Food and Agriculture Organization of the United Nations

AGRIS, the International System for Agricultural Science and Technology

User guide

Abbreviations and acronyms

AGRIS: International System for Agricultural Science and Technology

AIMS: Agricultural Information Management Standards portal of the FAO

LOD: Linked Open Data

M2B: Meaningful Bibliographic Metadata

OAI-PMH: Open Archives Initiative Protocol for Metadata Harvesting

ODS: Open Data Set

RDF: Resource Description Framework

SDGs: Sustainable Development Goals

URI: Uniform Resource Identifier

XML: Extended markup language

Contents

Executive summary

Research organizations, higher education institutions and policy-makers require access to relevant and timely scientific information to generate knowledge, strengthen research capacity and support informed decision-making in the food and agriculture domains. To help provide access to scientific information, the Food and Agriculture Organization of the United Nations (FAO) enables knowledge transfer through the use of online platforms such as AGRIS, the International System for Agricultural Science and Technology.

AGRIS is one of the most comprehensive databases for food and agricultural scientific literature worldwide. Accessible through a web portal, millions of bibliographic records in 90 different languages are available for free to global users. An international network of data providers, including publishers, governments and organizations, volunteer information (metadata) about science publications. These records are provided in multilingual formats and frequently include full text links to connect users to scientific literature worldwide.

Grey literature, journal articles and technical reports may not be sufficiently utilized, or could even be lost, if technologies are not employed to ensure that such resources are commonly accessible, interoperable and reusable. By making bibliographical information of research literature and references to research data available in a large collection, AGRIS provides global information commons for agricultural research. As all records are also indexed by Google Scholar, participation in AGRIS also increases the visibility of locally-contributed data beyond peer-reviewed dissemination of knowledge.

The AGROVOC multilingual thesaurus is one of the main pillars in building the information commons for food and agriculture. But the power of a globally-distributed participatory information system can only be fully realized if every contributor applies certain standards, including using accepted language and terminology. AGROVOC helps to provide a common vocabulary for food and agriculture worldwide and, currently, allows users to work with more than 38 000 relevant agricultural concepts across 40 languages. Consequently, AGROVOC allows AGRIS to transcend technical, geograhical, political and lingual boundaries.

Over recent years, AGRIS has evolved to become an acknowledged information resource worldwide by moving from paper to digital, and from a centralized model to a distributed network. This guide aims to update the AGRIS community about the latest technical developments, recommended standards and various ways to engage with AGRIS.

Key messages

AGRIS provides free access to more than 12 million bibliographic records, including over 1 500 datasets

AGRIS records are available in more than 90 languages

AGRIS records are predominantly based on the AGROVOC multilingual thesaurus covering all FAO's interest areas

"**AGRIS is a service that allows the import of … global information in agricultural and food sciences for Belarusian scientists, specialists and practicals. At the same time, AGRIS is a service that allows the export of … Belarusian scientific knowledge in the fields of agriculture, forestry, food and natural resources into the global information space.**"

Veranika Babaryka-Amelchanka, Belarus Agricultural Library of the National Academy of Sciences of Belarus (Belarus)

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1. About **AGRIS**

AGRIS consists of three elements – a network, a database and a web portal. The AGRIS network refers to the contributing community of up to 450 institutions and 150 countries. AGRIS is also a database with millions of structured bibliographical records on agricultural science and technology. Finally, AGRIS is a web portal that links AGRIS knowledge to related web resources. The purpose of AGRIS is to provide comprehensive scholarly research information in the agricultural domain, accepting content related to all FAO's areas of interest from data providers. AGRIS is used by anyone interested in such literature, including students, scientists, librarians, researchers, publishers and policy-makers, among others.

AGRIS users
- government officials
- graduate students
- lecturers
- librarians and other information professionals
- practitioners in the agriculture sector
- professional associations
- publishers
- researchers

AGRIS data providers
- academic institutions
- development programmes
- international and national organizations
- governmental bodies
- libraries
- publishers
- research centres

Types of content

books
conference papers
data sets
journal articles
scientific and technical projects
technical reports
theses

Some topics covered by AGRIS

agriculture
animal husbandry
biotechnology
environment
fishing and aquaculture
food
food technology
food toxicology
forestry
plant protection
veterinary medicine

2. The **AGRIS** search interface

Any user can access AGRIS at agris.fao.org. AGRIS facilitates access to knowledge and information by indexing books, journal articles, monographs, book chapters, datasets and grey literature including unpublished scientific and technical reports, theses, dissertations and conference papers. AGRIS indexes bibliographic references but does not store the full text articles. Resources submitted before 2010 may not have the link.

