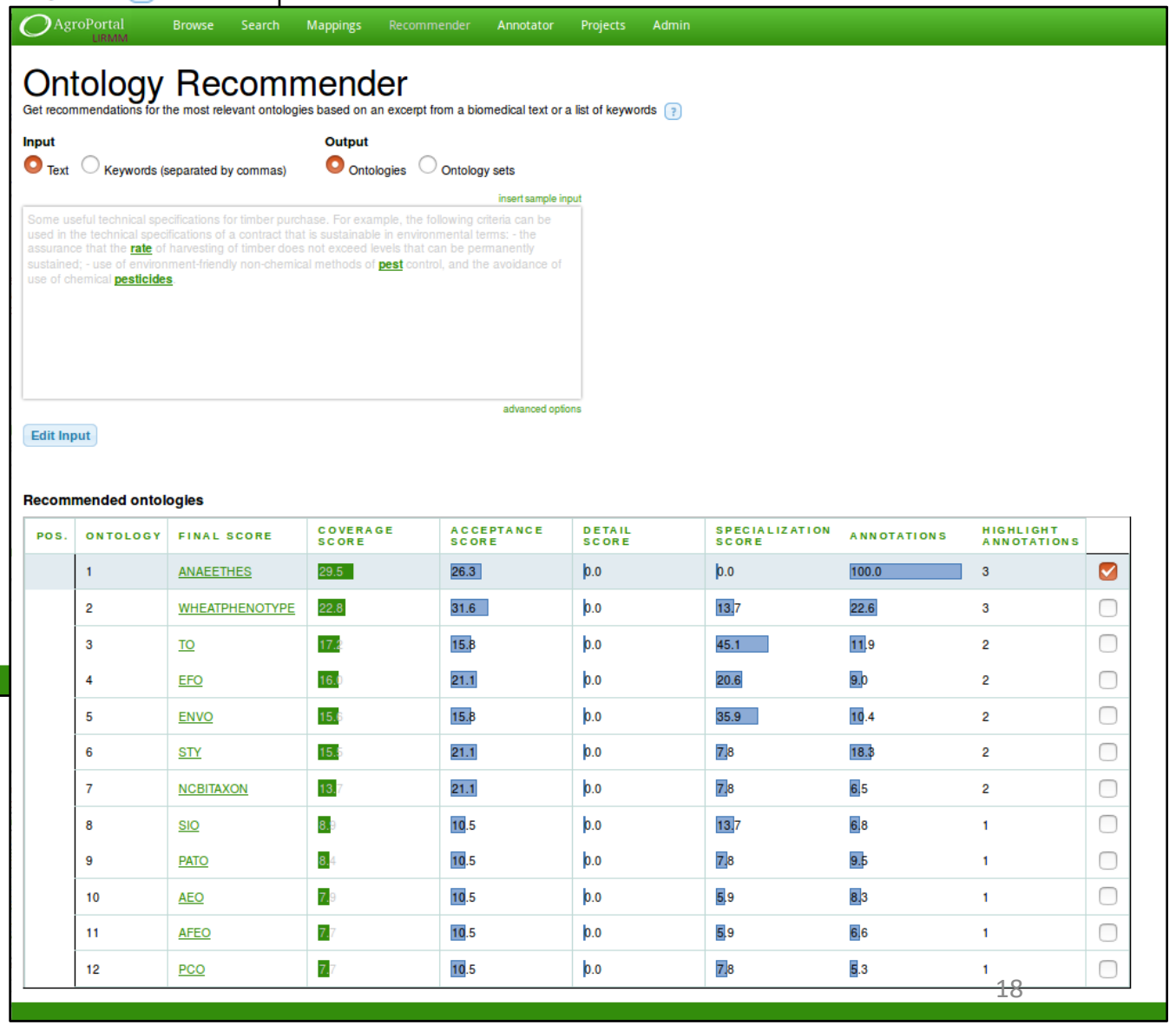
Summary Classes Properties Notes Mappings Widgets

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



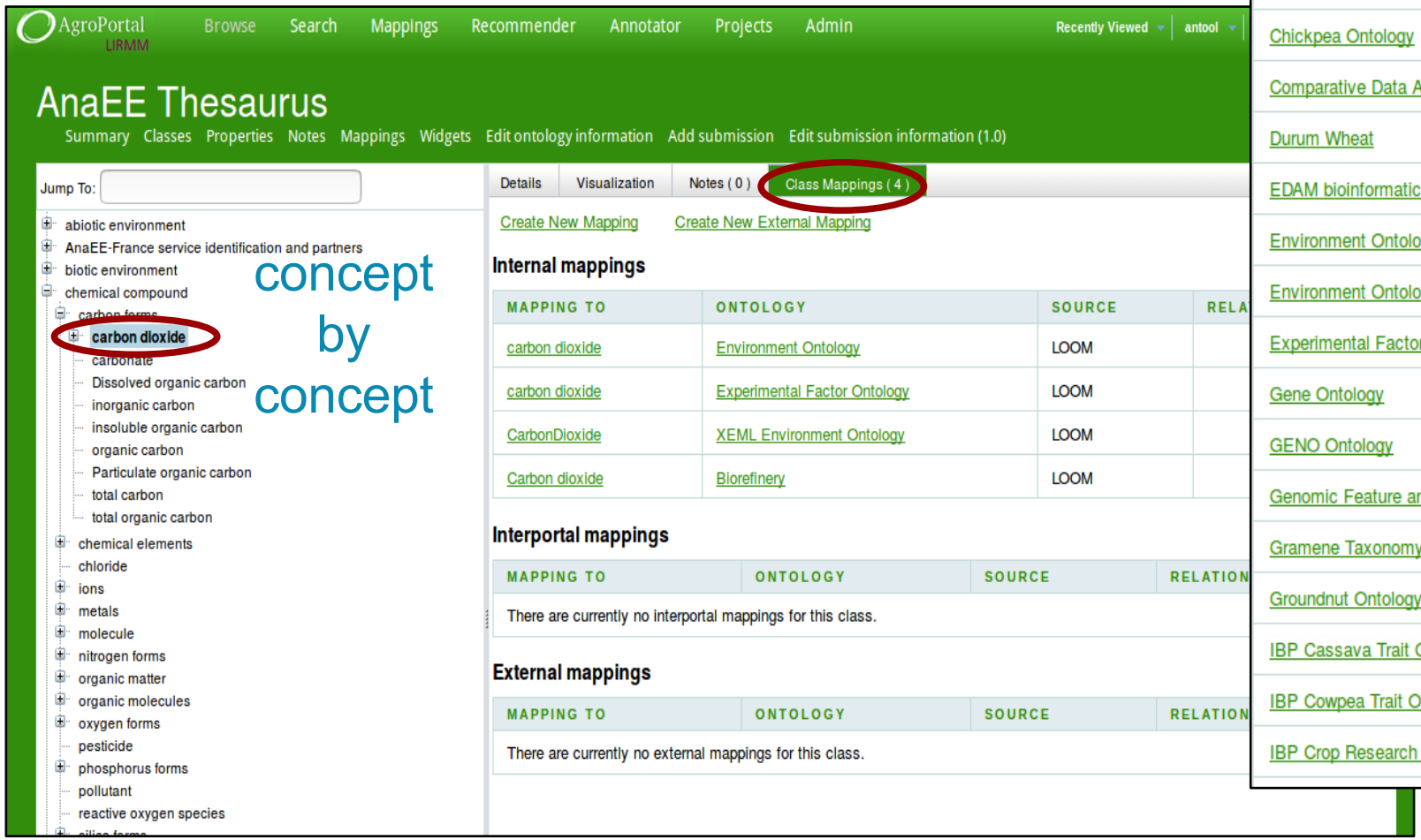


POS.	ONTOLOGY	FINAL SCORE	COVERAGE SCORE	ACCEPTANCE SCORE	DETAIL SCORE	SPECIALIZATION SCORE	ANNOTATIONS	HIGHLIGHT ANNOTATIONS	
	1	ANAEETHES	29.5	26.3	0.0	0.0	100.0	3	☑
	2	WHEATPHENOTYPE	22.8	31.6	0.0	13.7	22.6	3	☐
	3	TO	17.4	15.8	0.0	45.1	11.9	2	☐
	4	EFO	16.0	21.1	0.0	20.6	9.0	2	☐
	5	ENVO	15.5	15.8	0.0	35.9	10.4	2	☐
	6	STY	15.5	21.1	0.0	7.8	18.3	2	☐
	7	NCBITAXON	13.7	21.1	0.0	7.8	6.5	2	☐
	8	SIO	8.9	10.5	0.0	13.7	6.8	1	☐
	9	PATO	8.4	10.5	0.0	7.8	9.5	1	☐
	10	AEO	7.9	10.5	0.0	5.9	8.3	1	☐
	11	AFEO	7.7	10.5	0.0	5.9	6.6	1	☐
	12	PCO	7.7	10.5	0.0	7.8	5.3	1	☐

