ONTOLOGIES
Community of Practice

Crop Ontology, Agronomy Ontology and others

Elizabeth Arnaud
Ontologies CoP Lead

Digital Solutions Team Lead
Alliance Bioversity-CIAT

Alliance
Bioversity International
CIAT International Center for Tropical Agriculture
CGIAR
Platform for Big Data in Agriculture

ONTOLOGIES
COMMUNITY OF PRACTICE

WELCOME ENGAGE NEWS RESOURCES EVENTS

WELCOME!

Community members gathered at the 2018 PhenoHarmoniS workshop, the biennial event hosted by the Ontologies Community of Practice.

The Ontologies Community of Practice brings together researchers, modelers, information specialists, data managers, and ontology experts from the CGIAR research network, academia, and the private sector, thus creating a critical mass of expertise to tackle the major issues related to semantics for FAIR data in agri-food science.

The CoP provides the ideal forum for co-learning and knowledge exchange on ontologies and for guiding consistent data annotation, as well as the deployment of quality ontologies in databases and repositories. The CoP stimulates exchanges between domain experts and experts in ontology design, knowledge modeling, ontology-driven applications, and semantic web technologies

The CoP is led by the Alliance of Bioversity International and CIAT and was launched by the CGIAR Platform for Big Data in Agriculture.

This webpage presents the different working groups of the CoP, lists the tools developed

Get in touch

CoP Lead

Elizabeth Arnaud | Email
Elizabeth leads the Ontologies CoP and is a scientist at the Alliance of Bioversity International and CIAT in Montpellier, France

CoP Communication

Céline Aubert | Email
The International Food Policy Research Institute, France

Read the Ontologies CoP paper

Visit the Ontologies CoP YouTube channel

ENGAGE WITH THE COMMUNITY

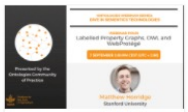
BE INFORMED
Tune in to the latest CoP updates by subscribing to our newsletter.

ENGAGE
Interact with community members through our LinkedIn Group.

CONTRIBUTE
Share your expertise in our working groups.

See our Working Groups

COMMUNITY NEWS



Labelled property graphs, Web Ontology Language, and WebProtégé

September 9, 2021 / Hannah Craig

This webinar by the Ontologies Community of Practice presents work on making WebProtege compatible with a labelled property graph representation ...

Webinar – Governance operational model for ontologies (GOMO)

August 9, 2021 / Hannah Craig

This webinar by the Ontologies Community of Practice presents the governance operational model for ontologies (GOMO) which establishes an agile ...

Webinar - Ontology tools provided by EBI: OLS, ZOOMA, OxO

June 29, 2021 / Lorna Pizzaro Madera

This webinar by the Ontologies Community of Practice presents OLS, ZOOMA, & OxO– platforms developed by the ontology tools team ...

Webinar – Advances of the Crop Ontology website and graph visualization using graph database

April 6, 2021 / Lorna Pizzaro Madera

Webinar on how to use the new version of the Crop Ontology website ...

FAO cooperates with CGIAR to increase interoperability between food and agricultural information systems

June 8, 2021 / Lorna Pizzaro Madera

CGIAR and FAO announce new collaboration aiming to enhance data sharing in the food and agricultural sector through the AGROVOC ...

Release: Crop Ontology Guidelines for Annotation of Phenotypic Data version 2.0

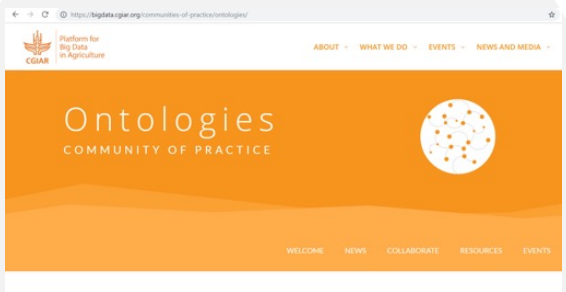
April 21, 2021 / Lorna Pizzaro Madera

The Crop Ontology (CO) compiles concepts related to crops (traits, methods and scales), validated by community members. To better structure ...

https://bigdata.cgiar.org/communities-of-practice/ontologies/

To engage in the Community of Practice

Web site



bigdata.cgiar.org/communities-of-practice/ontologies/

https://www.youtube.com/c/OntologiesInAgriculture

18 Webinars

224 members

https://www.linkedin.com/groups/13707155/

Newsletter

472 suBscribers

ONTOLOGIES
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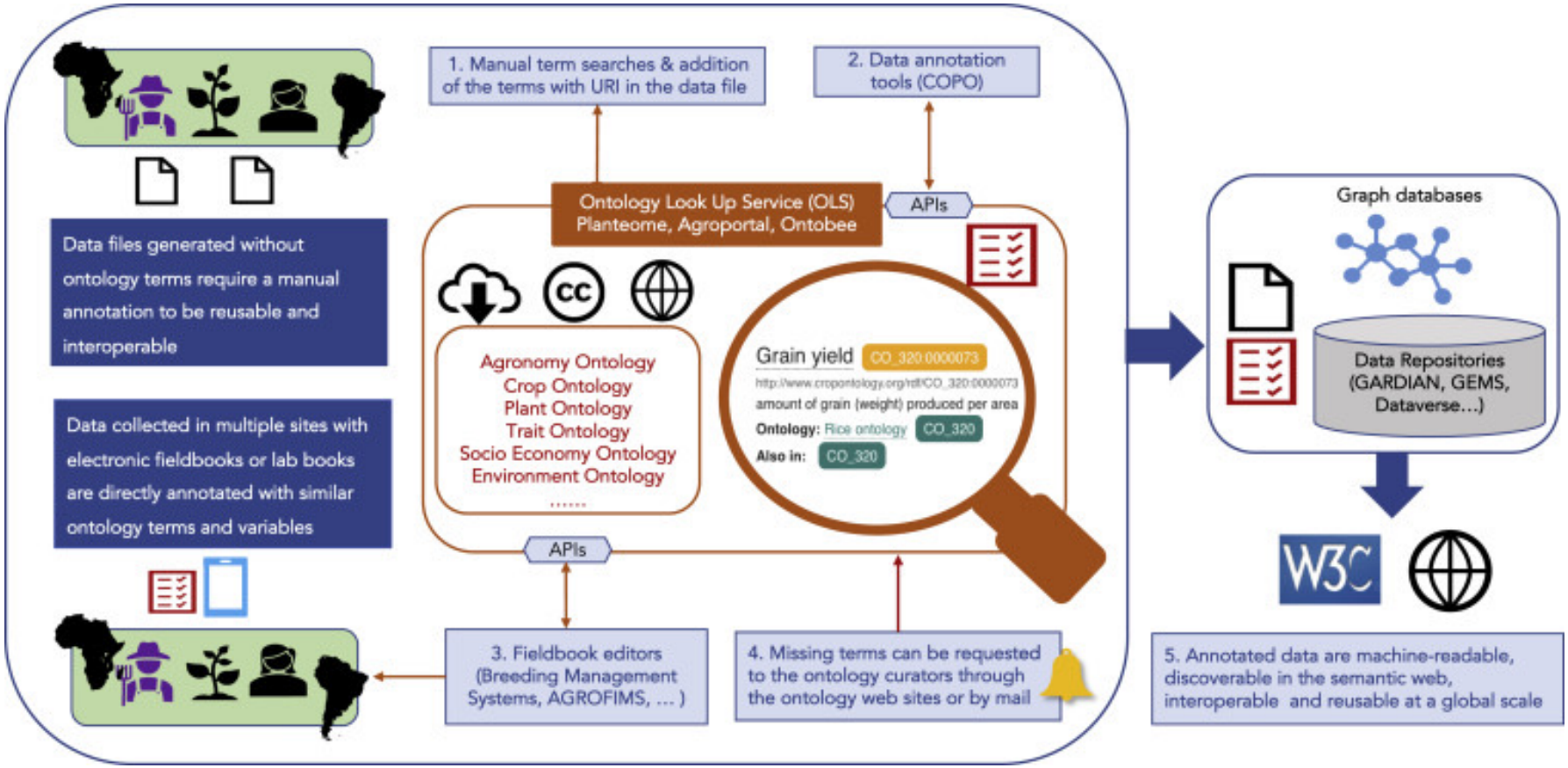


The Ontologies Community of Practice: A CGIAR Initiative for Big Data in Agrifood Systems. Arnaud E. et al, Patterns J., Vol. 1, Issue 7, DOI:https://doi.org/10.1016/j.patter.2020.100105

