

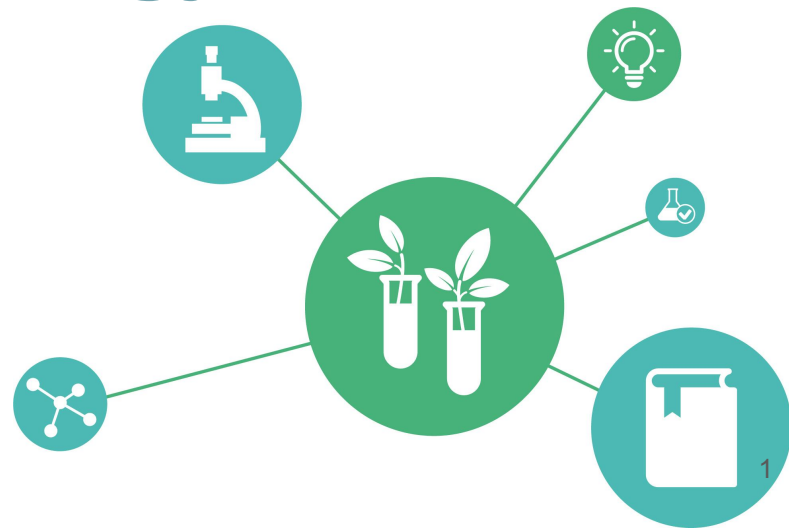


Food and Agriculture Organization
of the United Nations

AGROVOC

Revising the Agrontology

22 September 2021



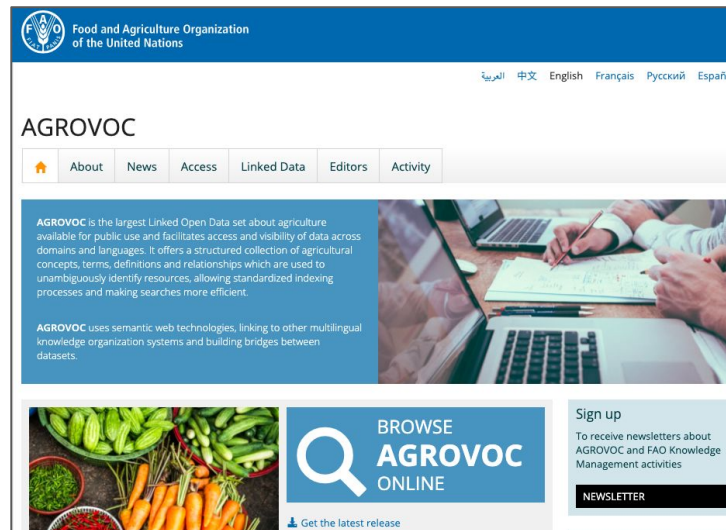
What is AGROVOC?



Multilingual thesaurus
available in up to 40 languages

Managed by FAO
in collaboration with more than 25
institutions in 22 countries.

Covers all areas of interest to FAO
Food, nutrition, agriculture, forestry,
fisheries, environment, etc.