AgroPortal Recommender

get the most relevant ontologies for your data

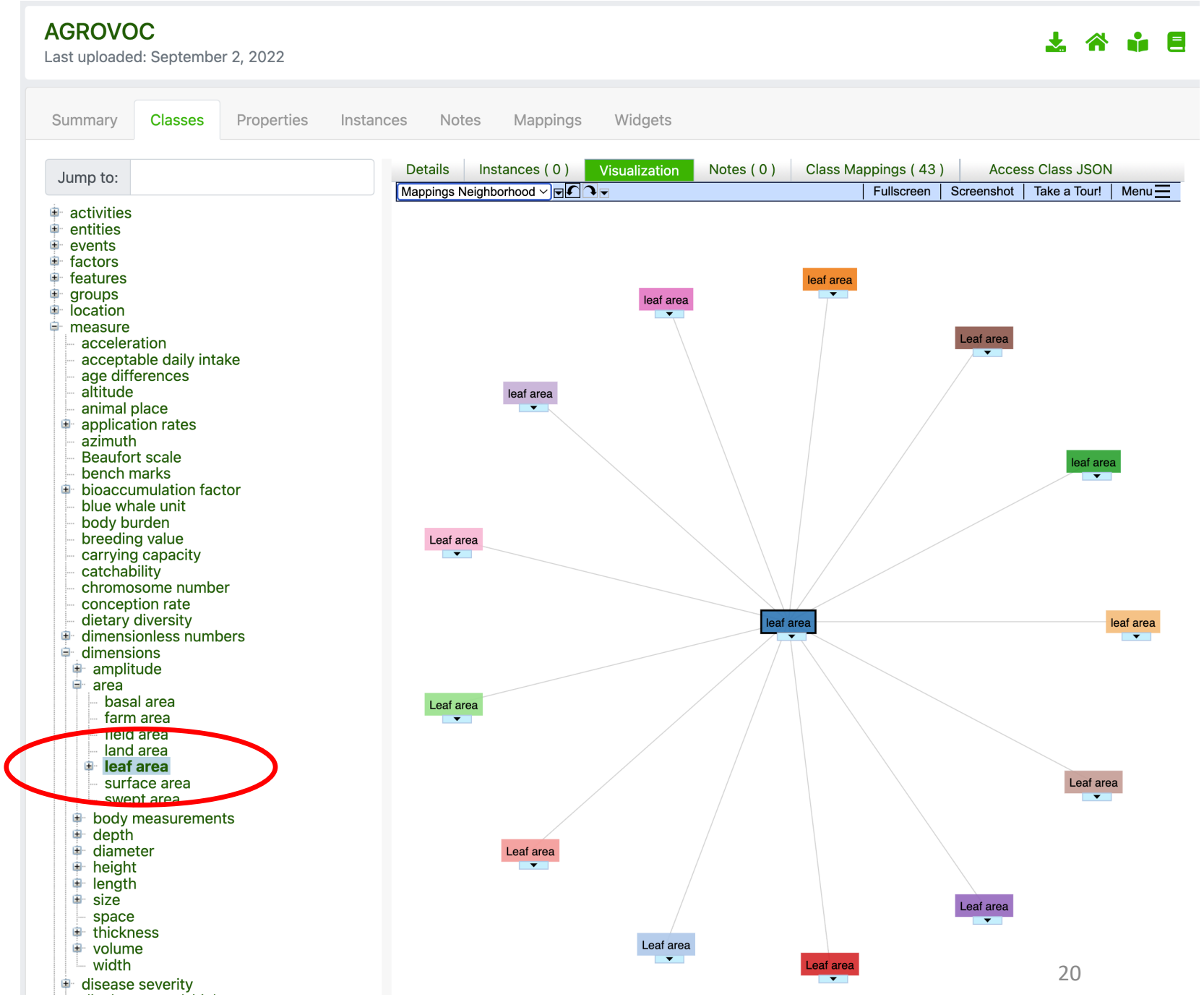
Align ontologies one another



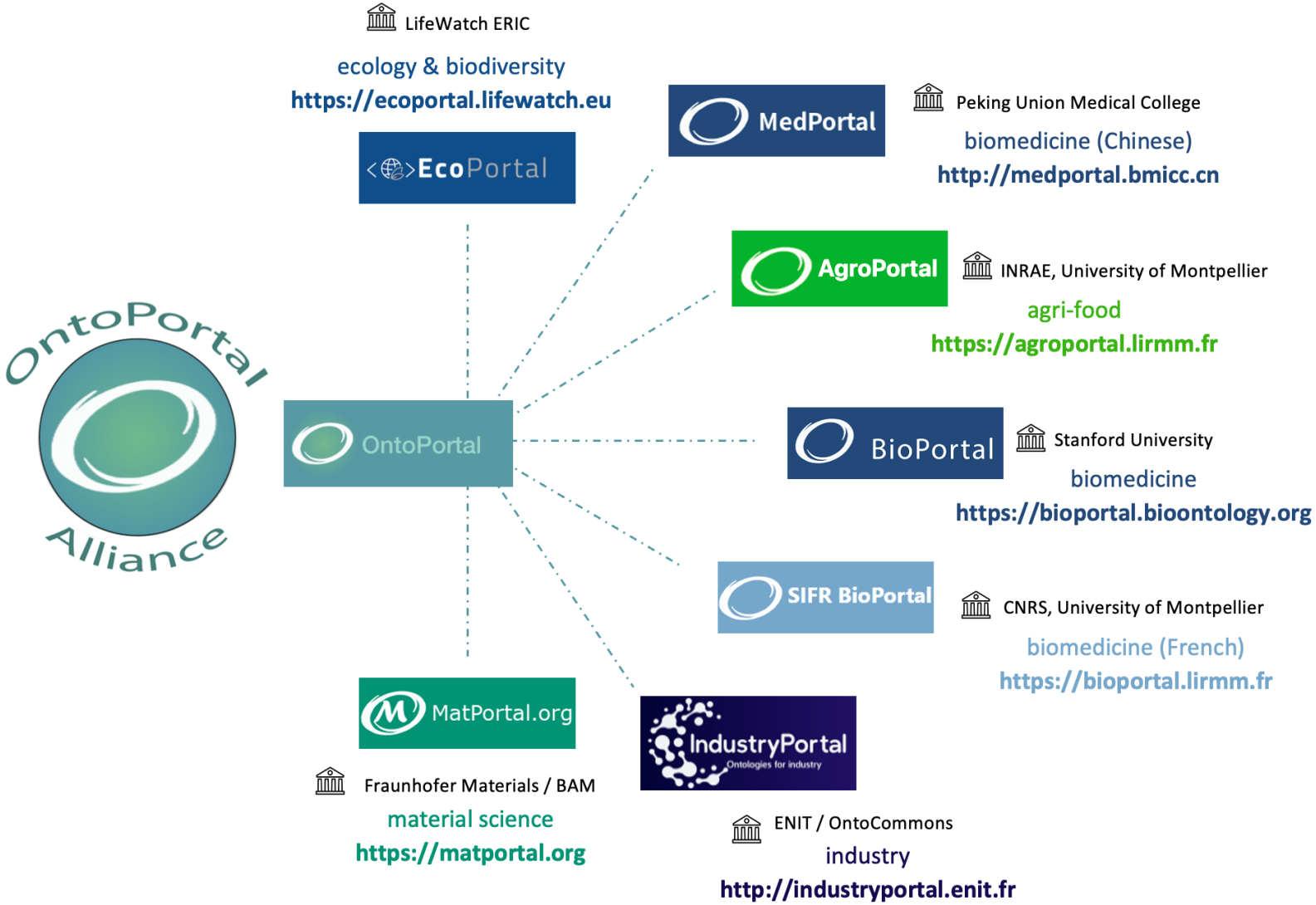
Mappings

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

Mappings visualization



OntoPortal Alliance: Synchronizing and mutualizing research and development efforts



Representing OntoPortal adopters and end users

- to maximize OntoPortal value (state-of-the-art service portfolio)
- to improve OntoPortal software while managing several parallel and different installations
- to increase semantic uptake in science communities and facilitate adoption of the FAIR principles
- to increase the ecosystem's long term operational and financial health

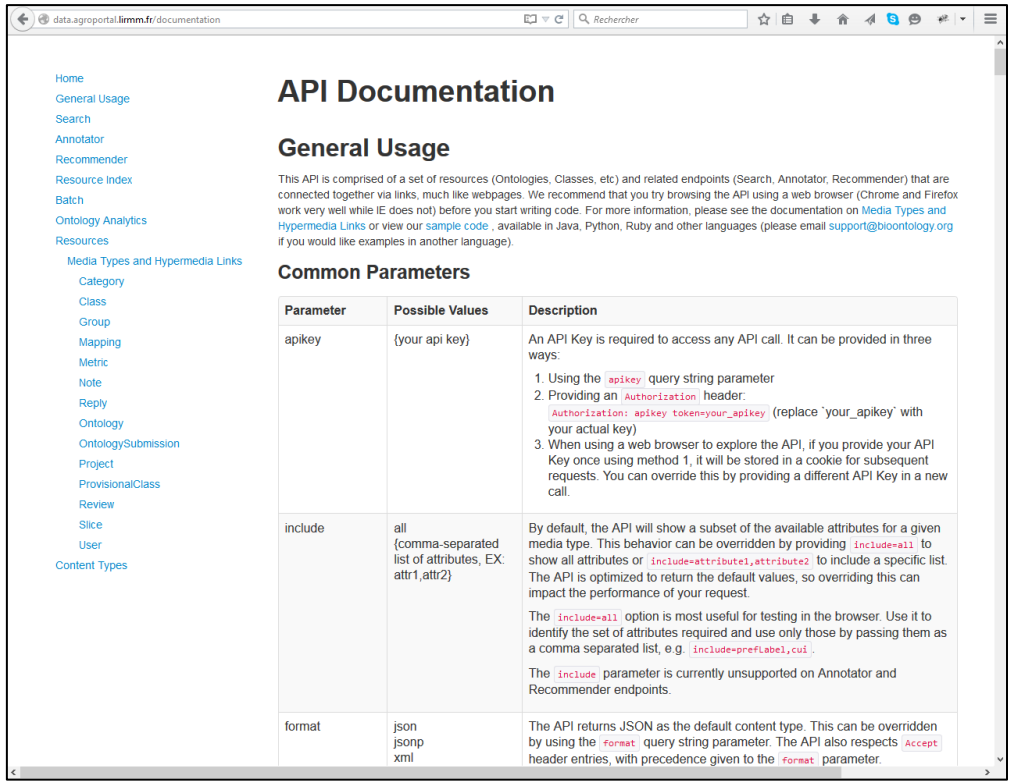
Always in-line with the OntoPortal technology but with many added features…

- Customization of group, categories, look-and-feel
- Change default language
- Slices fix, sync of group and slices
- New metadata model
- New metadata user interfaces (browse, summary, landscape)
- Annotator enhancements (French ConText, formats, scoring, etc.)
- NCBO Annotator+
- Internal/external mappings + multiple mapping properties

- User admin page
- Support instances
- FAIRness assessment O'FAIRe
- Repair notifications and subscriptions
- Better multilingual support
- Large file processing
- Enhanced SKOS support
- SSSOM mappings import
- Metadata edition in batch

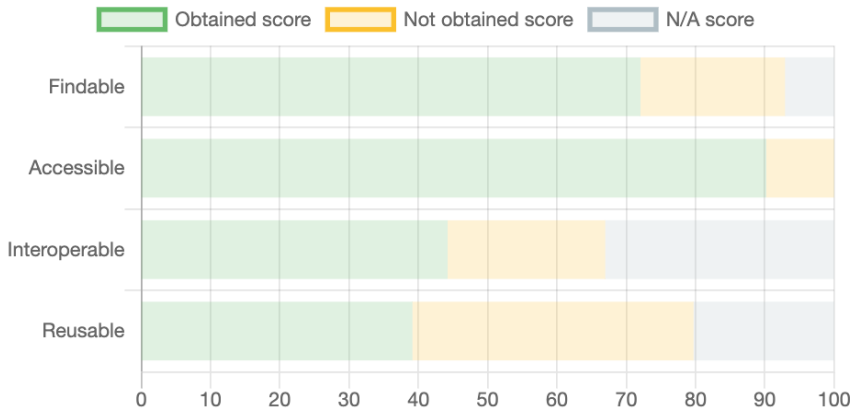
REST Service API:

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



SPARQL endpoint:

http://sparql.agroportal.lirmm.fr

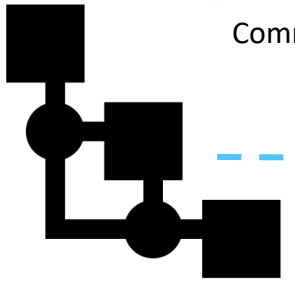


O'FAIRe: Ontology FAIRness Evaluator

in the AgroPortal semantic resource repository

Work with Emna Amdouni, Syphax Bouazzouni

Our objective: a **methodology** and a **tool** to automatically assess the level of FAIRness of a semantic resource



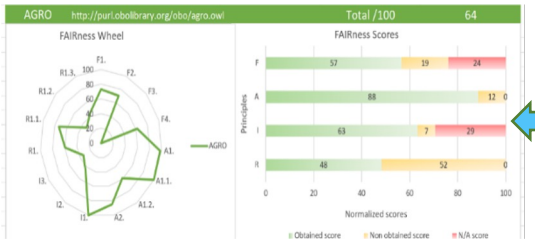
Ontologies

Commonn metadata model (MOD 1.4)

ID < … >
Auteurs < … >
Date < … >
License < … >
Type < … >
….

Metadata

Metadata curation



http://agroportal.lirmm.fr/

Background: 50 shades of FAIR!

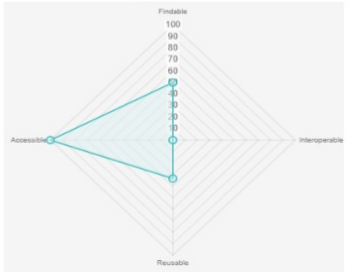
- Generic (any type of data): SHARC, FDMM, FAIR Metrics, FAIR-Aware, FAIRshake, FAIR dat, FAIR checker
- Specific to semantic resources
  - *H2020 FAIRsFAIR deliverable,*
  - *Poveda et al., (2 papers then FOOPS)*
  - *10 simple rules paper*
  - *DBPedia Archivo*
- Specific to semantic resources but pre-existing FAIR
  - *MIRO guidelines (Minimum Information for Reporting an Ontology)*
  - *MOD (Metadata for Ontology Description and Publication Ontology)*
  - *5-stars for vocabularies*