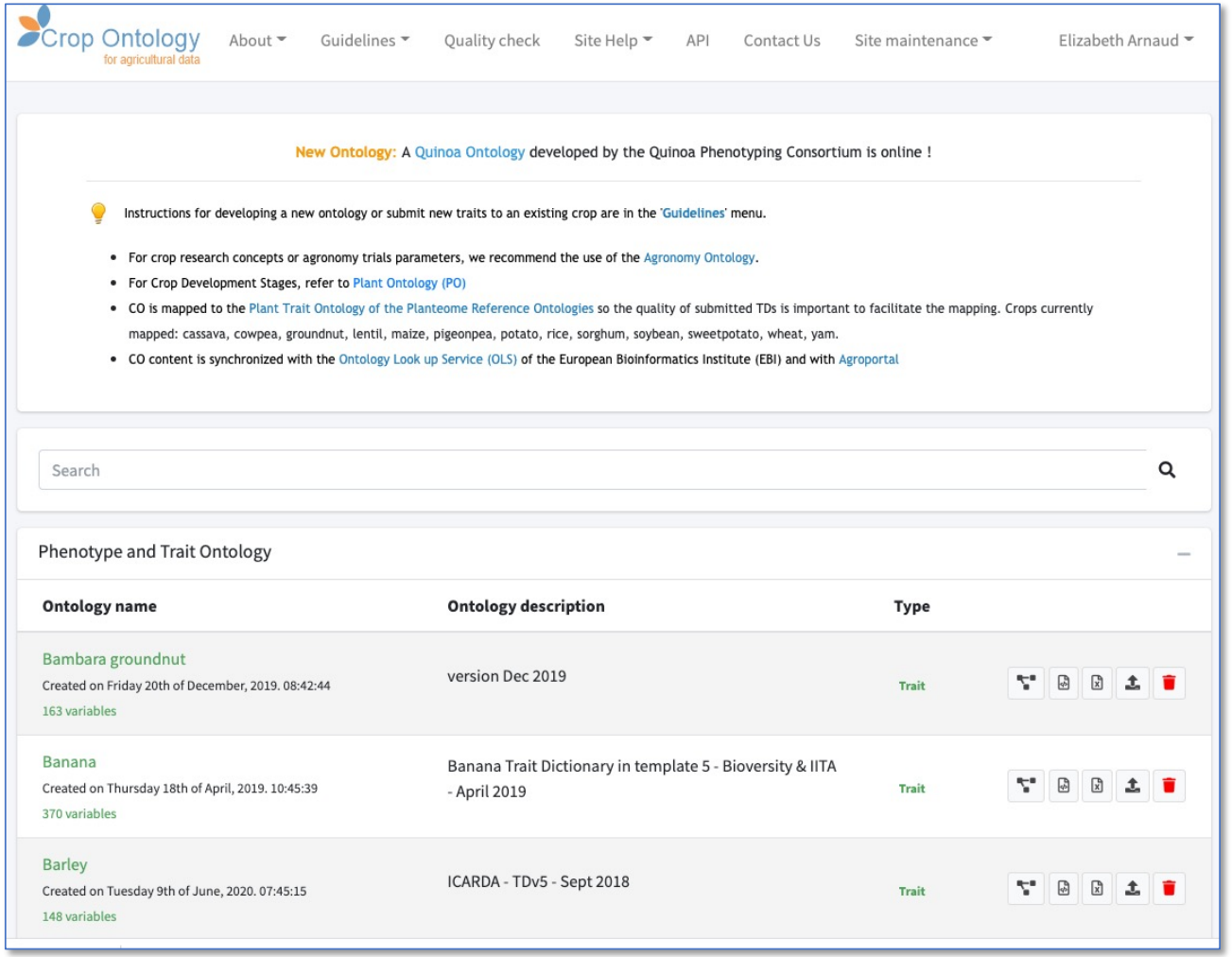
Crop Ontology
for agricultural data

CGIAR

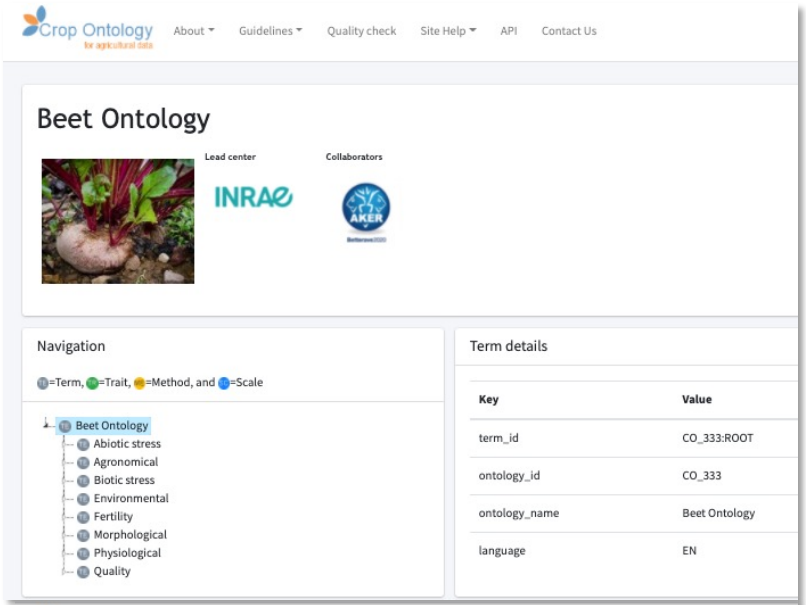
Created in 2009 by the Integrated Breeding Platform for breeders' traits

To date
- 32 species
- > 4,300 traits
- > 6,300 variables

Last crop: **Quinoa** by the **Quinoa Phenotyping Consortium**



Bioversity International
Planteome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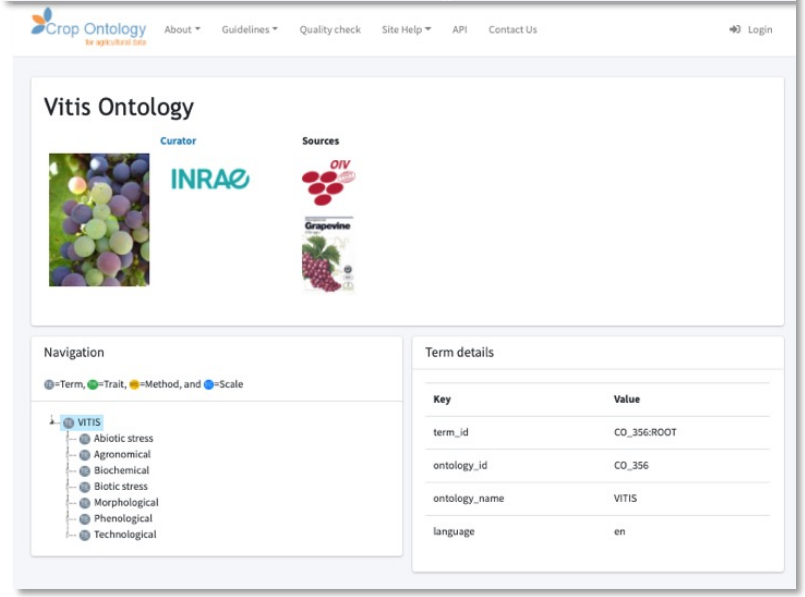
Agronomical
Biotic stress
Environmental
Fertility
Morphological
Physiological
Quality
Term details
Key
Value
term_id
CO_333:ROOT
ontology_id
CO_333
ontology_name
Beet Ontology
language
EN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Agronomical
Biochemical
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Morphological
Phenological
Technological
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ontology_id
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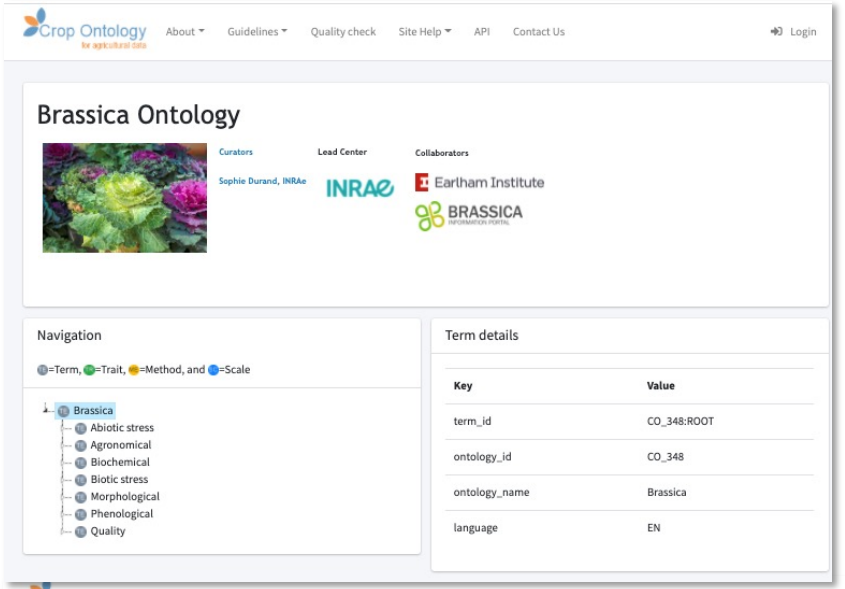
en