AGROVOC Editorial Network

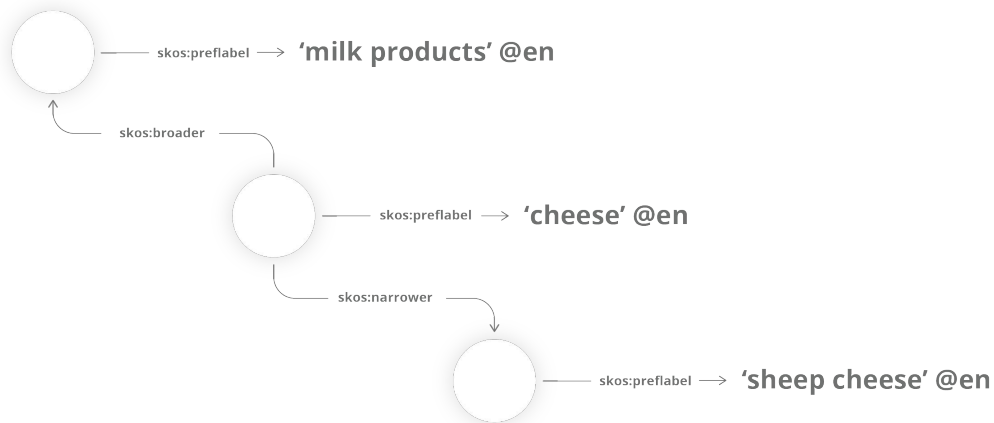


- Chinese Academy of Agricultural Sciences (**China**)
- Czech General Institute of Agricultural Economics and Information (**Czech Republic**)
- Iranian Research Institute for Scientific Information and Documentation (**Iran**)
- CIRAD (**France**)
- TECHINFORMI (**Georgia**)
- Gödöllo Agribusiness Centre (**Hungary**)
- Indian Institute of Technology Kanpur (**India**)
- Biblioteca Storica Nazionale dell'Agricoltura (**Italy**)
- AFFRIT (**Japan**)
- National Agriculture and Forestry Research Institute (**Lao People's Democratic Republic**)
- Norwegian University of Life Sciences (**Norway**)
- The Republican Scientific Agricultural Library State Agrarian University (**Republic of Moldova**)
- Central Agricultural Library (**Poland**)
- Central Scientific Agricultural Library (**Russian Federation**)
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- Belarus Agricultural Library, National Academy of Sciences (**Belarus**)
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- Kasetsart University, Department of Computer Engineering, Thai National AGRIS Centre, Kasetsart University (**Thailand**)
- Department of Training, Extension and Publications, Ministry of Food Agriculture and Livestock (**Turkey**)
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- Kuratorium für Technik und Bauwesen in der Landwirtschaft e. V. (KTBL) and Leibniz-Informationszentrum Lebenswissenschaften and BonaRes Centre for Soil Research (**Germany**)
- Aquatic Sciences and Fisheries Abstracts (**ASFA**) and FAOLEX (**FAO**)
- Land Portal Foundation (**LPF**)
- International Center for Agricultural Research in the Dry Areas (**ICARDA**)

AGROVOC is an RDF/SKOS-XL concept scheme



From a formal point of view, AGROVOC is an RDF/SKOS-XL concept scheme. The classical BT/NT thesauri relations are expressed by the SKOS predicates `skos:broader` and `skos:narrower`. SKOS is part of the Semantic Web family of standards, and its main objective is to enable easy publication and use of such vocabularies as linked data.

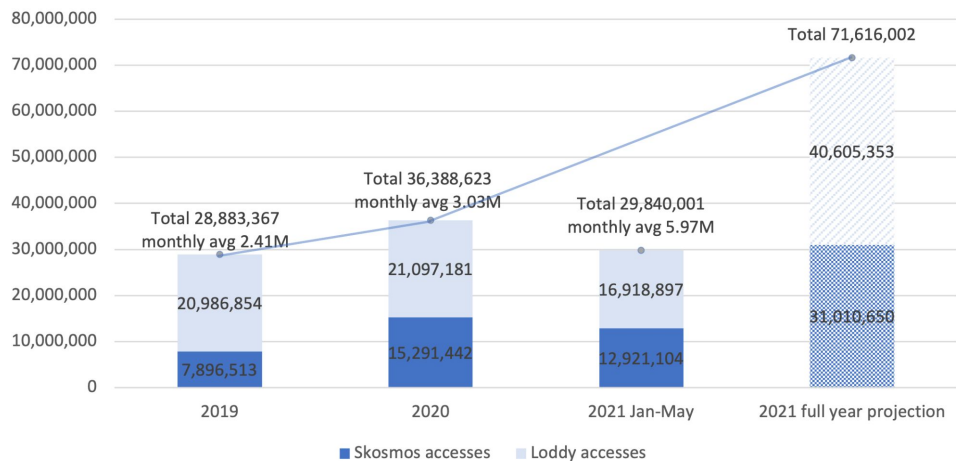


In addition to SKOS properties, it is possible to use a number of relations to state that two concepts are related to one another through the Agrontology, a support ontology for AGROVOC.