(a) FAIRdat

(c) FAIRshake

(d) FAIR-Aware

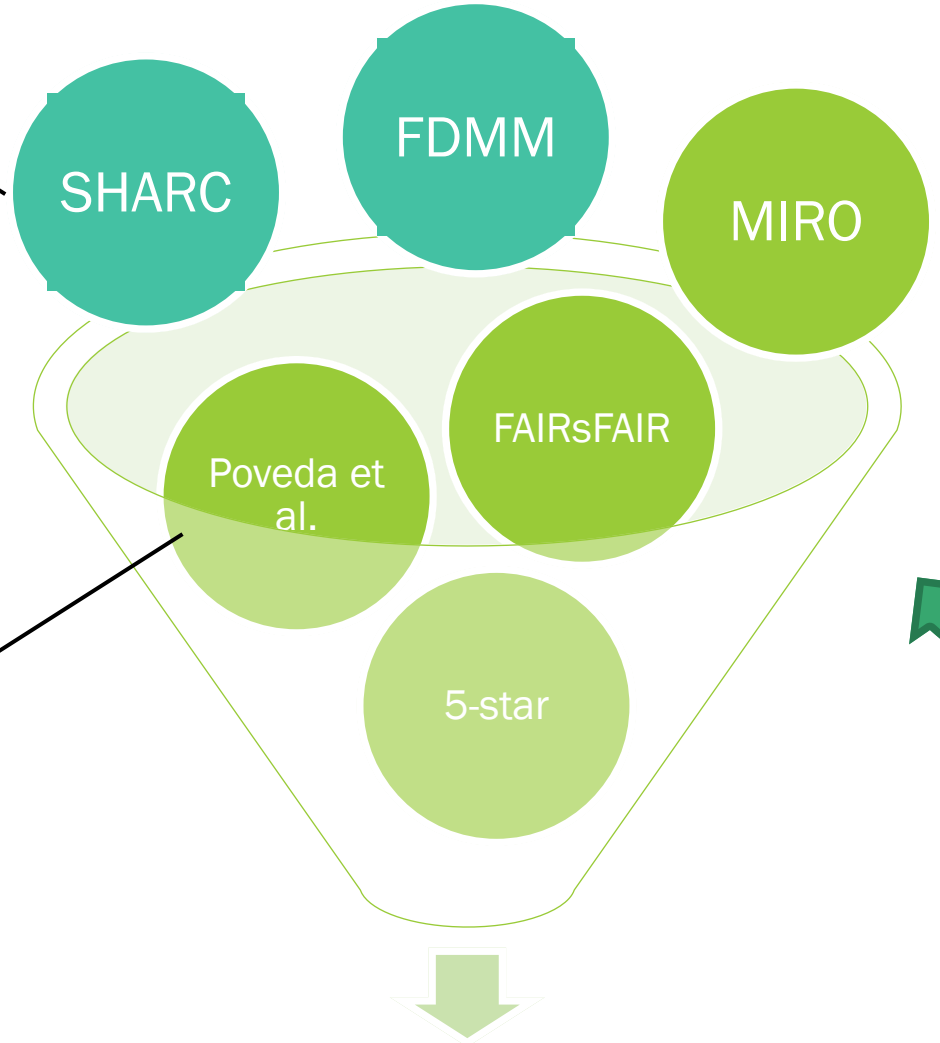
(e) FAIR checker



Recent work on FAIRness or alike…

- **[SHARC]** R. David et al., "Fairness literacy: The achilles' heel of applying fair principles," *Data Science Journal*, vol. 19, no. 1, pp. 1–11, Aug. 2020, doi: 10.5334/DSJ-2020-032.
- **[FDMM]** C. Bahim et al., "The FAIR data maturity model: An approach to harmonise FAIR assessments," *Data Science Journal*, vol. 19, no. 1, pp. 1–7, Oct. 2020, doi: 10.5334/DSJ-2020-041.
- **[5-star]** A. Hasnain and D. Rebholz-Schuhmann, "Assessing FAIR data principles against the 5-star open data principles," in *ESWC 2018 Satellite Events*, Jun. 2018, vol. 11155 LNCS, pp. 469–477. doi: 10.1007/978-3-319-98192-5_60.
- **[MIRO]** N. Matentzoglu, J. Malone, C. Mungall, and R. Stevens, "MIRO: guidelines for minimum information for the reporting of an ontology.," *J Biomed Semantics*, vol. 9, no. 1, p. 6, Jan. 2018, doi: 10.1186/s13326-017-0172-7.
- **[Povedal et al.]** D. Garijo and M. Poveda-Villalón, "Best Practices for Implementing FAIR Vocabularies and Ontologies on the Web," in *Applications and Practices in Ontology Design, Extraction, and Reasoning*,. IOS Press, 2020. doi: 10.3233/SSW200034. + M. Poveda-Villalón, P. Espinoza-Arias, D. Garijo, and O. Corcho, "Coming to Terms with FAIR Ontologies," in *22nd International Conference on Knowledge Engineering and Knowledge Management, EKAW'20*, Sep. 2020, vol. 12387 LNAI, pp. 255–270. doi: 10.1007/978-3-030-61244-3_18.
- **[FAIRsFAIR]** Y. le Franc, G. Coen, J. P. Essen, L. Bonino, H. Lehväslaiho, and C. Staiger, "D2.2 FAIR Semantics: First recommendations," Mar. 2020. doi: 10.5281/zenodo.3707985.
- **[10-simple-rule] (not used at the time)** S. J. D. Coxid, A. N. Gonzalez-Beltran, B. Magagna, and M.-C. Marinescu, "Ten simple rules for making a vocabulary FAIR," PLOS Comp. Biology, June 2021, doi: 10.1371/journal.pcbi.1009041.

Generic methodologies



Methodologies specific to ontologies

Integrated FAIRness assessment grid

Recent work on FAIRness or alike...

- [SHARC] R. David et al., "Fairness literacy: The achilles' heel of applying fair principles," *Data Science Journal*, vol. 19, no. 1, pp. 1–11, Aug. 2020, doi: 10.5334/DSJ-2020-032.
- [FDMM] C. Bahim et al., "The FAIR data maturity model: An approach to harmonise FAIR assessments," *Data Science Journal*, vol. 19, no. 1, pp. 1–7, Oct. 2020, doi: 10.5334/DSJ-2020-041.
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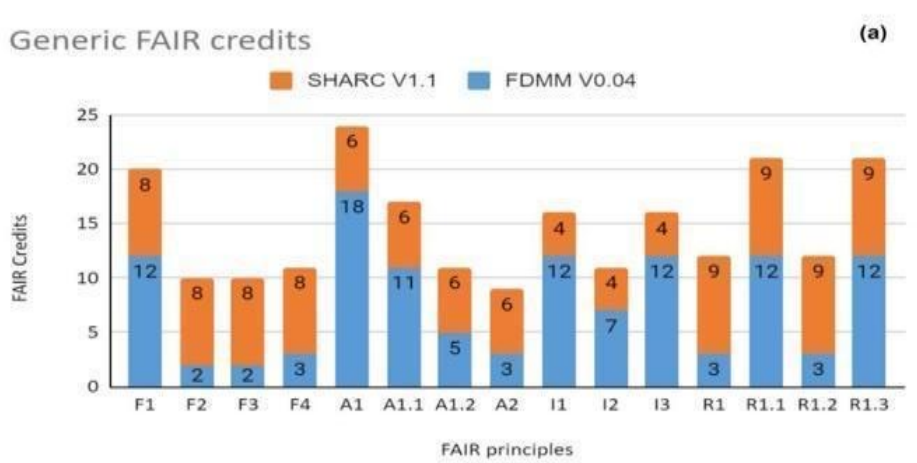
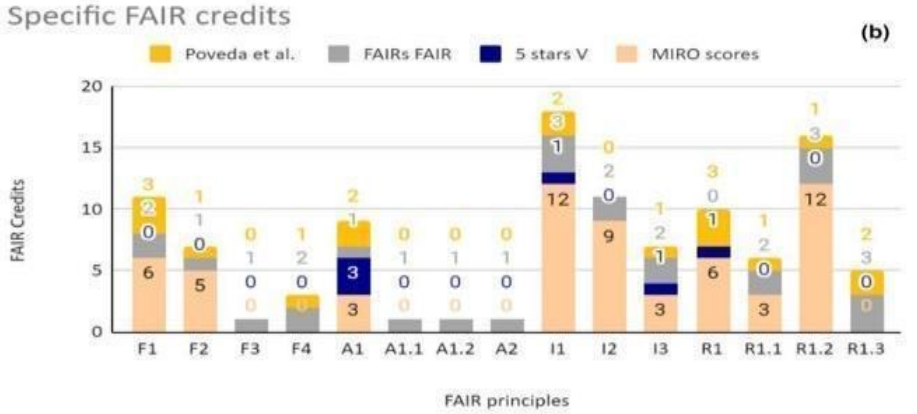
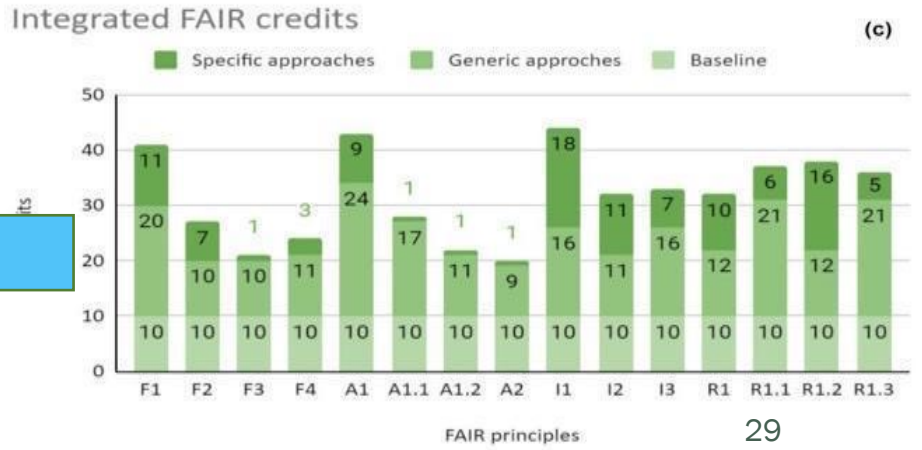
Requirement #1: a FAIRness assessment grid

- FAIR or FAIRer?
- Evaluate the importance of each principles in multiple approaches (generic & specific)
- Integrate them all in an “quantitative” grid







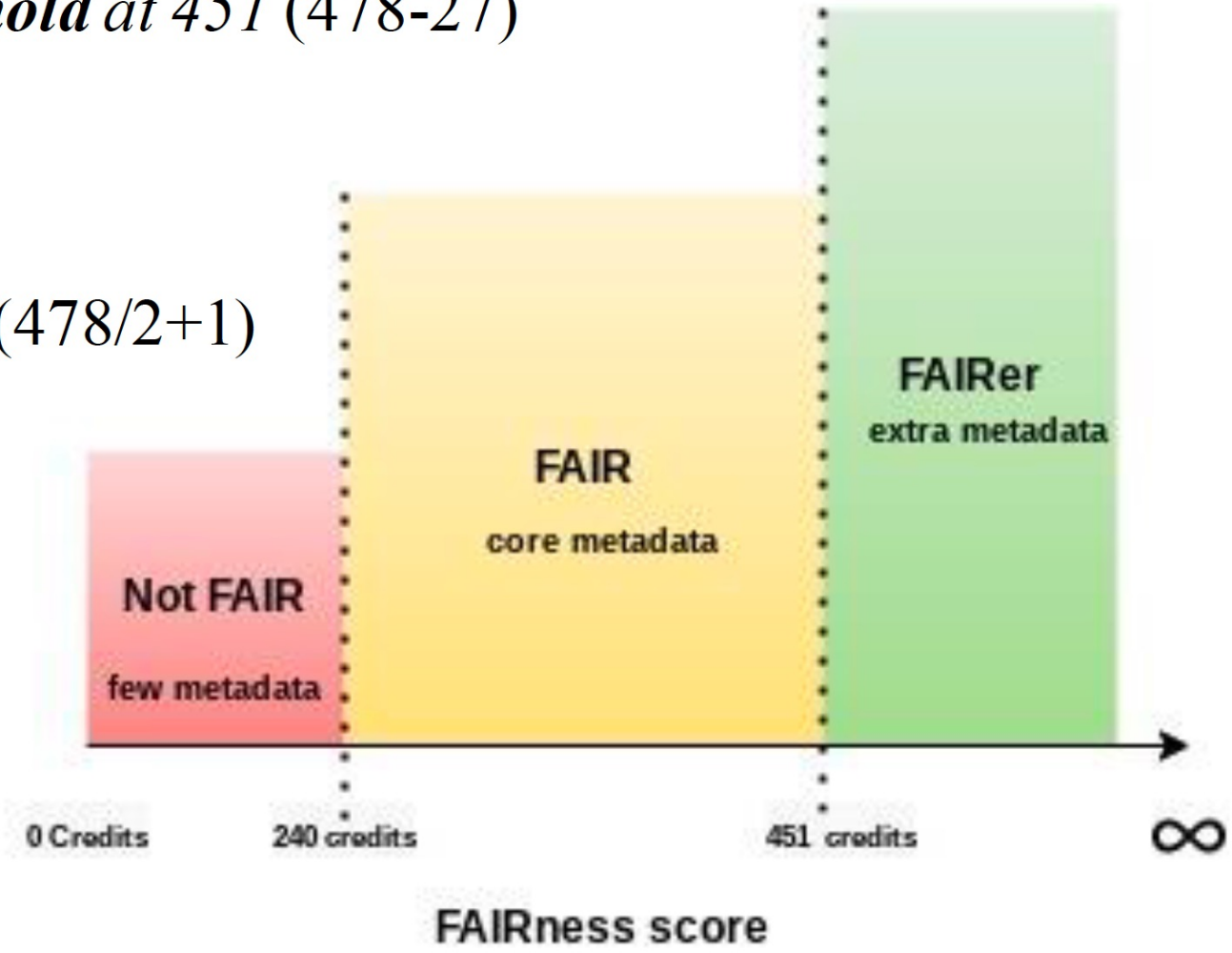
Integration

478 credits dispatched on 15 principles

FAIR or FAIRer?