GUIDELINES FOR CREATING
CROP-SPECIFIC ONTOLOGIES
TO ANNOTATE
PHENOTYPIC DATA
Crop Ontology
for agricultural data
VERSION 2
2020
CIMMYT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Sophie Durand, INRAe
Lead Center
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Earlham Institute
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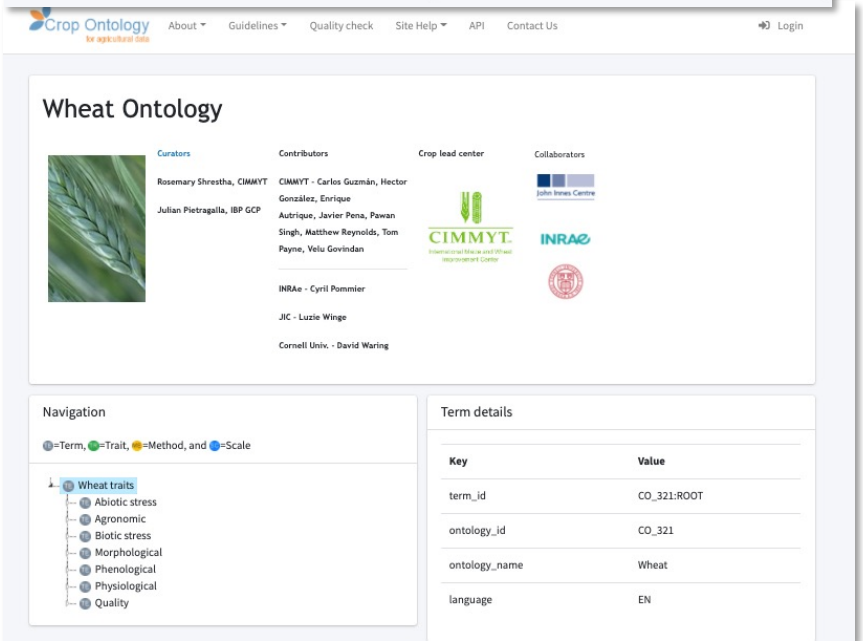
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Wheat Ontology
Curators
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Julian Pietragalla, IBP GCP
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Crop lead center
CIMMYT
Collaborators
John Innes Centre
INRAE
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Abiotic stress
Agronomic
Biotic stress
Morphological
Phenological
Physiological
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Term details
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CO_321:ROOT
ontology_id
CO_321
ontology_name
Wheat
language
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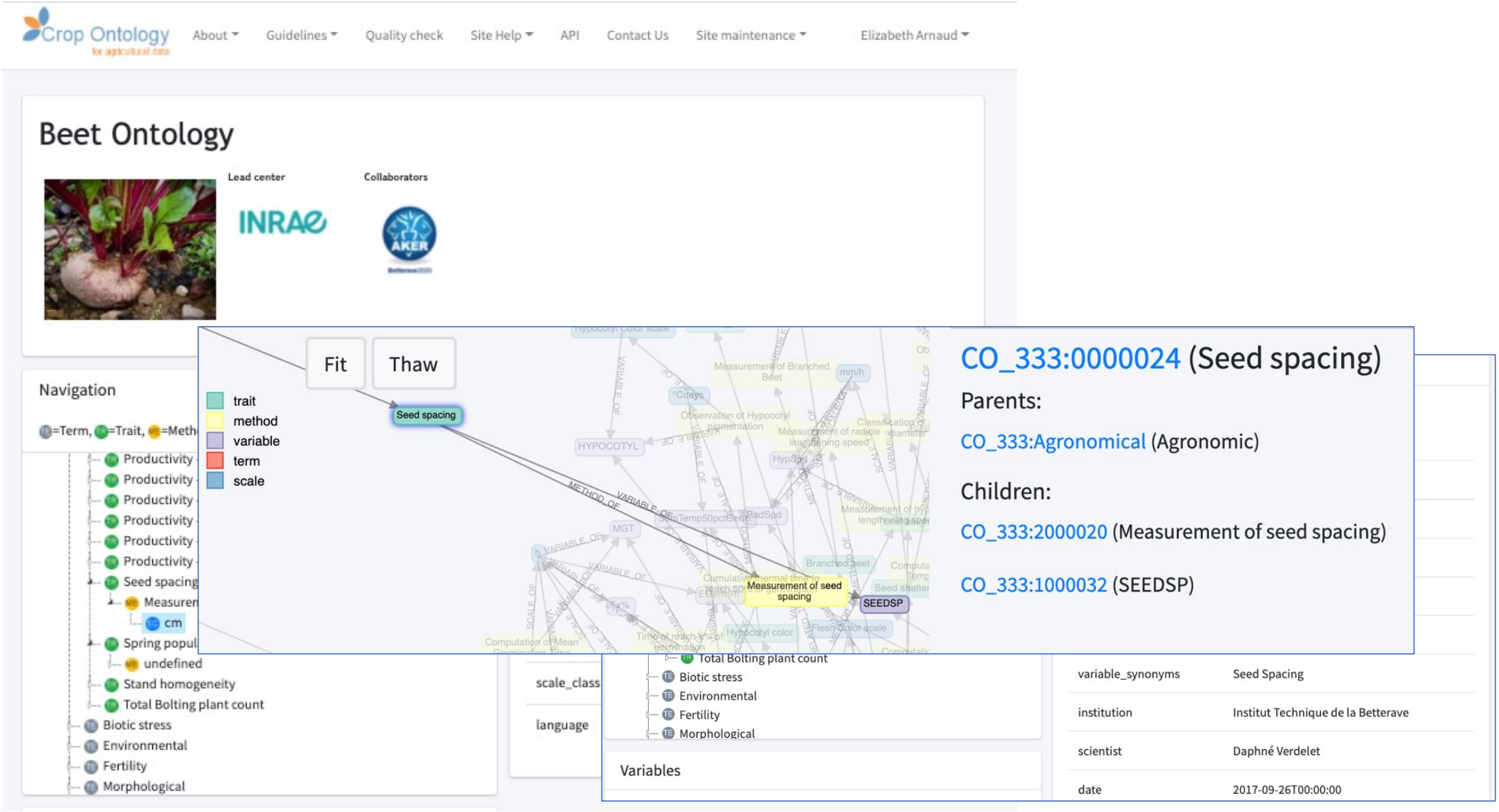
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Elizabeth Arnaud
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Total Bolting plant count
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Fit
Thaw
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scale
Seed spacing
METHOD_OF
VARIABLE_OF
Measurement of seed spacing
SEEDSP
CO_333:0000024 (Seed spacing)
Parents:
CO_333:Agronomical (Agronomic)
Children:
CO_333:2000020 (Measurement of seed spacing)
CO_333:1000032 (SEEDSP)
scale_class
language
Total Bolting plant count
Biotic stress
Environmental
Fertility
Morphological
Variables
variable_synonyms
Seed Spacing
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Institut Technique de la Betterave
scientist
Daphné Verdelet
date
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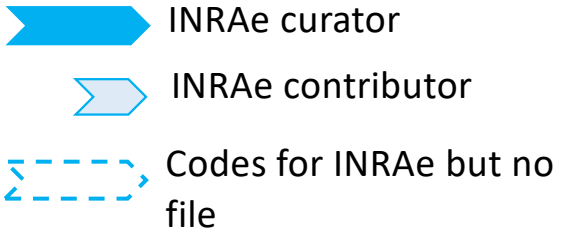
32 Crops To Date



Crop	Code
Andean Roots and Tubers	332
Bambara groundnut	366
Barley	323
Beet	333
Brachiaria (Forages)	345
Brassica	348
Cassava	334
Castor bean	347
Chickpea	338
Coconut	326
Coffee	361
Cotton	358
Cowpea	340
Faba bean	365
Finger Millet	328
Flax	362
Forages	342
Groundnut (Peanut)	337
Lentil	339
Maize	322
Melon	364
Mungbean	346
Musa (Banana)	325
Oat	350
Pearl Millet	327
Phaseolus (Common Bean)	335
Pigeon Pea	341
Potato	330
Protein crops	349
Quinoa	367
Rice	320
Sorghum	324
Soybean	336
Sugar Kelp	360
Sunflower	359
Sweet Potato	331
Vitis	356
Wheat	321
Woody plants	357
Yam	343
Walnut	363

percode | percrop

Common Reference Ontology

Banana Traits

CO

Finger color

Fruit Color

Berry color

Pod color

Reference Trait Ontology

CO

Tomato Traits

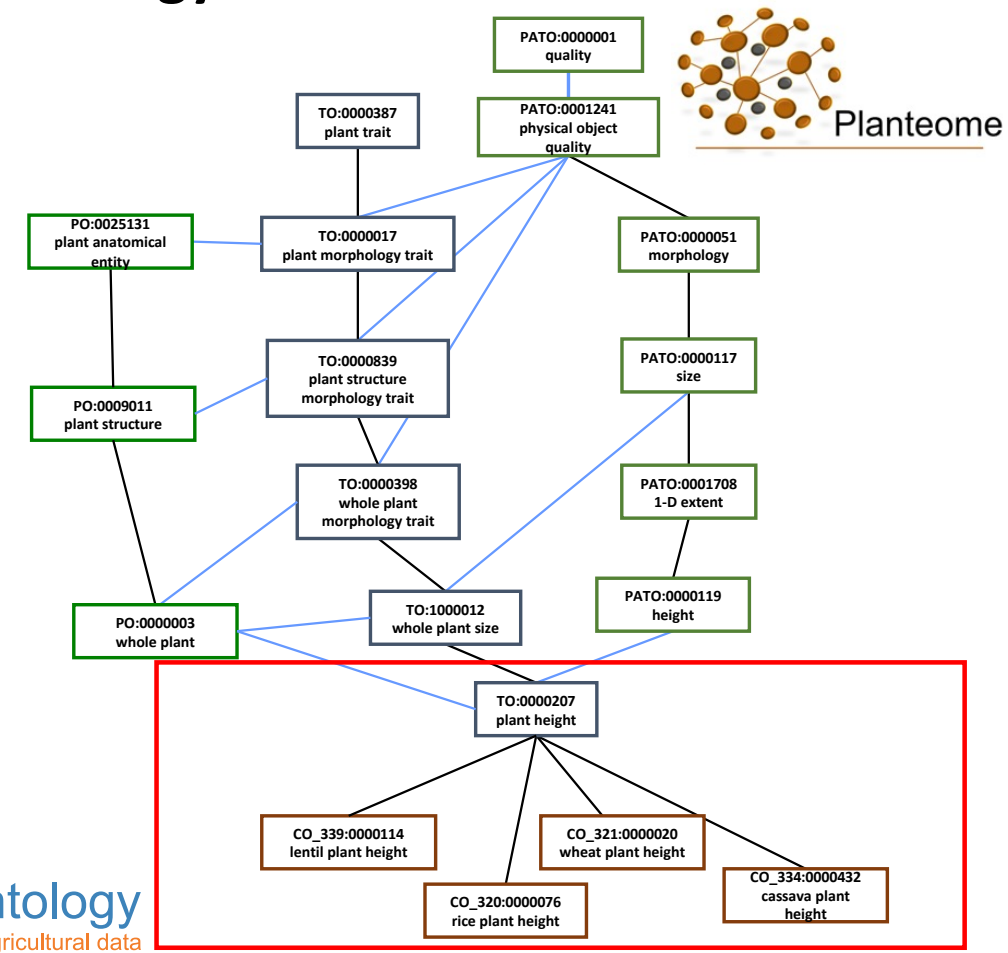
Soybean Traits

CO

Integration of Species-Specific Ontologies with the Trait Ontology of Planteome

	# traits	# manually curated
CO_320_rice	157	5
CO_321_wheat	266	9
CO_322_maize	200	31
CO_324_sorghum	130	27
CO_331_sweetpotato	195	27
CO_334_cassava	163	16
CO_336_soybean	83	2
CO_339_lentil	68	11
CO_341_pigeonpea	62	9
CO_343_yam	159	40