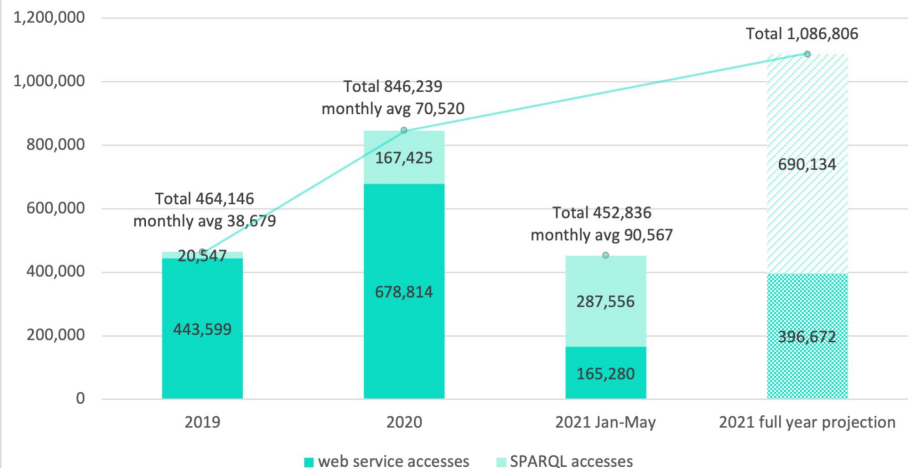
AGROVOC use



Total AGROVOC accesses
Single resource



Total AGROVOC accesses
Multiple resource



Updated projection accesses for year: 68,962,266 single resources, 1,228,364 multiple resources

The Agrontology



A Web Ontology Language (OWL) vocabulary providing a set of additional domain properties to the AGROVOC thesaurus. The URI of the Agrontology ontology is: <http://aims.fao.org/aos/agrontology> and its namespace is <http://aims.fao.org/aos/agrontology#>. Most are concept-to-concept relations, such as `isProducedBy/produces`, `hasComponent/isComponentOf`, `hasPest/pestOf`. Some are also label-to-label relations, like `HasOldName/isOldNameOf` or `hasSynonym / hasSynonym`. Many, but not all, are symmetric properties.

[products](#) > [plant products](#) > [oilseeds](#) > sesame seed

PREFERRED TERM

 **sesame seed** 

BROADER CONCEPT

[oilseeds](#) (en)

ENTRY TERMS

 *sesame* (en)

IS PRODUCED BY

[Sesamum indicum](#) (en)

IS SOURCE OF

[sesame oil](#) (en)

IN OTHER LANGUAGES

 سمن

Arabic

 芝麻

Chinese

 sezam

Czech

 seesamin siemenet

Finnish

Status Quo



The Agrontology has 170 properties. These are also known as refined relationships.

This vocabulary defines properties relating concepts as sub-properties of `skos:related` and properties relating labels as sub-properties of `skosxl:labelRelation`.

Most date from a joint initiative of FAO and ICRISAT in the mid-2000s. The first version of the AGROVOC concept scheme was developed in OWL and was later converted to a standard SKOS-XL model. The Agrontology was meant to complement that as a class-based ontology when required to support reasoning.

 `:isPerformedByMeansOf`

 `:isPropagationMaterialOf`

 `:isSourceOf`

 `:isStudiedBy`

 `:isSubstituteFor`

 `:isUsedAs`

 `:isUsedIn`

 `:isUsedToMake`

 `:isUseOf`

 `:isWeedOf`

 `:makeUseOf`

 `:quantitativeRelationship`

 `:greaterThan`

 `:isMeasuredBy`

 `:measures`

 `:smallerThan`

 `:usingValue`

Why change?



Most of the Agrontology properties have **not been applied consistently** and at scale. Only 22 properties of the 170 have been used more than 500 times in AGROVOC, while 61 properties have never been used (September 2021).

Why? Reasons include

- complicated structure, too unwieldy for practical use
- lack of a well-understood model of concept types
- large number of possible and somewhat overlapping options
- many properties in Agrontology lacked clear definitions.