Second threshold *at 451* (478-27)
Score=94%

First threshold *at 240* (478/2+1)
Score=50%



E. Amdouni, C. Jonquet. **FAIR or FAIRer? An integrated quantitative FAIRness assessment grid for semantic resources and ontologies**. *15th Int. Conf. on Metadata and Semantics Research (MTSR)*, Nov 2021, Madrid.

So much things to say about an ontology

Intrinsic

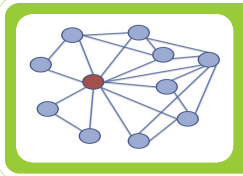
- names, acronym, language, ids, version, status, license, syntaxe, type, guidelines

People

- creator, contributor, publisher, contact, curator

Grouping

- domain, group



Relation

- imports, versions, views, related to, aligned to, used by, translation, generalization, specialization

Content

- key classes, dumps, partitions, example, changes

Community

- endorsments, reviews, notes, projects, analytics, support, audience

Date

- creation, modification, released, validation

Metrics

- classes,properties, individuals, depth, etc.

Provenance

- Source, generated by, invalidated by

Description

- documentation, abstract, reference, notes, methods, tools, logo, property used, homepage

Requirement #2: a projection of the FAIR Principles for semantic resources

- FAIR Principles are very generic and need to be “projected” for different kind of research objects (cf. FAIR-IMPACT Horizon EU project)
- 61 questions
  - *45 are dependent on the semantic resource*
  - *16 are independent of the ontology*
- 3 examples
  - F4 Q2. Is the ontology registered in multiple open ontology 'repositories'? **10 pts**
  - A2 Q2. Are the ontology metadata of each version available? **5 pts**
  - R1.1 Q1. Is the ontology license clearly specified, with an URI that is resolvable and supports content negotiation? **15 pts**

https://github.com/agroportal/fairness

$$FAIRScore\ (sr) = \sum_{j=1}^{n} FAIRSubPrincipleScore_{ij}(sr) = \sum_{k=1}^{m} QScore_{ijk}\ (sr)$$

Examples

F1 assessment questions (41 credits)	Identifiers
Q1. Does the ontology have a "local" identifier, i.e., a glol unique and potentially permanent identifier assigned by th developer (or developing organization)? **9 pts**	
Q2. Does the ontology provide an additional "ex identifier, i.e., a guarantee globally unique and p identifier assigned by an accredited body? If yes identifier a DOI? **11 pts**	
Q3. Are the ontology metadata clearly identifiec same identifier as the ontology (if included in th or with its own globally unique and persistent id	
Q4. Does the ontology provide a version-specifi this URI resolvable? **9 pts**	
Related recommendations: (i) FAIRsFAIR: P- (ii) Poveda el al.: Rec 1, 2, and 3.	

F4 assessment questions (24 credits)	Repository
Q1. Is the ontology registered in multiple ontology 'libraries'? **6 pts**	
Q2. Is the ontology registered in multiple open ontology 'repositories'? **10 pts**	
Q3. Are the ontology 'libraries' or 'repositories' properly indexed by Web search engines? **8 pts**	

nd 6

A1.1 assessment questions (28 credits)	Protocol
Q1. Is the ontology relying on HTTP/URIs for its identification and access me	
Q2. Is the ont implementabl	
Q3. If the ont another proto implementabl	
Related reco	

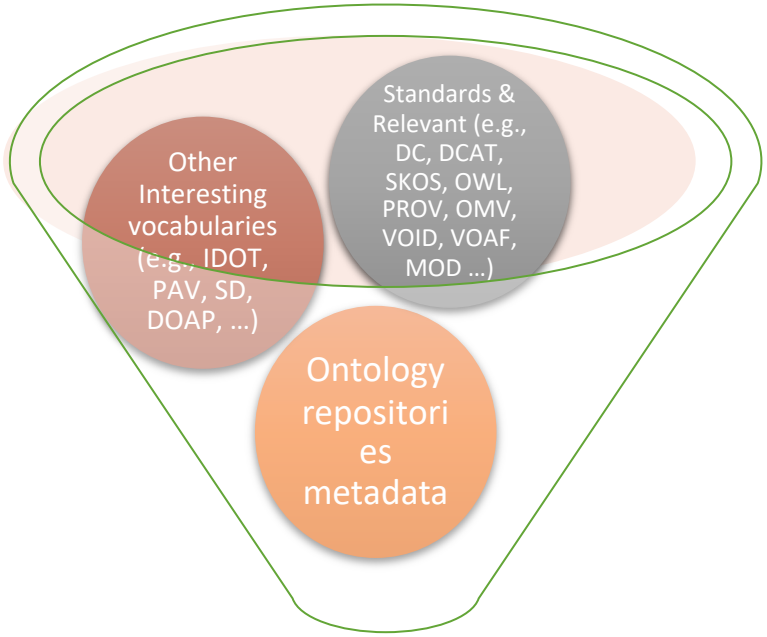
R1.1 questions (37 credits)	Licensing & rights
Q1. Is the ontology license clearly specified, with an URI that is resolvable and supports content negotiation? **15 pts**	
Q2. Are the ontology access rights specified and permissions documented? **7 pts**	
Q3. Are the ontology usage guidelines and copyright holder documented? **15 pts**	
Related recommendations: (i) FAIRsFAIR P-Rec 3 and 16 (ii) Poveda et al. Rec 6.	

Let’s see the list of 61 questions

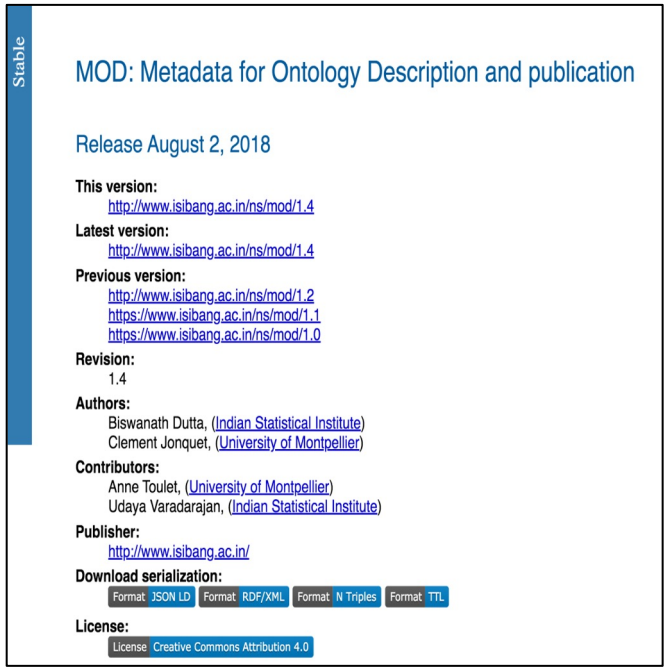
- https://github.com/agroportal/fairness/blob/master/doc/results/FAIR-questions.md

- E. Amdouni, S. Bouazzouni, C. Jonquet, **O'FAIRe makes you an offer: Metadata-based Automatic FAIRness Assessment for Ontologies and Semantic Resources**, Int. J. of Metadata, Semantics and Ontologies, Inderscience, 2022, TO BE PUBLISHED. https://hal.archives-ouvertes.fr/lirmm-03630233

Requirement #3: a unified way to describe semantic resources (metadata)



- MOD1.4 = a set of identified properties (127) one can use to describe a semantic resource
- In O'FAIRe
  - *57 MOD properties are "core" metadata properties allowing 276/478 credits*
  - *70 MOD properties are "extra" metadata properties for a FAIRer level*


Stable

MOD: Metadata for Ontology Description and publication

Release August 2, 2018

This version:
http://www.isibang.ac.in/ns/mod/1.4
Latest version:
http://www.isibang.ac.in/ns/mod/1.4
Previous version:
http://www.isibang.ac.in/ns/mod/1.2
https://www.isibang.ac.in/ns/mod/1.1
https://www.isibang.ac.in/ns/mod/1.0
Revision:
1.4
Authors:
Biswanath Dutta, (Indian Statistical Institute)
Clement Jonquet, (University of Montpellier)
Contributors:
Anne Toulet, (University of Montpellier)
Udaya Varadarajan, (Indian Statistical Institute)
Publisher:
http://www.isibang.ac.in/
Download serialization:
Format JSON LD Format RDF/XML Format N Triples Format TTL
License:
License Creative Commons Attribution 4.0

346 relevant properties that could be used to describe ontologies

127 used to build a new metadata model inside AgroPortal and available in MOD1.4

Dutta, B., Toulet, A., Emonet, V. and Jonquet, C. (2017). New Generation Metadata vocabulary Description and Publication. In E. Garoufallou, S. Virkus, R. Siatri and D. Koutso Communications in Computer and Information Science (CCIS) 755, proceedings of 11th M Semantics Research Conference (MTSR 2017), November 28 – December 1, 2017, Talli Springer Nature, pp. 173-185.

MOD 1.4 (August, 2018)

(https://www.isibang.ac.in/ns/mod/index.html)

Stable

MOD: Metadata for Ontology Description and publication

Release August 2, 2018

This version:
http://www.isibang.ac.in/ns/mod/1.4

Latest version:
http://www.isibang.ac.in/ns/mod/1.4

Previous version:
http://www.isibang.ac.in/ns/mod/1.2
https://www.isibang.ac.in/ns/mod/1.1
https://www.isibang.ac.in/ns/mod/1.0