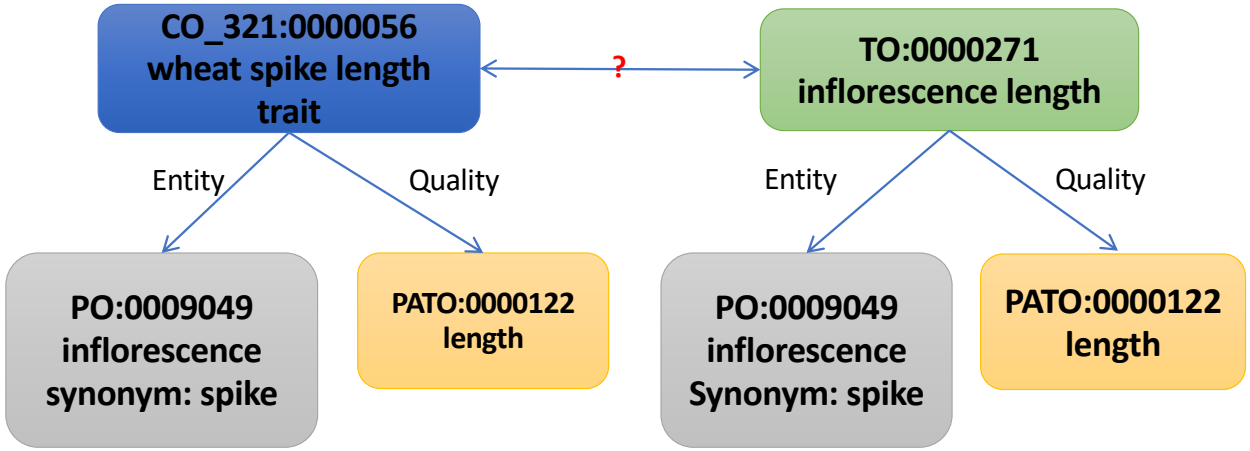
potato
cowpea
groundnut



Crop Ontology
for agricultural data

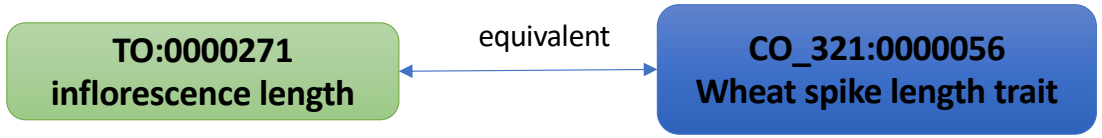
Automated Mapping is based on Design Patterns
For example: Entity-Quality pattern

Manual curation



Reasoner infers that these terms are exact matches

Inference



Planteome

Marie-Angélique Laporte
Crop Ontology, Alliance Bioversity International-CIAT

CO

Adding Value Chain Actors & Preferences on Food products' Qualities

Boiled Cassava
Boiled Plantain
Boiled Potato
Boiled Sweet potato
Boiled Yam
Fried Sweet potato
Attieke (Cassava)
Eba
Cassava Fufu
Gari
Pounded Yam
Matooke

BILL & MELINDA GATES foundation

From the Lexicon to the Sensory Trait dictionary for Matooke

Matoke Samples
Photo: NARO

Trait name (Attribute)	Trait class (Type)	Trait description
Matooke surface yellowness intensity	Appearence	Color of the surface of the sample from light yellow to bright yellow
Matooke homogeneity of surface colour	Appearence	Uniformity of color of the surface of the sample

Type	Attributes	Definition	How to measure?	Scale
Appearence	Yellow	Color of the surface of the sample from light yellow to bright yellow	When you receive the sample, observe the surface and evaluate the intensity of the color and its homogeneity	0: very light yellow 10:bright yellow
	Homogeneity of colour	Uniformity of color of the surface of the sample		0 : heterogeneous 10 : homogeneous

Method name (How to measure)	Method class	Method description	Formula
Appearance method	Sensory descriptive measurement	When you receive the sample, observe the surface and evaluate the intensity of the color	
Appearance method	Sensory descriptive measurement	When you receive the sample, observe the surface and evaluate the homogeneity	

Scale name	Scale class
yellowness scale 0-10	Ordinal
color homogeneity scale 0-10	Ordinal
firmness scale 0-10	Ordinal

Crop Ontology
for agricultural data

A Community Of Curators

Curators of the species ontologies in 2021

Bambara Groundnut	Liliana Andres, South King Cross University
Banana	Marie-Angélique Laporte, Alliance Bioversity-CIAT, Naama Menda; BTI
Barley	Ramesh Verna and Fawzy Nawar, ICARDA
Beet	Daphne Verdelet and Cyril Pommier, INRAE
Bracharia	Valheria Castiblanco and Luis Miguel Hernandez, Alliance Bioversity-CIAT
Brassica	Wiktor Jurkowski, Earlham Institute
Cassava	Afolabi Agbona, IITA and Naama Menda, Boyce Thompson Institute
Castor Bean	Salihu, B. Z., NCRI, Nigeria
Chickpea	Roma Das and Abhishek Rathore, ICRISAT
Common Bean	Guerrero Alberto Fabio, Alliance Bioversity-CIAT
Cotton	Jing Yu, Washington State University
Cowpea	Sam Ofodile and Tunde Agbaje, IITA
Faba Bean	Fouad Maalouf, ICARDA
Groundnut	Abhishek Rathore, ICRISAT
Lentil	Julian Pietragalla , IBP
Maize	Rosemary Shrestha, Kate Dreher, CIMMYT and Julian Pietragalla, IBP
Mungbean	Julian Pietragalla, IBP
Oats	David Waring, Cornell University
Pearl Millet	Roma Das and Abhishek Rathore, ICRISAT
Pigeon Pea	Roma Das and Abhishek Rathore, ICRISAT
Potato	Vilma Hualla, Elisa Salas, Thiago Mendes, CIP
Rice	Jeffrey Detrás, IRRI
Sorghum	Abhishek Rathore, ICRISAT
Soybean	Rex T. Nelson, USDA
Sugar Kelp	David Waring, Cornell University
Sunflower	Evan Staton, University of British Columbia
Sweet Potato	Jolien Swanckaert, CIP
Vitis	Eric Duchêne, INRA
Wheat	Rosemary Shrestha, CIMMYT and Julian Pietragalla, IBP
Woody Species	Celia Michotey, INRAE and Ines Chaves, IBET

Main Databases using Crop Ontology

Integrated Breeding Platform (IBP)

https://www.integratedbreeding.net/

BREEDBASE

Breedbase.org

GnpIS
GENETIC AND GENOMIC INFORMATION SYSTEM

https://urgi.versailles.inra.fr/Tools/GnpIS

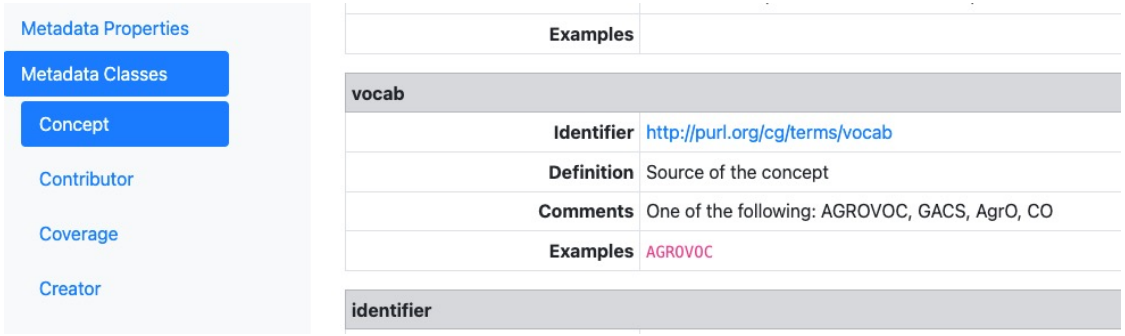
GEMS Data-Driven Agricultural Innovation
GENETICS • ENVIRONMENT • MANAGEMENT • SOCIOECONOMICS