For records without a link to the full text, it is recommended that the user contact the data provider directly to ask for an electronic copy of the resource.
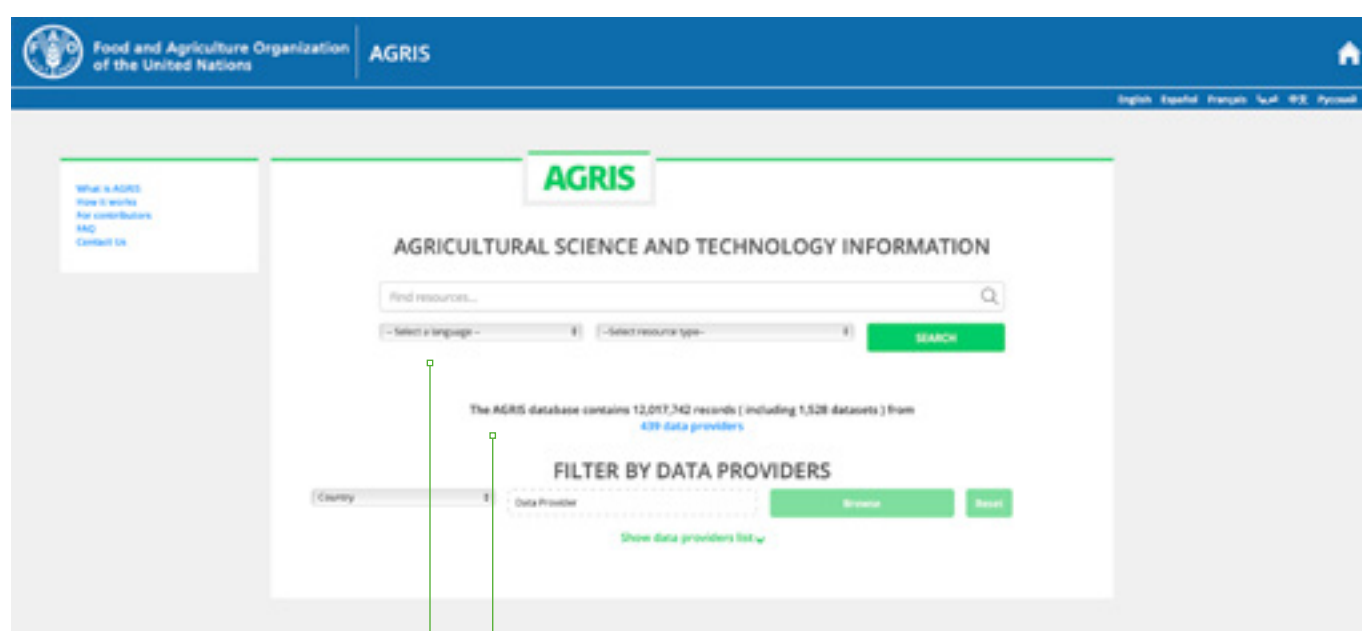
Figure 1
AGRIS homepage

The AGRIS search interface can be displayed in English, Spanish, French, Arabic, Chinese and Russian.

In the central part of the AGRIS homepage, general information about the database is available: the number of records, the number of data sets, and the number of data providers.

AGRIS offers several options to search for information:
- simple search – using keywords and phrases
- truncation and wildcards
- advanced – using Boolean operators
- filtering the search results
- browsing

2.1 Simple search

Searching in AGRIS is very simple. To start the search, the user can type any keywords related to a topic, author names, or title into the search box. As the user types in the search box, suggested terms, which are optional, will appear. The AGRIS search engine is activated by the user clicking the magnifying glass icon, the 'Search' button, or pressing 'Enter' on a keyboard. A page of results related to the search terms will be displayed.

The search in AGRIS can be performed according to the following access keys: AGROVOC terms, author, conference, collective authorship, ISBN, ISSN, journal title, publisher or title.