Revision:
1.4

Authors:
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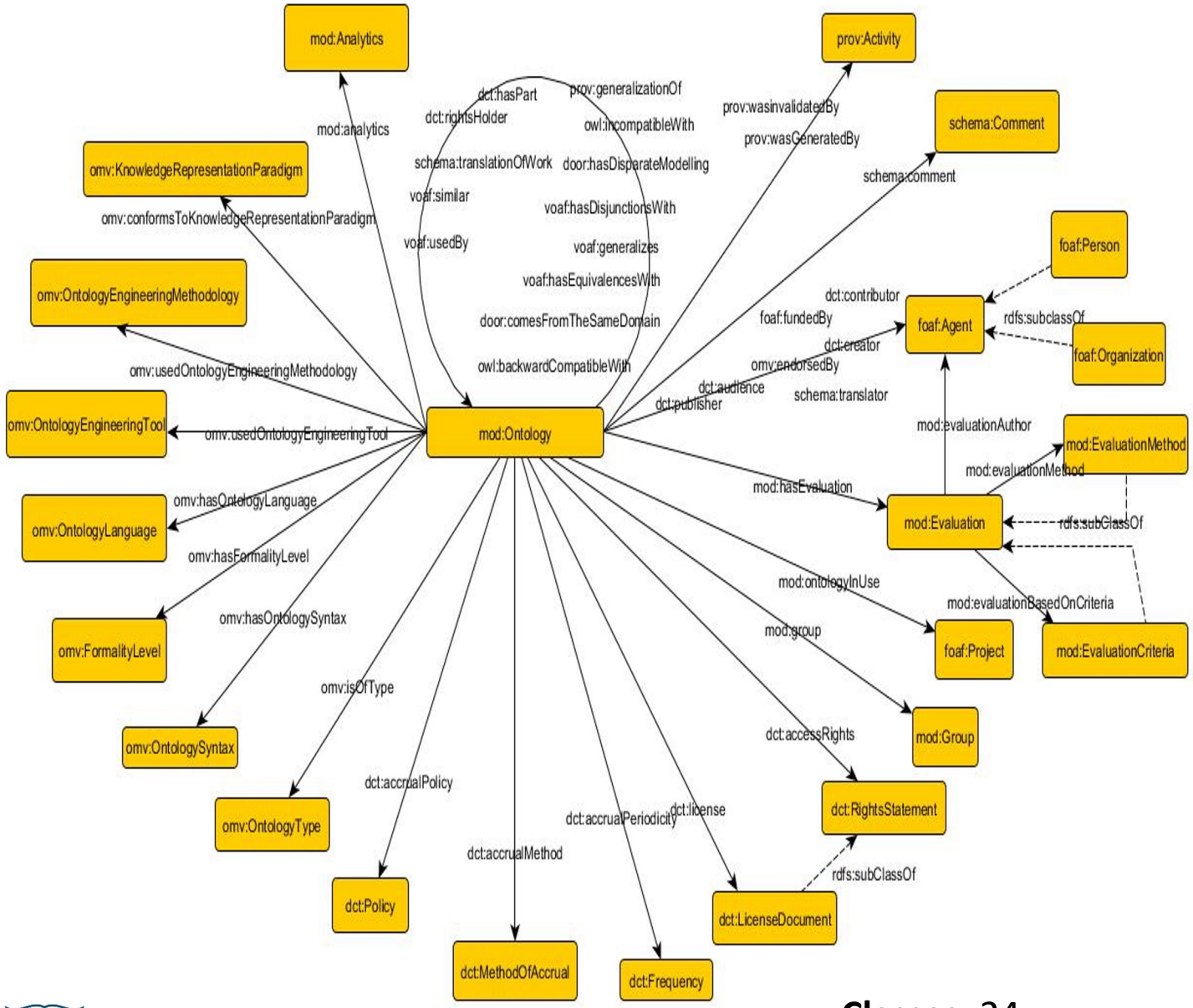


Classes: 24
Object property: 44
Data property: 96

There are many many metadata vocabularies to describe your ontology…

Name Space	Name
rdfs	RDF Schema
owl	OWL 2 Web Ontology Language
skos	Simple Knowledge Organization System
dc	Dublin Core Metadata Element Set
dct	Dublin Core Terms
omv	Ontology Metadata Vocabulary
mod	Metadata for Ontology Description and Publication
door	Descriptive Ontology of Ontology Relations
voaf	Vocabulary of a Friend
void	Vocabulary of Interlinked Datasets
idot	Identifiers.org
vann	Vocabulary for annotating vocabulary descriptions
dcat	Data Catalog Vocabulary
adms	Asset Description Metadata Schema
schema	Schema.org
foaf	Friend of a Friend Vocabulary
doap	Description of a Project
cc	Creative Commons Rights Expression Language
prov	Provenance Ontology
pav	Provenance, Authoring and Versioning
oboInOwl	OboInOwl Mappings

One exemple: Semanticscience Integrated Ontology (SIO)

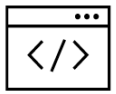
<rdf:Description rdf:about="http://semanticscience.org/ontology/sio.owl">
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#Ontology"/>
<vann:preferredNamespacePrefix xml:lang="en">sio</vann:preferredNamespacePrefix>
<dct:license rdf:resource="http://creativecommons.org/licenses/by/4.0/"/>
<cito:citesAsAuthority
rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI">http://www.jbiomedsem.com/content/5/1/14</cito:citesAsAuthority>
<owl:versionInfo rdf:datatype="http://www.w3.org/2001/XMLSchema#string">1.29.0</owl:versionInfo>
<dct:description xml:lang="en">The semanticscience integrated ontology (SIO) provides a simple (...). website: http://semanticscience.orgemail: sio-ontology@googlegroups.commailing list: http://groups.google.com/group/sio-ontology</dct:description>
<dct:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2010-03-29</dct:issued>
<dc:creator xml:lang="en">Michel Dumontier</dc:creator>
<vann:preferredNamespaceUri
rdf:datatype="http://www.w3.org/2001/XMLSchema#string">http://semanticscience.org/resource/</vann:preferredNamespaceUri>
<schema:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">general class inclusion axioms:'is part of' some 'physical entity' subClassOf 'is located in' some 'physical entity'role chains:'has capability' o 'is realized in' -> 'is participant in'</schema:comment>
<dc:contributor rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Contributors are those that engage in discussions in the context of SIO (in alphabetical order):christopher baker, joachim baran, (...) </dc:contributor>
<rdfs:seeAlso rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI">http://sio.semanticscience.org</rdfs:seeAlso>
<dct:rights rdf:datatype="http://www.w3.org/2001/XMLSchema#string">free to use,share,modify. modify with attribution [http://creativecommons.org/licenses/by/4.0/].</dct:rights>
<protege:defaultLanguage> en</protege:defaultLanguage>
<dct:creator rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI">http://orcid.org/0000-0003-4727-9455</dct:creator>
<dct:title xml:lang="en">Semanticscience Integrated Ontology (SIO)</dct:title>
<dc:identifier> sio.owl</dc:identifier>
<rdfs:isDefinedBy rdf:resource="http://semanticscience.org/ontology/sio.owl"/>
<owl:versionIRI rdf:resource="http://semanticscience.org/ontology/sio/v1.29.0/sio-release.owl"/>
<dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2016-05-18</dct:modified>
</rdf:Description>

O'FAIRe is 80% resource metadata-based

« Findable »

- PID

owl:ontologyIRI, dct:identifier, owl:versionIRI



- Rich metadata

omv:acronym, dct:title, dct:alternative, skos:hiddenLabel, dct:description, foaf:page, omv:resourceLocator, omv:keywords …

- Metadata with PID

N/A

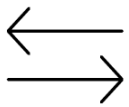
- Searchable resource

schema:includedInDataCatalog

« Accessible »

- Standardised protocol

owl:ontologyIRI, dct: identifier, sd:endpoint



- Free and open protocol

N/A

- Authentification

Schema:includedInDataCatalog

- Long term metadata access

omv:status, owl:deprecated

O'FAIRe is 80% resource metadata-based

« **Interoperable** »

- Vocabularies

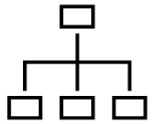
Omv:hasOntologyLanguage, omv:hasFormalityLevel, omv:hasOntologySyntax, dct:hasFormat, dct:isFormatOf

- FAIR vocabularies

F-A-I-R

owl:imports, voaf:hasEquivalenceWith, owl:priorVersion, voaf:similar, voaf:metadataVoc, dct:relation, dct:isPartOf, voaf:specializes, schema:translationOfWork,voaf:generalizes

« **Reusable** »



- Métadonnées avec attributs

mod:prefLabelProperty, mod:synonymProperty, mod:definitionProperty, mod:authorProperty, bpm:obsoleteProperty, mod:hierarchyProperty, mod:obsoleteParent, mod:maxDepth, mod:maxChildCount, mod:averageChildCount, mod:classesWithOneChild, mod:classesWithNoDefinition

- License

dct:license, dct:rightsHolder, dct:accessRights, cc:morePermissions, cc:useGuidelines

- Provenance

dct:source, prov:wasGeneratedBy, prov:wasInvalidatedBy, dct:accuralMethod, dct:accrualPeriodicity, dct:accrualPolicy, omv:versionInfo, vann:changes, dct:hasVersion, omv:usedOntologyEngineeringTool, omv:usedOntologyEngineeringMethodology, omv:conformsToKnowledgeRepresentationParadigm, omv:designedForOntologyTask, mod:competencyQuestion, dct:fundedBy

- Standards de la communauté

mod:ontologyInUse, omv:endorsedBy, mod:group, dct:accessRights

Requirement #4: a harmonized and curated environment for ontology descriptions

- AgroPortal offers a unified metadata model for every hosted semantic resources
- Metadata is curated

Springer Link

Original Article | Open Access | Published: 29 August 2018

Harnessing the Power of Unified Metadata in an Ontology Repository: The Case of AgroPortal

Clement Jonquet, Anne Toulet, Biswanath Dutta & Vincent Emonet

Journal on Data Semantics **7**, 191–221 (2018) | Cite this article

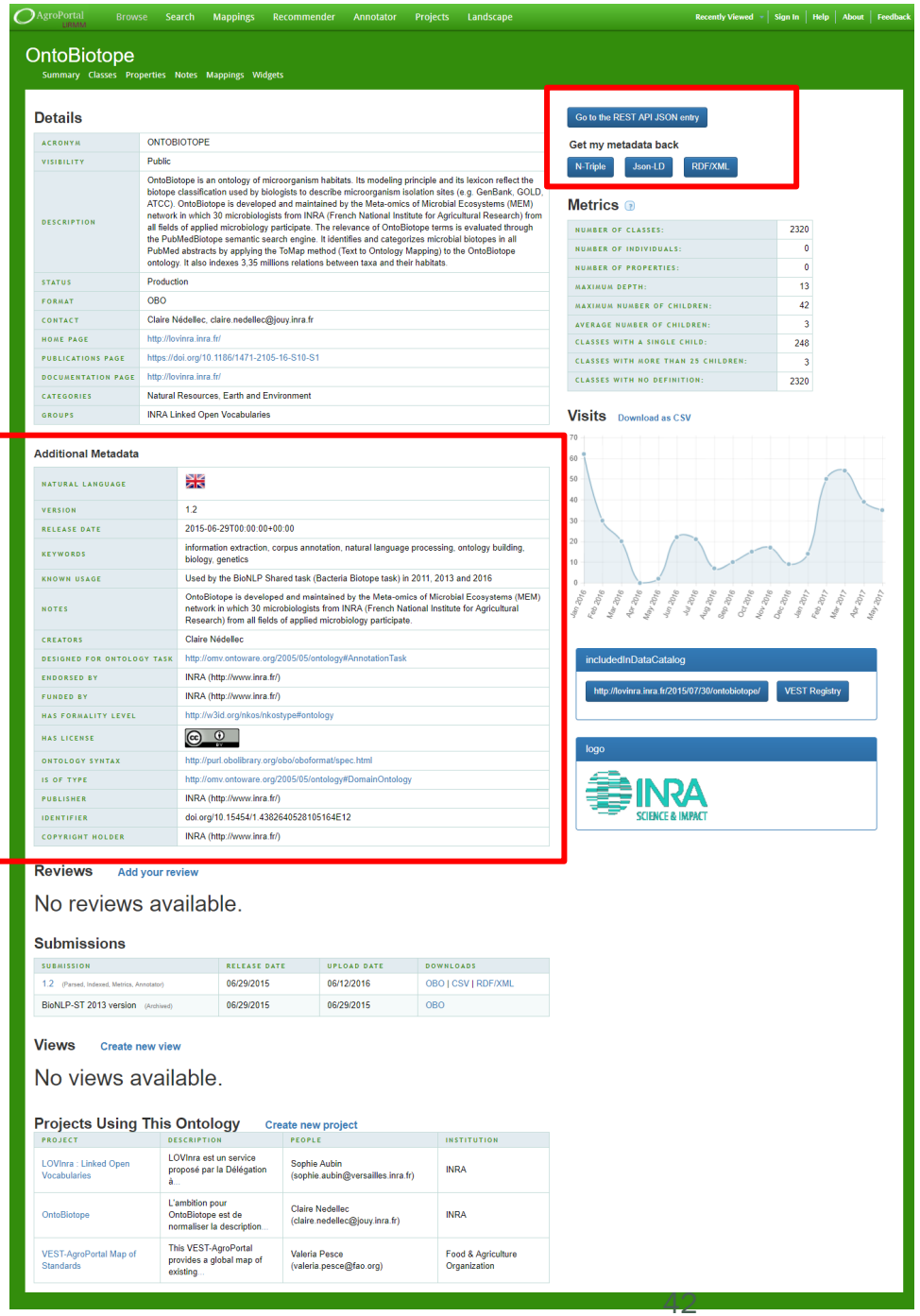
3635 Accesses | **6** Citations | **4** Altmetric | Metrics