Usage September 2021	
< http://aims.fao.org/aos/agrontology#hasScientificName >	17147
< http://aims.fao.org/aos/agrontology#hasBroaderSynonym >	9124
< http://aims.fao.org/aos/agrontology#hasTaxonomicRank >	8580
< http://aims.fao.org/aos/agrontology#isUsedAs >	2506
vs	
< http://aims.fao.org/aos/agrontology#isParentOf >	0
< http://aims.fao.org/aos/agrontology#isPerformedByMeansOf >	0
< http://aims.fao.org/aos/agrontology#isPhysiologicalFunctionOf >	0
< http://aims.fao.org/aos/agrontology#isPostProductionPracticeFor >	0

OWL vs SKOS

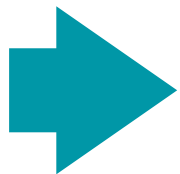


	SKOS	OWL
ontological commitment	minimal	strong
reasoning	reflects the flexible way that people think, “everyday reasoning”	foundations in (formal) logic
core elements	Concepts: ideas, loosely related	Classes: tightly defined, constrained
relations and properties	mostly terminological: labels, broader, narrower...	user defined, potentially strongly restricted (ranges, domains, datatypes...)
practical scalability	large number of concepts can be easily handled	prone to introducing logical flaws the larger the ontology

Objectives, Requirements, Challenges



- given the current number of concepts and AGROVOC growth, it is important to keep it maintainable and scalable
- nevertheless, we want to express richer semantic relations, that capture agri-food domain expertise, between concepts (and labels)
- complex reasoning capabilities are often not required and we do not want to introduce the necessity for it in editing work
- we do not want to throw away existing work, as people might be using AgrOntology URIs in their own systems already



need to find a good compromise between SKOS and OWL based on what exists already

The process



2019: in-depth analysis of the AGROVOC Agrontology

2020: lengthy discussions by AGROVOC editorial taskforce

2021: AGROVOC editorial taskforce is finalizing recommendations about Agrontology simplification

A revision of Agrontology is ongoing. The plan: 170 properties → about 70 active properties. Some properties will be hidden from active view for AGROVOC editors. Nothing will be deprecated. All will remain in AGROVOC releases.

The Agrontology is also being translated into FAO languages (English, French, Spanish, Arabic, Russian and Chinese). Better definitions will also be looked at to improve comprehension and use.

More outreach planned for editors.

Approach



- keep simplicity and define *only* properties as specializations of `skos:related`
- but use OWL for these definitions
- no classes, no concept types
- review existing AgrOntology properties:
 - usage in AGROVOC
 - documentation
- improve definitions to clarify meaning for the editorial community

Example in OWL

<https://agrovoc.fao.org/agrovocReleases/agrontology/agrontology.owl>

```
<owl:ObjectProperty rdf:about="http://aims.fao.org/aos/agrontology#isCausedBy">
  <rdfs:comment xml:lang="en">Y &lt;isCausedBy&gt; X. A result Y occurred because of an agent X ...</rdfs:comment>
  <rdfs:label xml:lang="en">Is caused by</rdfs:label>
  <rdfs:subPropertyOf rdf:resource="http://aims.fao.org/aos/agrontology#causativeRelationship"/>
  <owl:inverseOf>
    <owl:ObjectProperty rdf:about="http://aims.fao.org/aos/agrontology#causes">
      <rdfs:comment xml:lang="en">X &lt;causes&gt; Y. Agent X (animate or inanimate) brings about...</rdfs:comment>
      <rdfs:label xml:lang="en">Causes</rdfs:label>
      <rdfs:subPropertyOf rdf:resource="http://aims.fao.org/aos/agrontology#causativeRelationship"/>
      <owl:inverseOf rdf:resource="http://aims.fao.org/aos/agrontology#isCausedBy"/>
    </owl:ObjectProperty>
  </owl:inverseOf>
</owl:ObjectProperty>
```

Proposed to keep in active view in VocBench



processRelationship

isProcessFor / usesProcess
isUsedIn / makeUseOf
hasGoalOrProcess/isAchievedByMeansOf
hasObjectOfActivity / isObjectOfActivity

causativeRelationship

affects / isAffectedBy
afflicts / isAfflictedBy
Causes / isCausedBy
hasDisease / isDiseaseFor
hasHost / isHostFor
hasPathogen / isPathogenOf
hasPest / pestOf
hasProperty / isPropertyOf
IsDerivedFrom / isSourceOf
isMadeFrom/isUsedToMake
isPreventedBy / prevents
isProducedBy / produces