https://agroinformatics.org/

Main Standards Associated to Crop Ontology and Agronomy Ontology

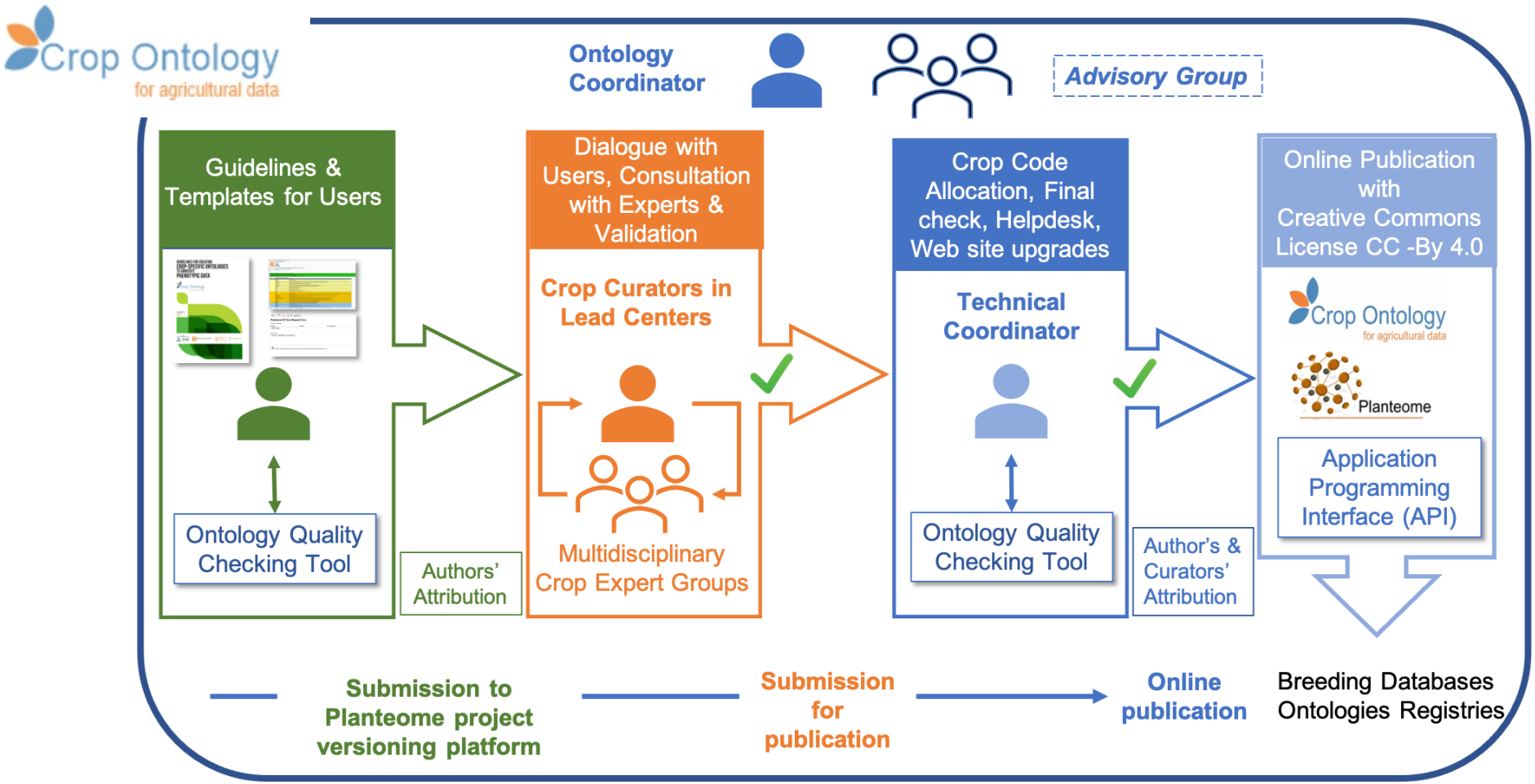
https://www.miappe.org/

https://brapi.org/



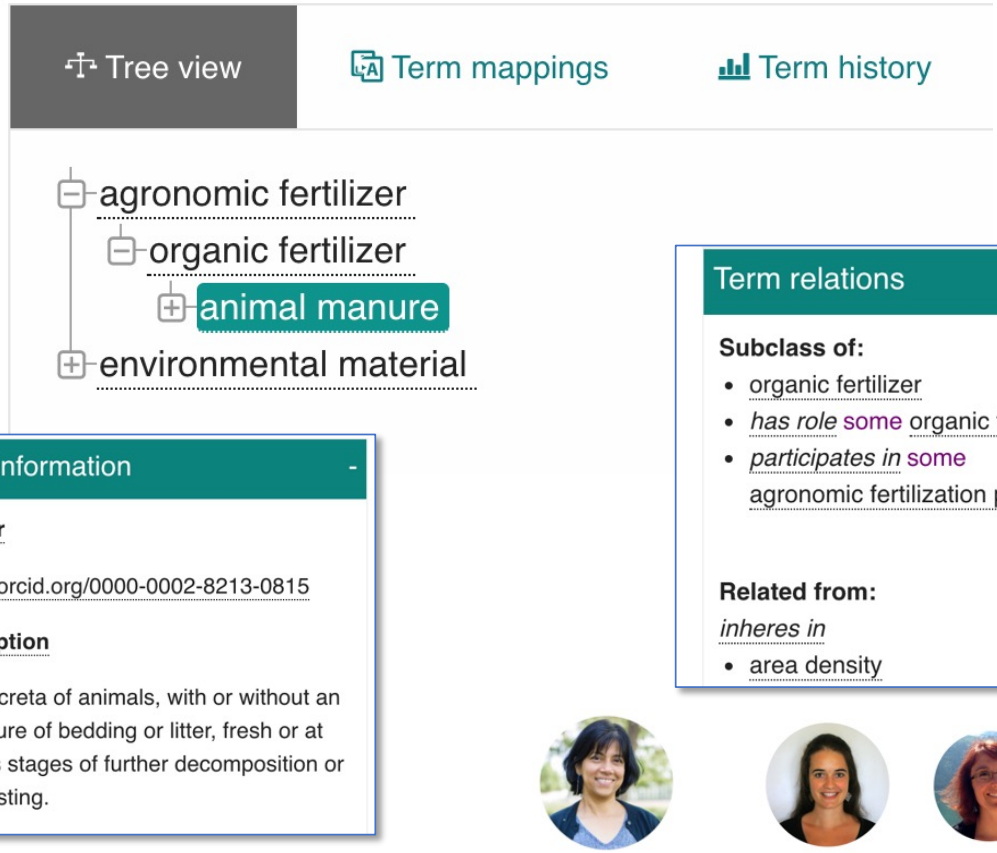
https://agriculturalsemantics.github.io/cg-core/cgcore.html