Abstract

As any resources, ontologies, thesaurus, vocabularies and terminologies need to be described with relevant metadata to facilitate their identification, selection and reuse. For ontologies to be FAIR, there is a need for metadata authoring guidelines and for harmonization of existing metadata vocabularies—taken independently none of them can completely describe an ontology. Ontology libraries and repositories also have to play an important role. Indeed, some metadata properties are intrinsic to the ontology (name, license, description); other information, such as community feedbacks or relations to other ontologies are typically information that an ontology library shall capture, populate and consolidate to facilitate the processes of identifying and selecting the right ontology(ies) to use. We have studied ontology metadata practices by: (1) analyzing metadata annotations of 805 ontologies; (2) reviewing the most standard and relevant vocabularies (23 totals) currently available to describe metadata for ontologies (such as Dublin Core, Ontology Metadata Vocabulary, VoID, etc.);
(3) comparing different metadata implementation in multiple ontology libraries or repositories. We have then built a new metadata model for our AgroPortal vocabulary and

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



AgroPortal Browse Search Mappings Recommender Annotator Projects Landscape Login Support

Agronomy Ontology

Last uploaded: November 5, 2021

Summary | Classes | Properties | Instances | Notes | Mappings | Widgets

Details

Acronym	AGRO
Visibility	Public
Description	AgrO is an ontlogy for representing agronomic practices, techniques, variables and related entities
Status	Alpha
Format	OWL
Contact	Céline Aubert, c.aubert@cgiar.org Marie-Angélique Laporte, m.a.laporte@cgiar.org
Categories	Agricultural Research, Technology and Engineering, Natural Resources, Earth and Environment
Groups	OBO Foundry, Rice Data Interoperability working group

Additional Metadata

URI	http://purl.obolibrary.org/obo/agro.owl
Abstract	An ontology is a formal representation of a disciplinary domain, representing a semantic standard that can be employed to annotate data where ke are defined, as well as the relationships that exist between those concepts (Gruber, 2009). Ontologies provide a common language for different k to be easily interpretable and interoperable allowing easier aggregation and analysis. The Agronomy Ontology (AgrO) provides terms from the agr domain that are semantically organized and can facilitate the collection, storage and use of agronomic data, enabling easy interpretation and reus data by humans and machines alike. To fully understand the implications of varying practices within cropping systems and derive insights, it is oft necessary to pull together information from data in different disciplinary domains. For example, data on field management, soil, weather and crop may need to be aggregated to assess performance of particular crop under different management interventions. However, agronomic data are oft collected, described, and stored in inconsistent ways, impeding data comparison, mining, interpretation reuse. The use of standards for metadata annotation play a key role in addressing these challenges. While the CG Core Metadata Schema provides a metadata standard to describe agricul datasets, the Agronomy Ontology enables the description of agronomic data variables using standard terms.
Accrual Method	Summit new terms submissions on GitHub issue tracker.
Bug Database	https://github.com/AgriculturalSemantics/agro/issues
Conforms To Knowledge Representation Paradigm	Used BFO as a foundational ontology.
Copyright Holder	CGIAR (http://www.cgiar.org/)
Curated By	Céline Aubert (CGIAR)
Deprecated	false
Endorsed By	CGIAR (http://www.cgiar.org/)
Endpoint	SPARQL
Example Of Use	local:AgrO
Example Identifier	http://purl.obolibrary.org/obo/AGRO_00000002
Funded By	CGIAR (http://www.cgiar.org/)
Contributors	Marié-Angélique Laporte, Céline Aubert, Pier Luigi Buttigieg

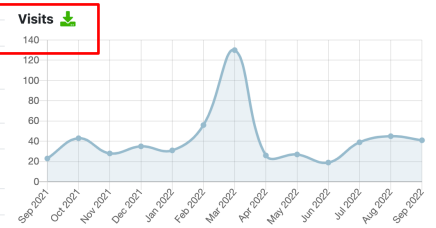
Creators	Marié-Angélique Laporte, Céline Aubert, Elizabeth Arnaud, Medha Devare
Has Domain	http://data.agroportal.lirmm.fr/categories/NATRES, http://data.bioontology.org/categories/TECH
Has Formality Level	http://w3id.org/nkos/nkostype#ontology
Has License	CC BY
Ontology Syntax	http://www.w3.org/ns/formats/RDF_XML
Has Prior Version	AGRO/submissions/7
Identifier	http://purl.obolibrary.org/obo/agro-edit.owl
Is Backward Compatible With	BFO
Is Of Type	http://omv.ontoware.org/2005/05/ontology#DomainOntology
Key Classes	http://purl.obolibrary.org/obo/AGRO_01000000, http://purl.obolibrary.org/obo/AGRO_01000000
Keywords	agricultural experiment, agricultural processes, agricultural implement, fertilizers
Known Usage	AgrO is an ontlogy for representing agronomic practices, techniques, variables and related entities.
Mailing List	local:agronomyOntology@googlegroups.com
Metadata Vocabulary Used	http://xmlns.com/foaf/0.1/, http://www.w3.org/2000/01/rdf-schema#, http://www.geneontology.org/formats/oboInOwl#, http://purl.org/dc/elements/1.1/, http://www.w3.org/2002/07/owl#, http://www.w3.org/2003/11/swrl#
Natural Language	en
Notes	The Agronomy Ontology by CGIAR is licensed under CC BY 4.0 (https://creativecommons.org/licenses/by/4.0/).
Ontology Related To	GO, ENVO, https://bioportal.bioontology.org/ontologies/CHEBI, NCBITAXON, PATO, https://bioportal.bioontology.org/ontologies/UO, https://bioportal.bioontology.org/ontologies/OGMS, RO, TO, PO, https://bioportal.bioontology.org/ontologies/IAO, https://bioportal.bioontology.org/ontologies/OBI, PECO
Preferred Namespace Prefix	agro
Publisher	CGIAR (http://www.cgiar.org/)
Release Date	2021-11-05T00:00:00+00:00
Repository	https://github.com/AgriculturalSemantics/agro
URI Lookup Endpoint	http://data.agroportal.lirmm.fr/search?ontologies=AGRO&require_exact_match=true&q=
URI Regex Pattern	http://purl.obolibrary.org/obo/AGRO_
Use Imports	local:local
Used Ontology Engineering Methodology	Follow the OBO Principle, used Protégé and the Ontology Development Kit.
Used Ontology Engineering Tool	http://protege.stanford.edu
Version	1.0
Version IRI	http://purl.obolibrary.org/obo/agro/releases/2018-05-14/agro.owl

Submissions

Version	Released	Modified	Uploaded	Downloads
1.0 (Parsed, Indexed, Metrics, Annotator)	11/05/2021		11/05/2021	OWL | CSV | RDF/XML | DIFF
1.0 (Archived)	07/01/2021		07/01/2021	OWL | DIFF
1.0 (Archived)	06/30/2021		06/30/2021	OWL | DIFF
1.0 (Archived)	04/04/2020		04/04/2020	OWL | DIFF
1.0 (Archived)	05/14/2018		12/13/2018	OWL | DIFF

More

Visits



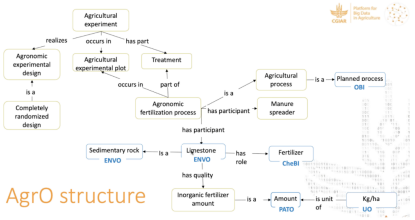
includedInDataCatalog

https://fairsharing.org/bsg-s000733 | The OBO Foundry | Ontobee | BioPortal | EBI Ontology Lookup | AberOWL

Logo

Agro the Agronomy Ontology

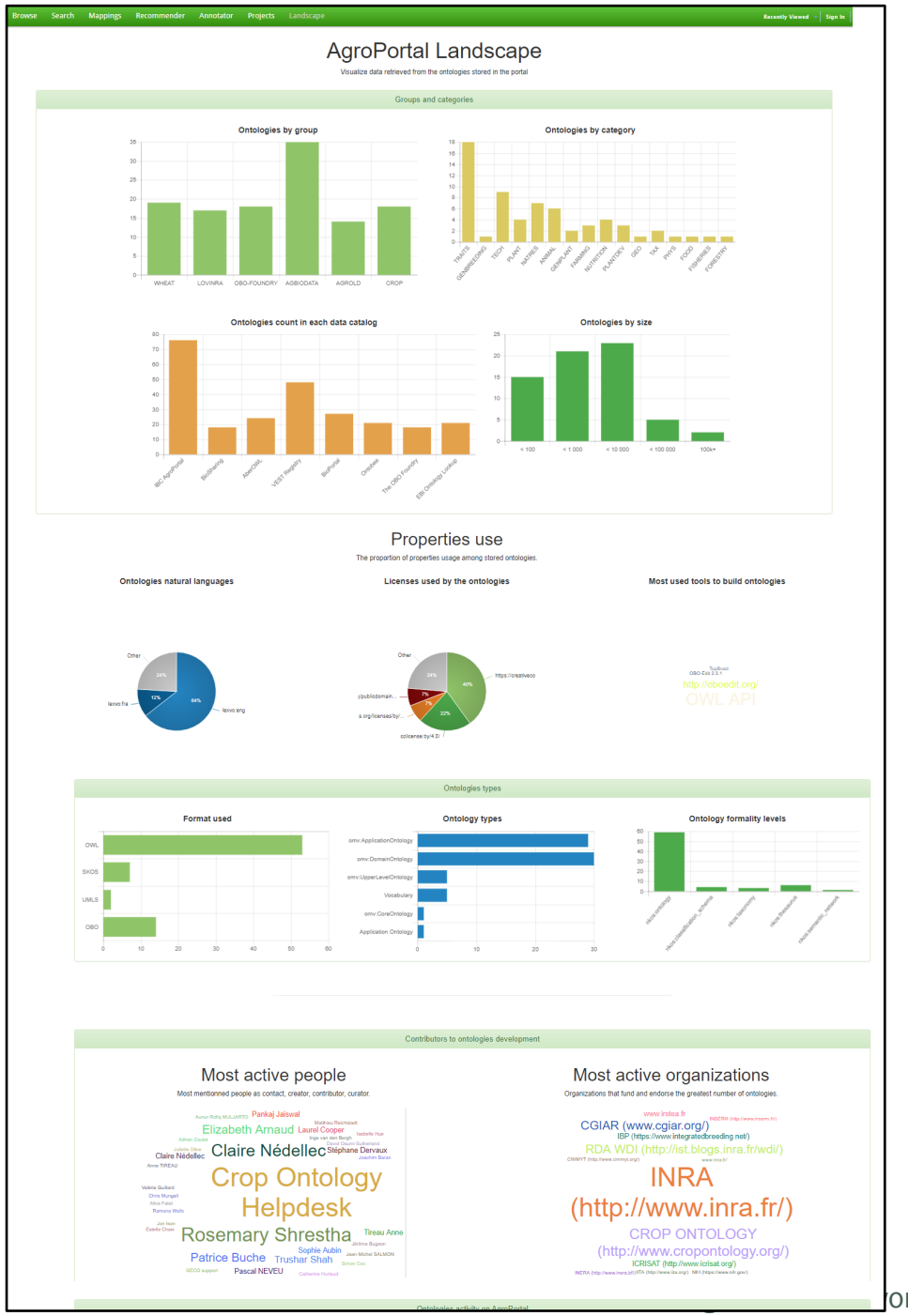
Depiction



Projects using AGRO

- Agricultural Model Intercomparison and Improvement Project
- Agrisemantics Map of Data Standards
- Agronomy Field Information Management System
- Collaborative Open Plant Omics
- Data to Knowledge in Agronomy and Biodiversity

AgroPortal landscape page



- Display “per property”
  - *Global presentation of the properties*
  - *Synthesis diagrams & listing*