quantitativeRelationship

isMeasuredBy/measures
hasSymptom/indicates

spatialRelationships

isSpatiallyIncludedIn / spatiallyIncludes
surroundedBy / surrounds

taxonomicRelationship

hasTaxonomicRank / isTaxonomicRankOf
hasTaxonomicConcept/HasCommonNameConcept

partitiveRelationship *(to create as new)*

hasPart/isPartOf
compose/isComposedOf
hasComponent/isComponentOf
hasMember / isMemberOf
includes/includedIn

skosxl:labelRelation (Label to label relationships)

hasSynonym / hasSynonym
hasAbbreviation / isAbbreviationOf
hasAcronym/isAcronymOf
hasOldName / isOldNameOf
hasScientificName / scientificNameOf
hasSymbol/isSymbolFor

skos:notation

hasCodeFaoterm
hasCodeISO3Country
M49code

Other

isPartOfSubvocabulary
hasTermType

Example: affects, afflicts, causes...



- Needed: better definitions, clarity on application, real examples

affects/ isAffectedBy	X <affects> Y. Action of agent X changes the state or location of Y. E.g. "water depletion" <affects> "groundwater table"; "mechanical damage" <affects> "postharvest quality". Y <isAffectedBy> X. An object Y changes state or location because of an action of an agent X. E.g. "bacteria" <isAffectedBy> "sterilization"; "food safety" <isAffectedBy> "contamination". Do not use for diseases or disorders.
afflicts / isAfflictedBy	X <afflicts> Y. The disease or disorder X could adversely affect the health of an organism or body part Y. E.g. "scrapie" <afflicts> "sheep"; "goats", "oesophageal diseases" <afflicts> "oesophagus" Y <isAfflictedBy> X. The health of an organism Y could adversely be affected by the disease X. E.g. "honey bees" <isAfflictedBy> "colony collapse disorder".



- Consistency and cleanup needed: frog legs `isDerivedFrom` frogs, mutton `productOf` sheep, but horse meat `isProducedBy` horses?
- Disambiguation needed on properties like `usesProcess`, `makeUseOf`, `isAchievedByMeansOf`, `isObjectOfActivity`, `isUseOf`, `isMeansFor`.

Agrontology in VocBench




In VocBench, it is possible to maintain a thesaurus and a related ontology in the same project, and let them evolve as one resource. All SKOS projects in VocBench have all OWL functionalities, with support for SKOS. In order to see all the consequences of inheritance, it is best to enable a reasoner. All stores supported by VocBench offer some kind of reasoning.

The original Agrontology was not developed using VocBench, but now we plan to manage it using Vocbench3, and there is a dedicated project for it. Agrontology is now a project in Vocbench with History and Validation enabled.

Current project: agrontology  Global Data Management 

VocBench


Data

Metadata 

SPARQL


History

Validation




Tools 

Commits

Operation sort:

Unordered 

 Time s

Commit ID	Operation	1st param	Other param(s)
metadata0edf46c6-e2a9-436a-a4eb-387d127e1b7c	update triple	subject: <http://aims.fao.org/aos/agrontology>	property: <http://purl.org/dc/terms/modified> 
metadataae51196ce-6007-466f-b002-154cdcad67c5	remove expression	classiri: <http://aims.fao.org/aos/agrontology#hasTermType>	exprType: <http://www.w3.org/2000/01/rdf-schema#range> 
metadata7c809593-a53b-4c57-a1ea-82355e8737fe	add property range	property: <http://aims.fao.org/aos/agrontology#hasTermType>	range: <http://aims.fao.org/aos/agrontology#RangeOfHasTermType>
metadataaa3873561-df01-4370-9fed-70197a32f3e3	remove expression	classiri: <http://aims.fao.org/aos/agrontology#isPartOfSubvocabulary>	exprType: <http://www.w3.org/2000/01/rdf-schema#range> 
	add property	property: <http://aims.fao.org	range: <http://aims.fao.org

More information:

[http://vocbench.uniroma2.it/doc/user/projects.jsf#repository configuration](http://vocbench.uniroma2.it/doc/user/projects.jsf#repository_configuration)