Quality Control Process and Governance

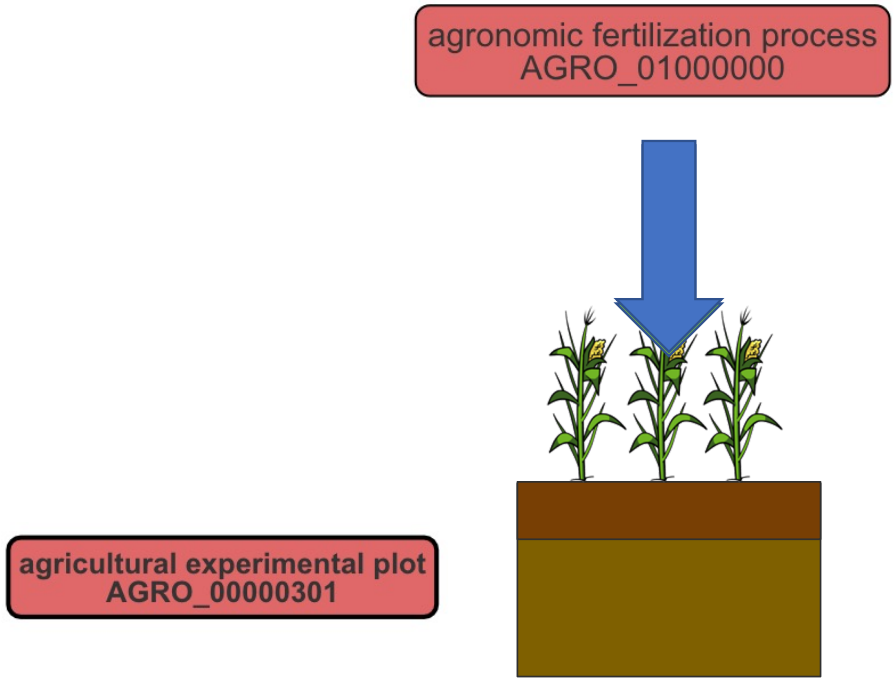


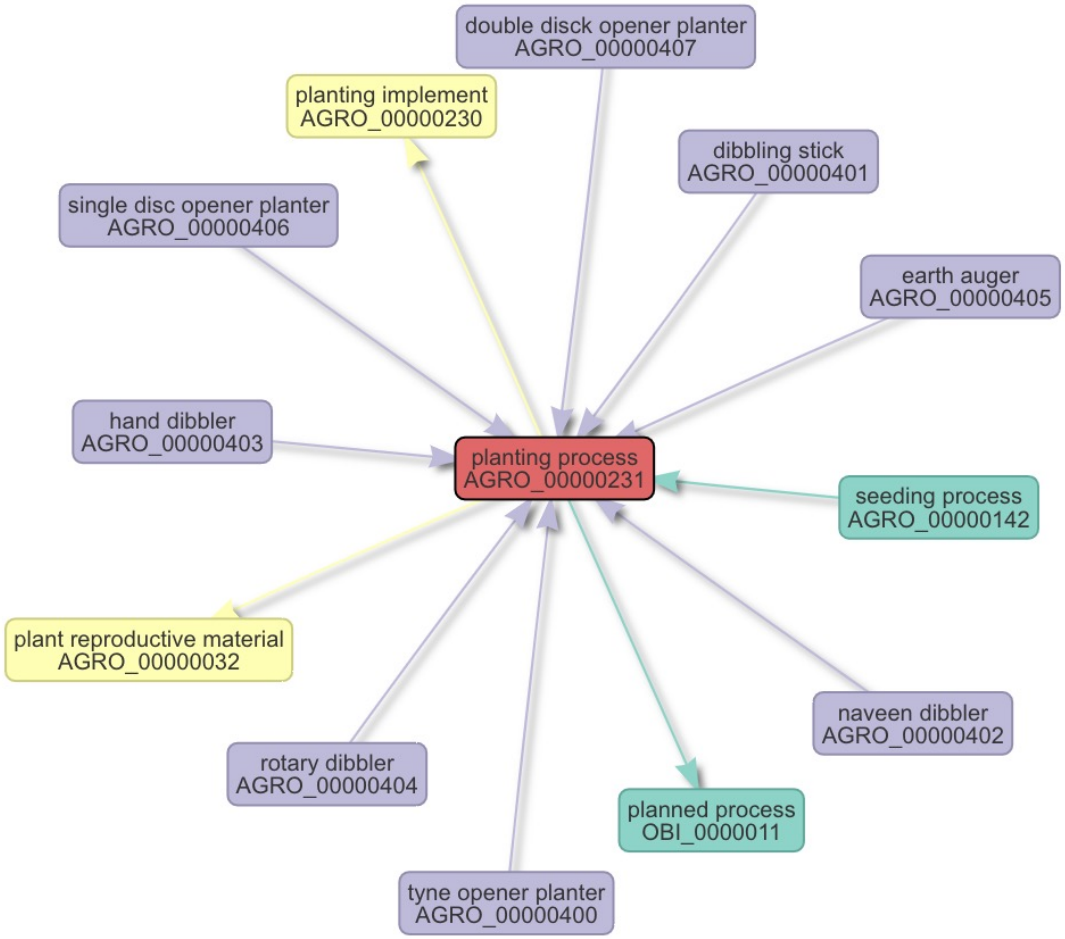
Agronomy Ontology (AgrO) content

https://github.com/AgriculturalSemantics/agro



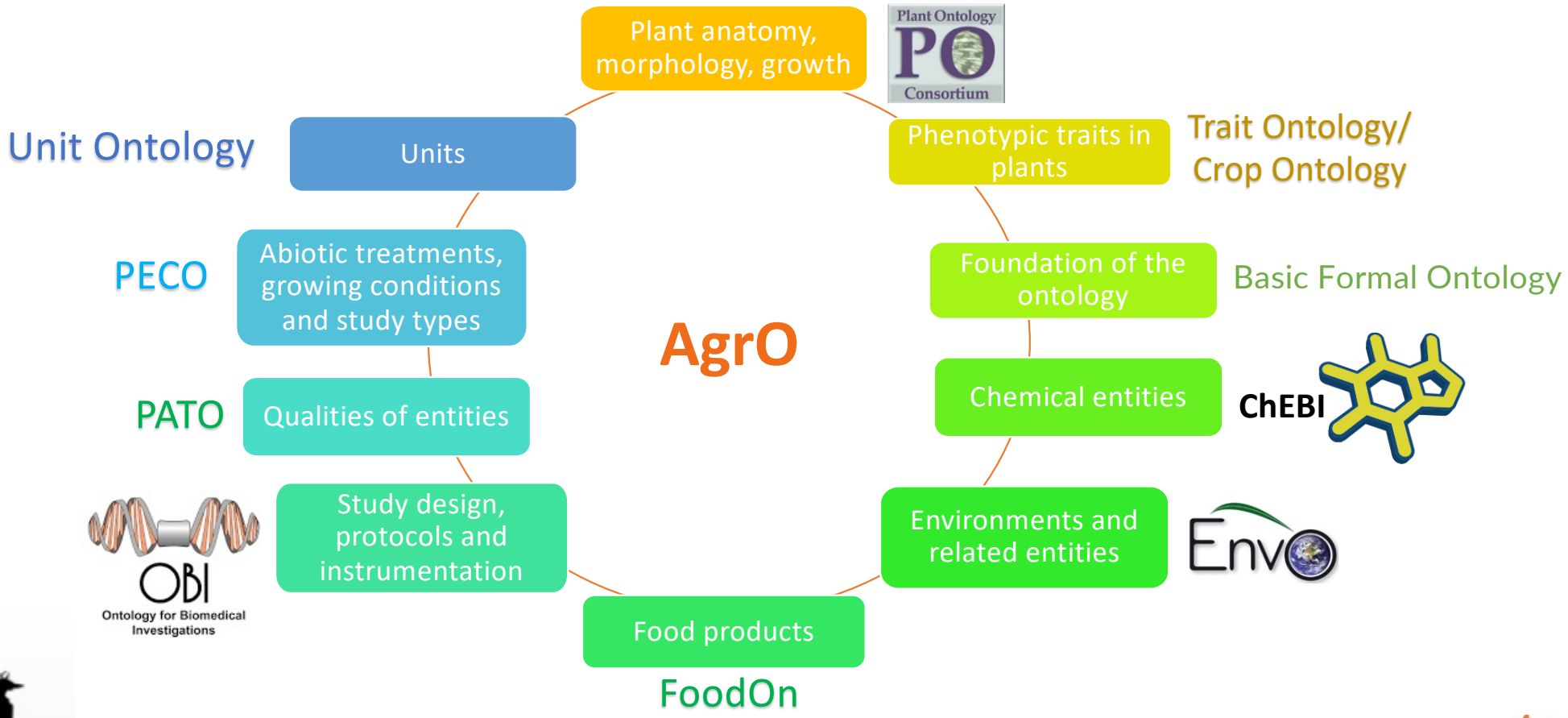
AgrO structure





Ontologies reused in AgrO

Mapped to AGROVOC (FAO)



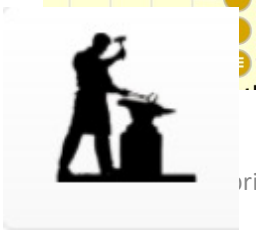
AgrO content

- planned process
  - agricultural process
    - agricultural experiment
    - agronomic fertilization process
    - crop cultivation process
    - crop residue management process
    - crop rotation process
    - dessication process
    - harvesting process
    - irrigation process
    - land levelling process
    - liming process
    - monoculture
    - much removal process
    - pest control process
    - plant transplanting process
    - planting process
    - propping process
    - pruning process
    - rotation phase
    - seedbed preparation process
    - sequence process
    - storage process
    - treatment

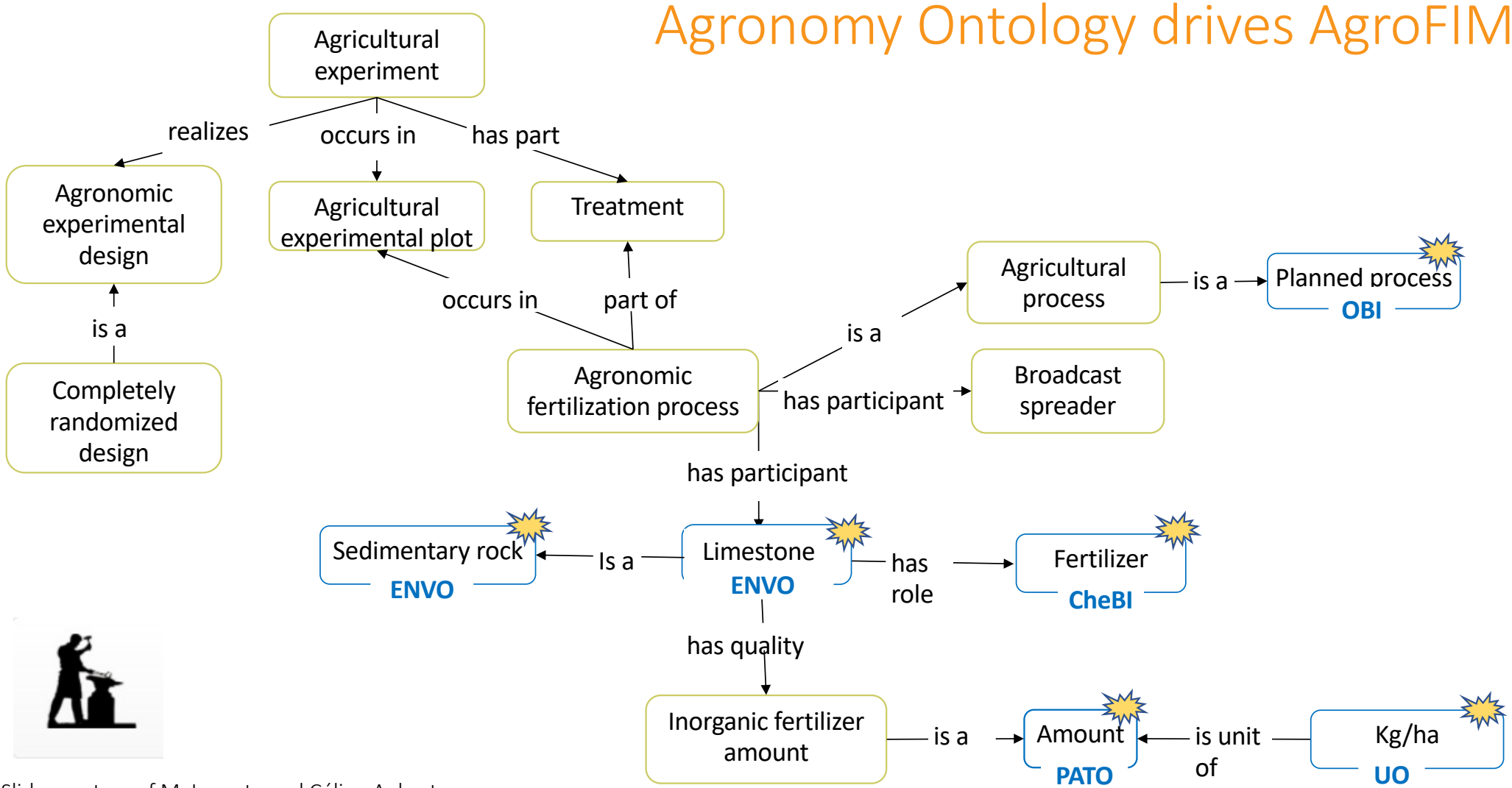
- experiment
  - agricultural experiment
    - crop rotation experiment
    - crop yield experiment
    - inter-cropping experiment
    - long-term experiment
    - mono-cropping experiment
    - sequence experiment