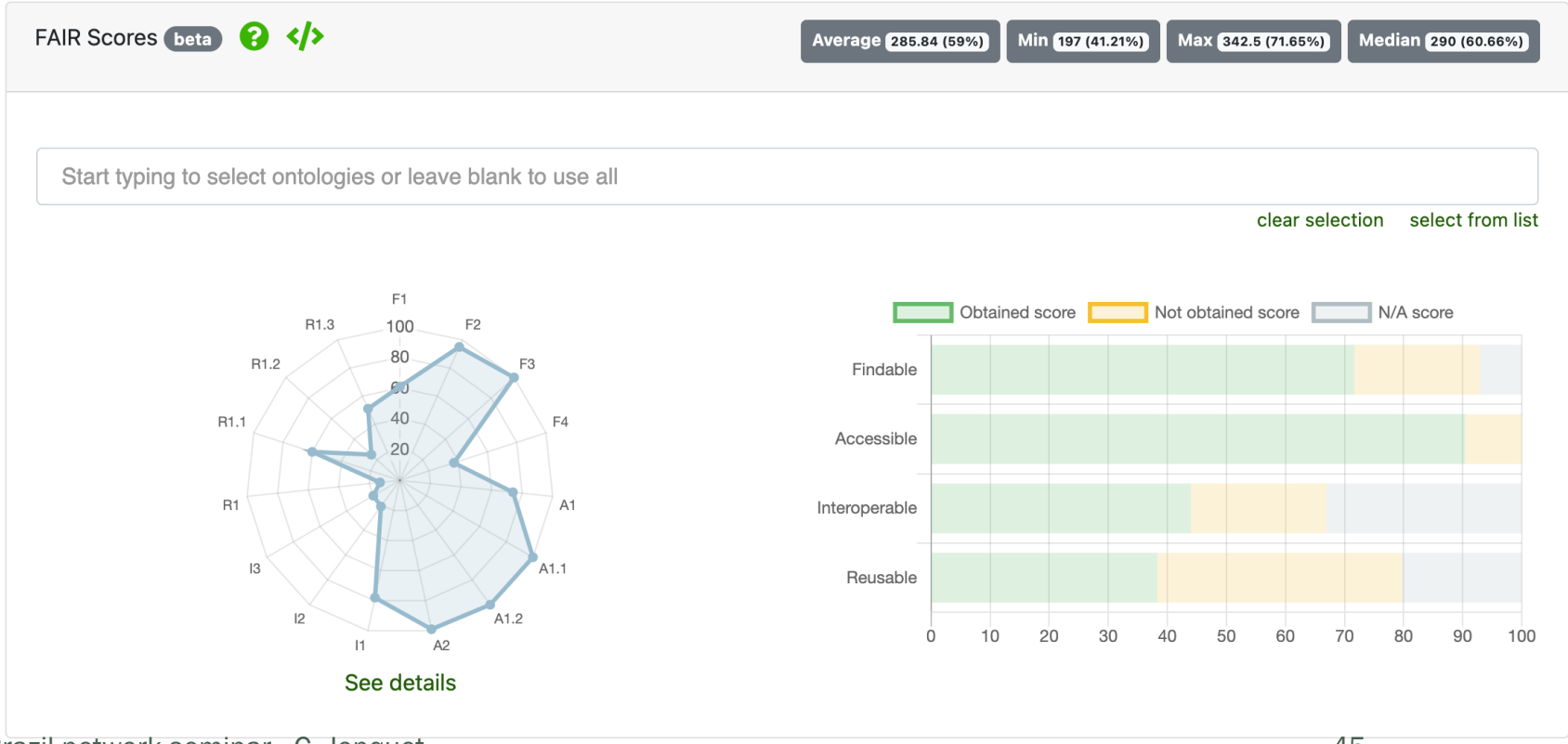
- Allows to explore the agronomical ontology landscape by automatically aggregating the metadata fields of each ontologies in explicit visualizations (charts, term cloud and graphs).

Clement Jonquet, Anne Toulet, Biswanath Dutta, Vincent Emonet. **Harnessing the power of unified metadata in an ontology repository: the case of AgroPortal**. *Journal on Data Semantics*, Springer, 2018, pp.1-31.

O'FAIRe: *Ontology FAIRness Evaluator*

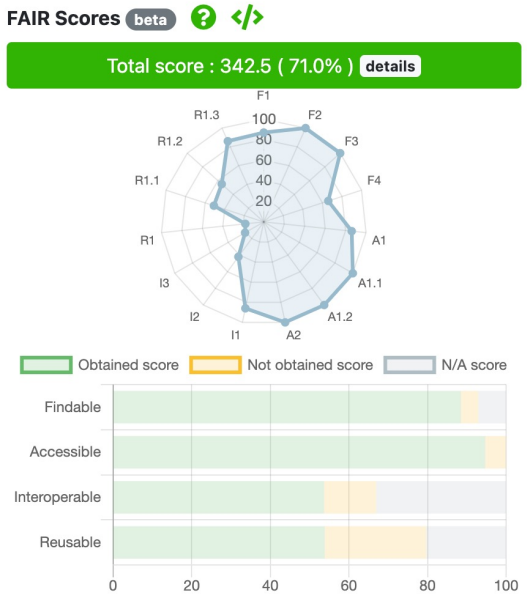
- A methodology
  - *Which uses as much as possible assigned metadata values to answer a series of questions, specialized for semantic resources*

- A tool
  - *A web service working with any OntoPortal installations respecting the MOD1.4 metadata profile to harmonize metadata*

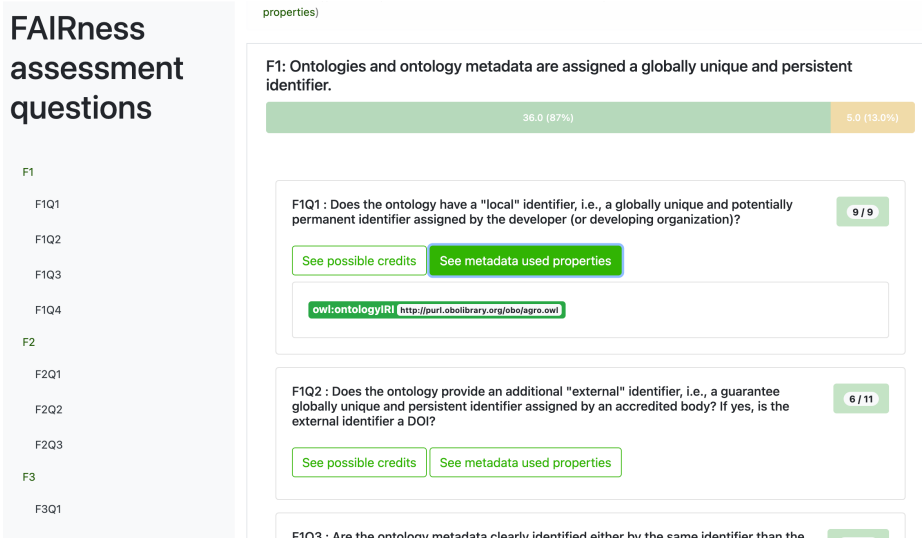


O'FAIRe in AgroPortal: Demo

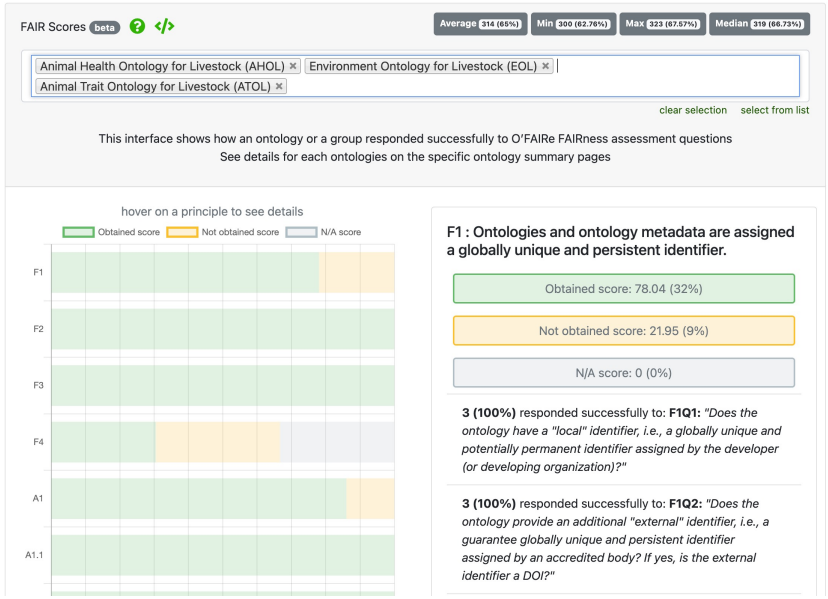
Get the FAIRness score of a given ontology