ClassConceptSchemeCollectionPropertyDatatype

- A C ▾
- agrontology:isNaturalEnemyOf

agrontology:isObjectOfActivity

agrontology:isPathogenOf

agrontology:isPerformedBy

agrontology:isPhysiologicalFunctionO

agrontology:isPracticeFor

agrontology:isPreventedBy

agrontology:isProducedBy

agrontology:isPropagationProcessOf

agrontology:isPropertyOf

agrontology:isThemeOf

agrontology:performs

agrontology:pestOf

agrontology:prevents

agrontology:produces

agrontology:productOf

agrontology:growsIn

barley (en), orge (fr), شعير (ar), ječmen... agrontology:isProducedBy

agrontology:isProducedBy http://aims.fao.org/aos/agrontology# isProducedBy Rename A Eye Filter Clock Refresh Settings ▾

Types:

rdf:type

owl:ObjectProperty

Equivalent properties:

Superproperties:

rdfs:subPropertyOf

agrontology:causativeRelationship

Subproperty chain axioms:

Facets:

☐ symmetric

☐ asymmetric

☐ functional

☐ inverseFunctional

☐ reflexive

☐ irreflexive

☐ transitive

owl:inverseOf

agrontology:produces

Disjoint properties:

Domains:

Property	Value
rdf:type	skos:Concept
skos:inScheme	http://aims.fao.org/aos/agrovoc
skos:broader	http://aims.fao.org/aos/agrovoc/c_1474
skos:narrower	http://aims.fao.org/aos/agrovoc/c_5b8bcf68
	http://aims.fao.org/aos/agrovoc/c_25485
	http://aims.fao.org/aos/agrovoc/c_e4483107
	http://aims.fao.org/aos/agrovoc/c_ad10e027
skos:exactMatch	http://lod.nal.usda.gov/nalt/15848
	http://cat.aii.caas.cn/concept/7536
	http://dbpedia.org/resource/Barley
	http://eurovoc.europa.eu/2193
	http://d-nb.info/gnd/4156898-9
	http://stitch.cs.vu.nl/vocabularies/rameau/ark:/12148/cb11934523g
skos:closeMatch	http://zbw.eu/stw/descriptor/14087-6
	http://purl.org/bnct/tid/47054
	http://purl.org/bnct/tid/46520
skos:broadMatch	http://dbpedia.org/resource/Barley
	http://cat.aii.caas.cn/concept/7567
	http://cat.aii.caas.cn/concept/7544

Property	Value
dcterms:created	2012-02-03T17:06:39Z
dcterms:modified	2021-06-16T21:24:42Z
http://aims.fao.org/aos/agrontology#hasProduct	http://aims.fao.org/aos/agrovoc/c_15941
http://aims.fao.org/aos/agrontology#isProducedBy	http://aims.fao.org/aos/agrovoc/c_3662
http://aims.fao.org/aos/agrontology#isUsedToMake	http://aims.fao.org/aos/agrovoc/c_03961d6f
http://aims.fao.org/aos/agrontology#produces	http://aims.fao.org/aos/agrovoc/c_4547
void:inDataset	http://aims.fao.org/aos/agrovoc/void.ttl#Agrovoc
skos:definition	http://aims.fao.org/aos/agrovoc/xDef_a56e776f

prefLabel	altLabel	Lang
شعير		ar
ječmen		cs
Gerste		de
barley		en
Cebada		es
جو (گياه)		fa
orge	escourgeon	fr
जौ		hi
árpa		hu
Orzo		it
オオムギ		ja
보리		ko
ຂົ້ວບາເລ		lo
Jęczmień (ziarno)		pl
cevada		pt
ячмень (зерно)		ru
jačmeň		sk
ข้าวบาร์เลย์		th
大麦		zh
Barli		ms
arpa		tr
ಜೀ ಇಡ್ಲಿ ಹಾಲುಗಿ ಮೊಡ		te
ງຽກົດ		ka
orz		ro
bygg		nb
elb		sq
byg		da
κριθάρι		el

The bigger picture



FAO is playing a role in assessing and responding to its potential impacts on people's life and livelihoods, global food trade, markets, food supply chains and livestock. Data-driven decision making is essential to drive further research, support ongoing investigations and share critical knowledge. Controlled vocabularies like AGROVOC play a small but important part in ensuring that data and research are accessible, also across languages.



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