- agricultural implement
  - chemical pest control implement
  - fertilization implement
  - harvest implement
    - baler
    - binder
    - combine harvester
    - flail
    - mowing implement
    - scythe
    - sickle
    - tedder
  - irrigation equipment
  - land levelling implement
  - planting implement
    - dibbling stick
    - double disck opener planter
    - earth auger
    - hand dibbler
    - naveen dibbler
    - rotary dibbler
    - single disc opener planter
    - sowing implement
      - broadcast spreader
      - drum seeder
      - furrow opener
      - hoe
      - seed drill
        - manual oilseed drill
    - tyne opener planter
  - residue management implement
  - tractor

- agronomic fertilizer
  - inorganic fertilizer
    - calcium carbonate
    - limestone
    - magnesium carbonate
    - nitrogen fertilizer
    - NPK fertilizer
    - phosphorus fertilizer
    - potassium fertilizer
      - potassium chloride
      - potassium nitrate
    - sodium selenate
  - organic fertilizer
    - alfalfa meal
    - animal manure (AGRO:00000079
    - bagasse
    - biofertilizer
    - blood meal
    - bone meal
    - bovine dairy liquid manure
    - charcoal
    - compost
    - fish fertilizer
    - green manure
    - oil cake
    - oil meal
    - peat soil
    - sludge



Agronomy Ontology drives AgroFIMS

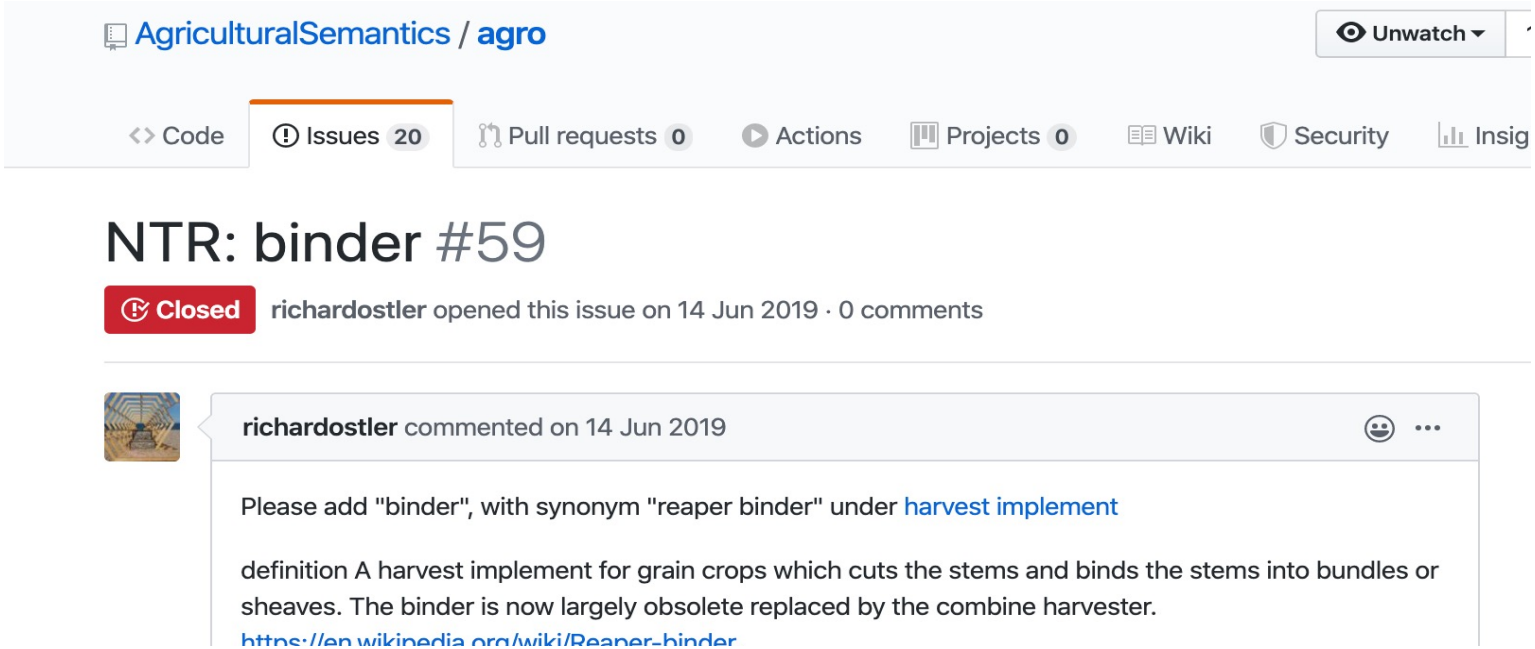


Slide courtesy of M. Laporte and Céline Aubert

Participate via GitHub

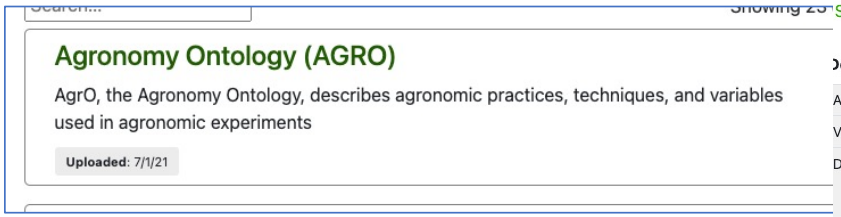
Open an issue to request new terms, new synonyms, and provide any feedback

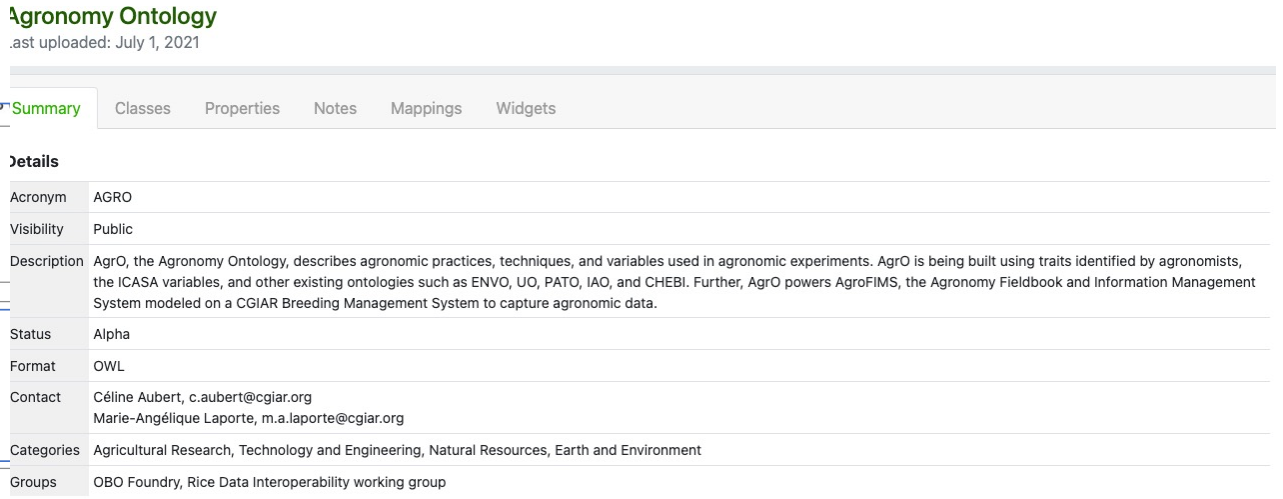
https://github.com/AgriculturalSemantics/agro/issues