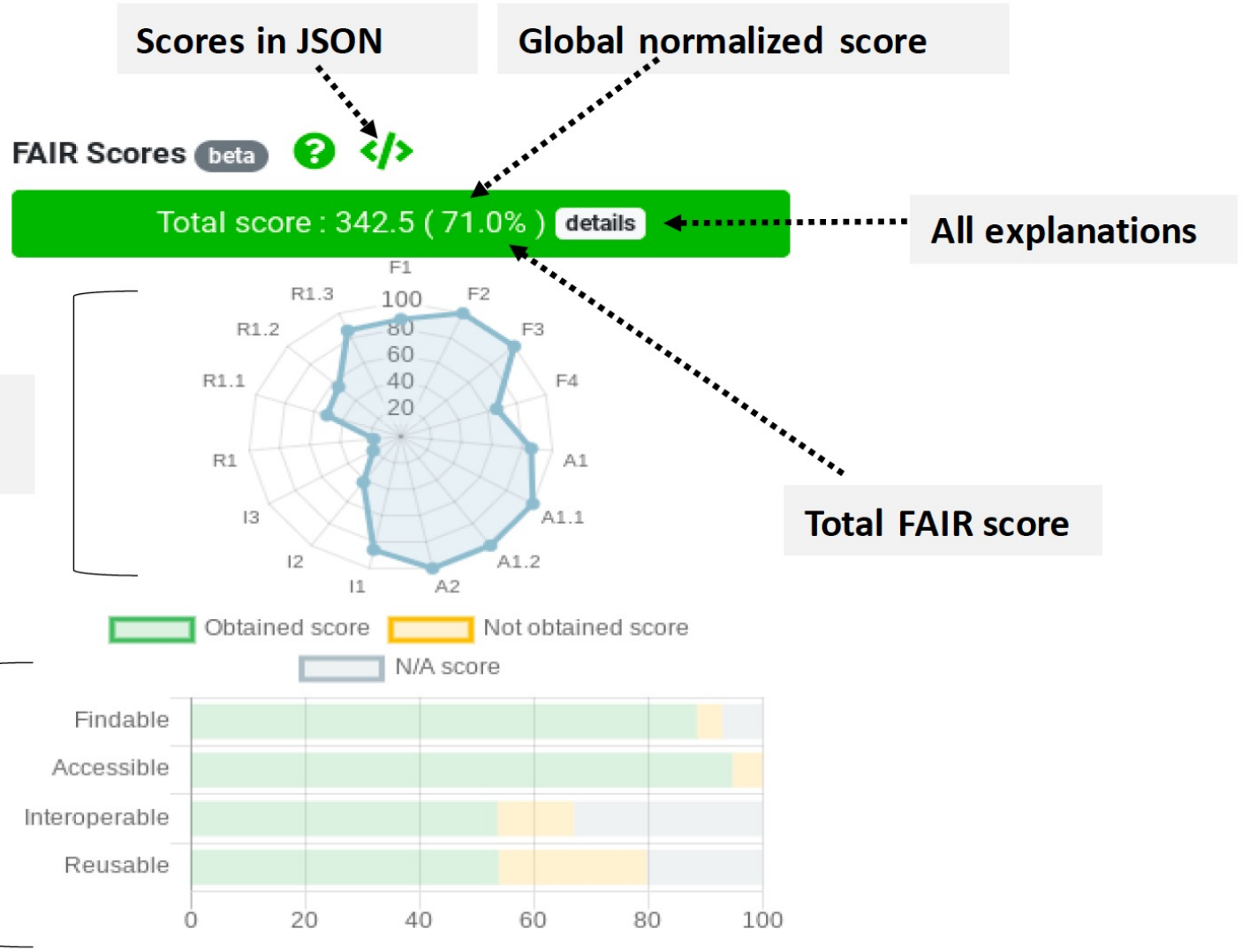
Get the explanations



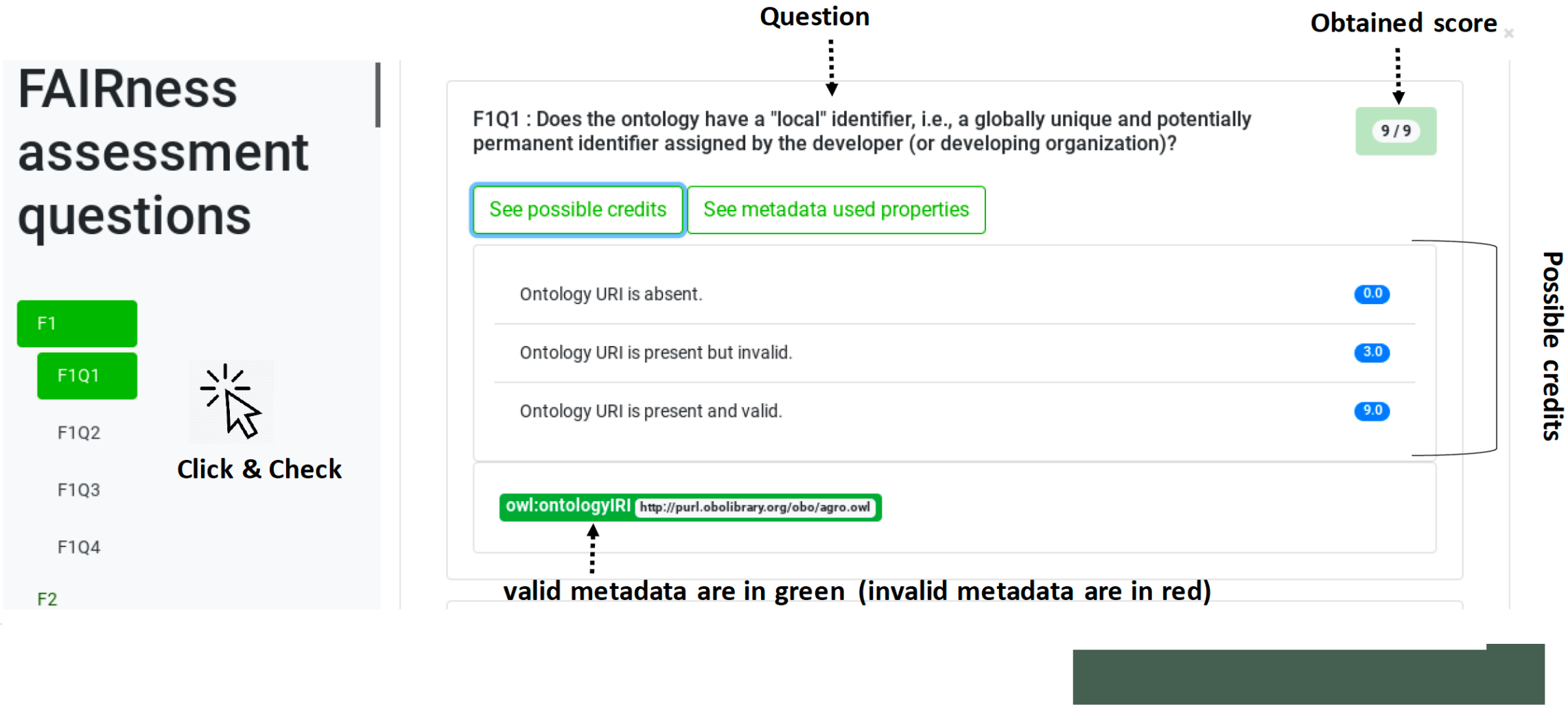
Get the FAIRness score of a group of ontologies



Get a FAIRness score for a given ontology



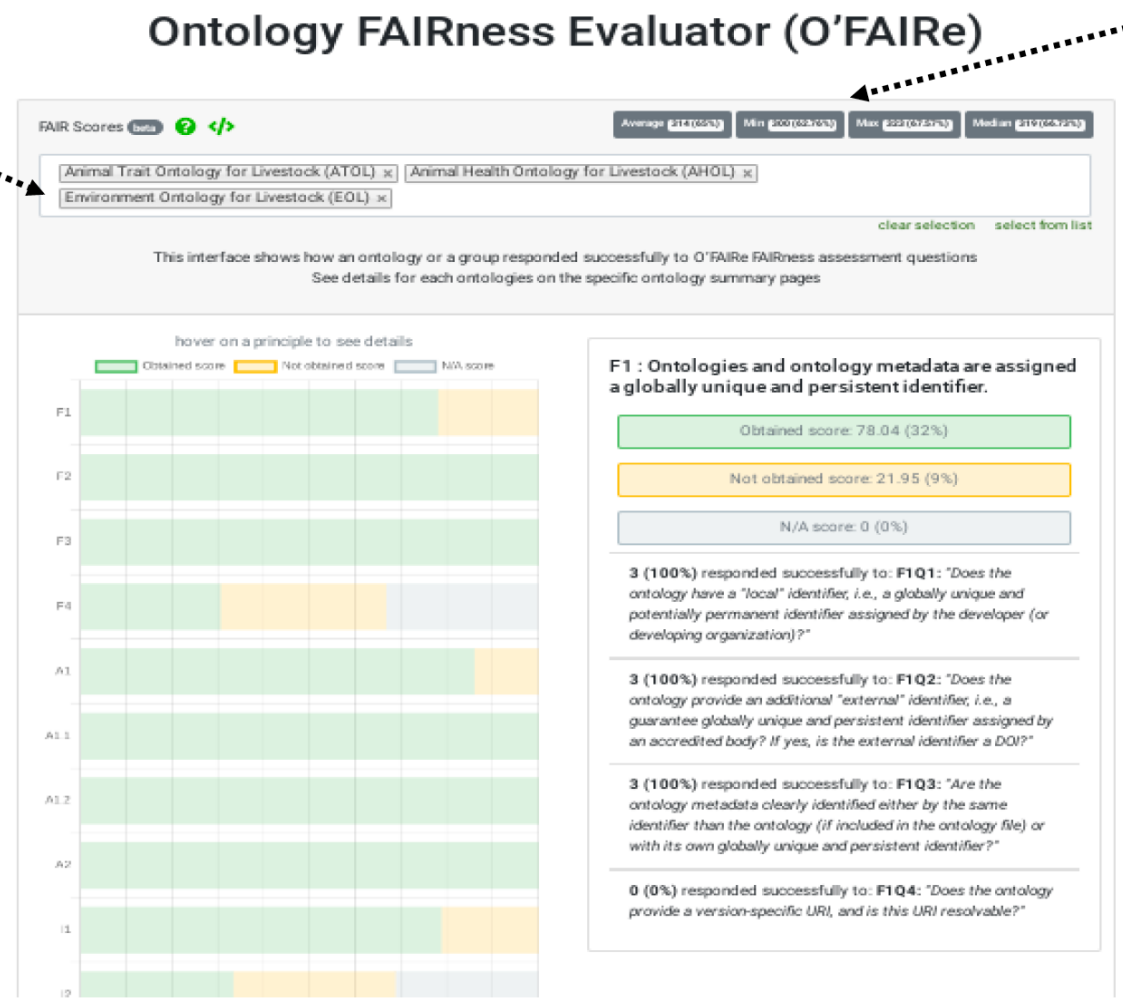
Get explanations



Get the FAIRness score of a group of ontologies

Normalized FAIR scores statistics: Average, Min, Max, Median

Listing of ontologies



Normalized scores by sub principle

http://agroportal.lirmm.fr/landscape

Web service (O'FAIRe returns a JSON with the following structure)


```
{
 "ontologies": {
   "FCU": { // ontology acronym
     "Findable": { // FAIR principal
       "F1": { // Subprincipal
         "label": "Ontologies and ontology metadata are assigned a globally unique and persistent ider
         "results": {
          "F1Q1": {
                "question": "Does an ontology have a \"local\" identifier i.e., a globally unique and
                "score": 9,
                "explanation": "Present and valid ontology URI.", //Score explanation
                "properties": {//List of properties used in the test with there values
                            "owl:ontologyIRI": "http://ontology.inrae.fr/frenchcropusage"
                },
                "maxCredits": 9,
                "points": [ //Array of possible scores and explanation for this question
                       {
                         "explanation": "Ontology URI is not present.",
                         "score": 0
                       },
                       {
                       "explanation": "Present but invalid ontology URI.",
                       "score": 3
                       },
                       {
                       "explanation": "Present and valid ontology URI.",
                       "score": 9
                       }
```


http://services.agroportal.lirmm.fr/ofaire?ontologies=AGRO

Or

http://services.agroportal.lirmm.fr/ofaire?ontologies=ATOL,EOL,AHOL&combined

O'FAIRe in summary

- Name: Ontology FAIRness evaluator
- Base URL: http://services.agroportal.lirmm.fr/ofaire
- Version: V2.0
- FAIRness assessement methodology: 61 questions
- Output: FAIR score of an ontology/group of ontologies

- Code & doc: https://github.com/agroportal/fairness

- Reference: E. Amdouni, S. Bouazzouni, C. Jonquet. **O'FAIRe makes you an offer: Metadata-based Automatic FAIRness Assessment for Ontologies and Semantic Resources.** *International Journal of Metadata, Semantics and Ontologies*, 2022, 16 (1), pp.16-46. ⟨10.1504/IJMSO.2022.131133⟩.

- O'FAIRe deployments:

AgroPortal

SIFR BioPortal

IndustryPortal
Ontologies for industry

EcoPortal

EarthPortal

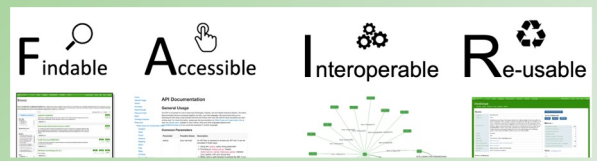
BiodivPortal

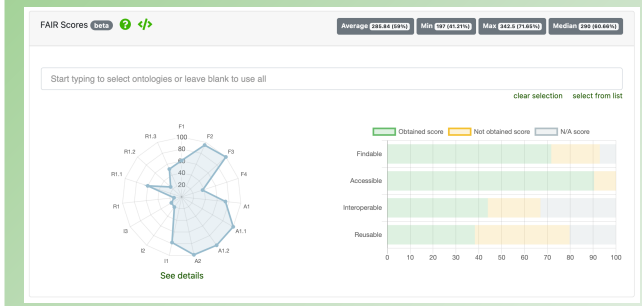
O'FAIRe in publications 📖

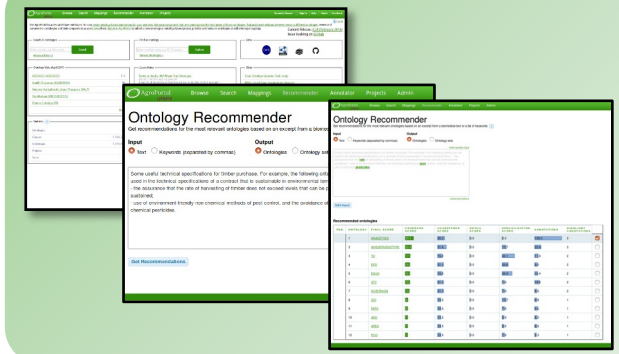
- E. Amdouni, S. Bouazzouni, C. Jonquet. **O'FAIRe makes you an offer: Metadata-based Automatic FAIRness Assessment for Ontologies and Semantic Resources.** *International Journal of Metadata, Semantics and Ontologies*, 2022, 16 (1), pp.16-46. ⟨10.1504/IJMSO.2022.131133⟩.

- E. Amdouni, S. Bouazzouni, C. Jonquet. **O'FAIRe: Ontology FAIRness Evaluator in the AgroPortal semantic resource repository.** *ESWC 2022 - 19th Extended Semantic Web Conference, Poster and demonstration*, May 2022, Hersonissos, Greece. ⟨10.1007/978-3-031-11609-4_17⟩

- E. Amdouni, C. Jonquet. **FAIR or FAIRer? An integrated quantitative FAIRness assessment grid for semantic resources and ontologies.** *MTSR 2021 - 15th International Conference on Metadata and Semantics Research*, Nov 2021, Madrid, Spain. pp.67-80. ⟨10.1007/978-3-030-98876-0_6⟩







FAIR-IMPACT
Expanding FAIR Solutions across EOSC

OntoPortal Alliance

D2KAB

Summary

Questions ?