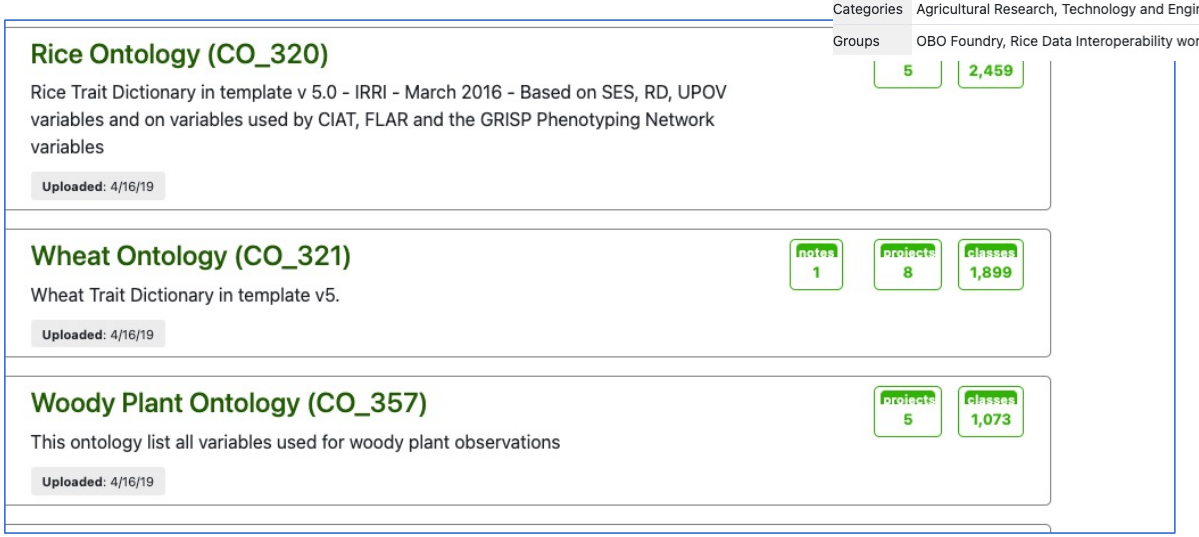


AgroPortal

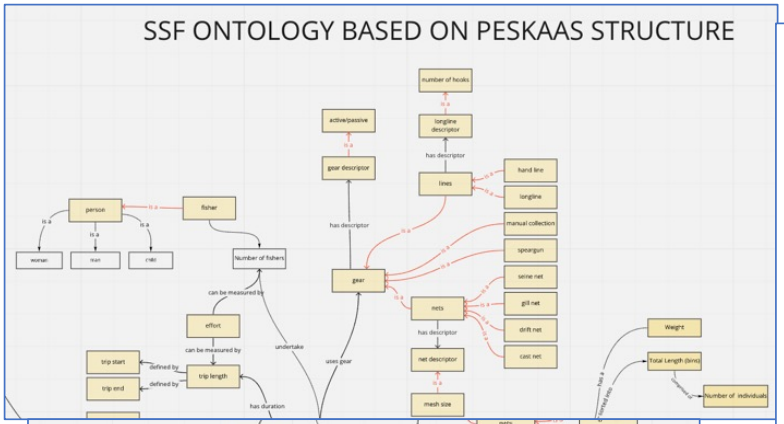
http://agroportal.lirmm.fr/

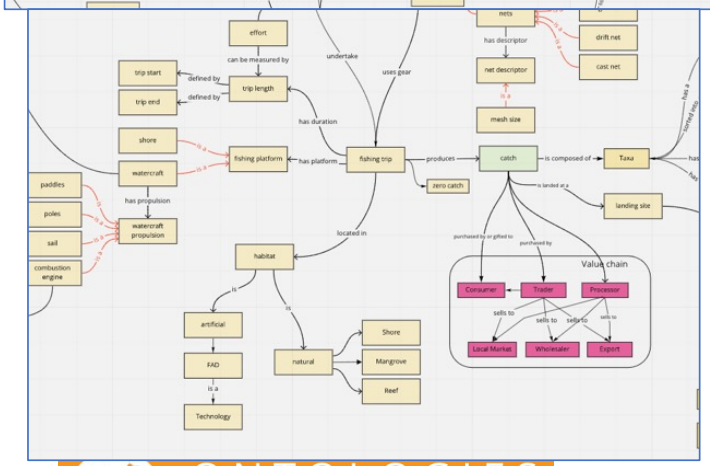


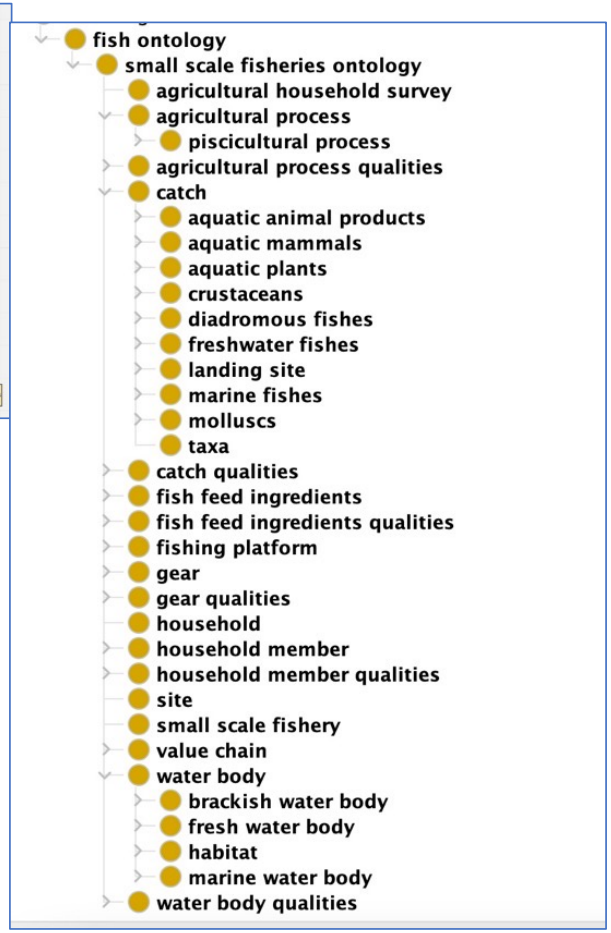




Small Scale Fisheries and Aquaculture Ontology







ONTOLOGIES
COMMUNITY OF PRACTICE

In development with WorldFish scientists as domain experts and data managers

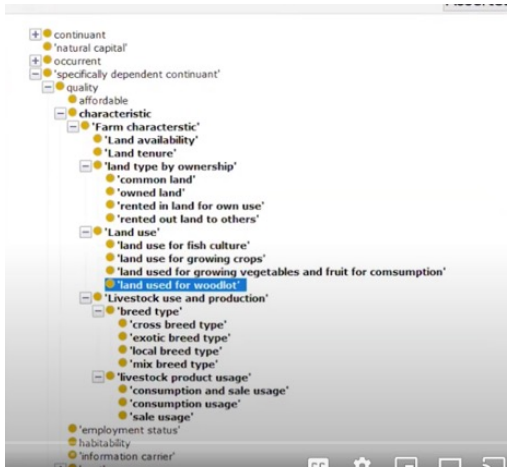
Will comply with the OBO Foundry principles

Jacqueline Muliro

Socio Economic Ontology SEONT

The SEONT was created with mixed top-down (from questionnaires) and bottom-up methodology (reusing existing concepts from 13 ontologies)

SEONT objective is to annotate the surveys conducted with RhoMIS, Advanced system for rural household surveys – 30,732 surveys to date https://www.rhomis.org /



Soonho Kim

Modules:

- Household composition & characteristics
- Farm characteristics (land availability, land use, livestock use…)
- Income and Assets
- Gender (Asset ownershi,; decision control, empowerement)
- Food security and dietary diversity
- Extension servcies & innovation

OBO Foundry Principles

High quality

Community-verified

Interoperable ontologies

Logically well-formed

Scientifically accurate

Quick Summary

The following summarizes each principle. See individual pages for details.

P1) **Open** - The ontology MUST be openly available to be used by all without any constraint other than (a) its origin must be acknowledged and (b) it is not to be altered and subsequently redistributed in altered form under the original name or with the same identifiers.

P2) **Common Format** - The ontology is made available in a common formal language in an accepted concrete syntax.

P3) **URI/Identifier Space** - Each ontology MUST have a unique IRI in the form of an OBO Foundry permanent URL (PURL).

P4) **Versioning** - The ontology provider has documented procedures for versioning the ontology, and different versions of ontology are marked, stored, and officially released.

P5) **Scope** - The scope of an ontology is the extent of the domain or subject matter it intends to cover. The ontology must have a clearly specified scope and content that adheres to that scope.

P6) **Textual Definitions** - The ontology has textual definitions for the majority of its classes and for top level terms in particular.

P7) **Relations** - Relations should be reused from the Relations Ontology (RO).

P8) **Documentation** - The owners of the ontology should strive to provide as much documentation as possible.

P9) **Documented Plurality of Users** - The ontology developers should document that the ontology is used by multiple independent people or organizations.

P10) **Commitment To Collaboration** - OBO Foundry ontology development, in common with many other standards-oriented scientific activities, should be carried out in a collaborative fashion.

P11) **Locus of Authority** - There should be a person who is responsible for communications between the community and the ontology developers, for communicating with the Foundry on all Foundry-related matters, for mediating discussions involving maintenance in the light of scientific advance, and for ensuring that all user feedback is addressed.

P12) **Naming Conventions** - The names (primary labels) for elements (classes, properties, etc.) in an ontology must be intelligible to scientists and amenable to natural language processing. Primary labels should be unique among OBO Library ontologies.

P16) **Maintenance** - The ontology needs to reflect changes in scientific consensus to remain accurate over time.

Alliance

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

CGIAR

Merci!

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