Figure 2
An example of search
results page in AGRIS

Figure 3
An individual search
result in AGRIS

The results page displays the initial search results in the main column of the page, as shown in Figure 2. The order of viewing results can be arranged by either descending or ascending relevance or submission year, using a drop-down menu option at the top right of the results list. 'Relevance' refers to the search query terms and filters used, while 'Submission year' refers to when information for a record was submitted to AGRIS by the data provider.

The ten results on each page are displayed with an icon that reflects the type of literature indexed, see Figure 2. Each result includes a preview with some information, such as title, author, publication year, a data provider, and/or subject terms. A result may also include an abstract and will state if the full text is available.

Selecting an individual result displays the information from the preview with additional metadata. An individual result is shown in Figure 3 and is selected by clicking on the blue hyperlinked title from the results list.

There are several additional tools to help users filter and browse for the most suitable results. The user can apply these features at different steps of the search: from the homepage, list of results or the page for an individual record.

AGRIS also enables multilingual searching. From the homepage, it is possible to 'Select a language' as an additional command to the main 'Search' box. In order to enhance ease of use, the number of languages available in the homepage drop-down menu is limited; however, the user can search in up to 90 languages through the 'Search' box. Searching by typing keywords in any language is the most precise method to discover what is available in a specific language; the results page and advanced search features also include a multilingual function. However, it should be noted that although many AGRIS results are indexed using English, the original work may be written in a different language.

Refining search strategies is recommended to find pertinent content in AGRIS, for example:

1. **Defining a research topic**, such as *"The use of nutritional additives in bee feeding to increase the productivity of bee families"*.

2. **Identifying search concepts from the research topic**. For example by keywords: *Apis mellifera*; *bee colony*; *nutritional additive*; *bee feeding*; or phrases: *"additives in bee feeding"*.

3. **Performing a simple search**. Enter a keyword or phrase in the search bar and click the button at the far right side of the page. It is recommended to structure a search in a correct, clear and explicit way in line with the research topic.

4. **Analysing the search results and making the necessary adjustments to the strategy used**. An effective search strategy should show only the results that match the identified search and contain the specific concepts a user is looking for.

> **In order to perform a more precise search, use AGROVOC terms.**

> **In order to search for an exact concept, type it in double quotes.**

The AGRIS system will provide relevant documents *only* if the search terms are present in the indexing of the document, i.e. only if they exist in the documents found. If initiating a search command without completed criteria, or if there are no resources in the database that contain the search concept, AGRIS provides an error message, e.g. "No results". The search interface allows the user to limit the search according to language and resource type.

2.2 Truncation and wildcards

To truncate a word, which allows searching for all derived words, the user should keep the root and remove the ending of the word, replacing it with a 'wildcard' symbol, e.g. an asterisk (*).

Example: If the user wants to search for the terms *horticulture* and *horticultural*, the root would be 'horticulture', and the search term with truncation would have the following aspect: horticultur*.

> **Truncation**
> is useful when a user wants to find variant spellings of the same word.

"AGRIS creates a great benefit for the younger Georgian generation, who are interested in the agricultural domain and it opens the door to the rich collection of research documents, which represents the great possibility to find the potential for collaboration, examples for analyzing problems and others' methods of resolutions of problems."

Marina Razmadze, Techinformi (Georgia)

CONTENTS

1. ABOUT **AGRIS**

2. The **AGRIS** search interface

3. Contribute to **AGRIS**

4. Re-using **AGRIS** data in other information systems

5. Additional resources about **AGRIS**

2.3 Advanced search

The advanced search is available through the link 'Get advanced search' in the upper right corner of the results page. This page includes all of the previously listed AGRIS search features and options but it is organized differently to the main results page. For example, as shown in Figure 4, on the advanced search page, the results are now on the left, and the filters or further search options are on the right. Individual results can be previewed by clicking on the green arrow at the bottom of each result box.

Benefits of the advanced search include the ability to export records or link to the full text (if available) without having to view each record in a separate screen. Ten records are listed per page.

To restart the search process with new search terms and filters, or to return to the homepage of the database, a user can either click on the AGRIS title at the top of the screen or the house icon in the far right corner. To continue using advanced search, a user can select 'Reset your search'.
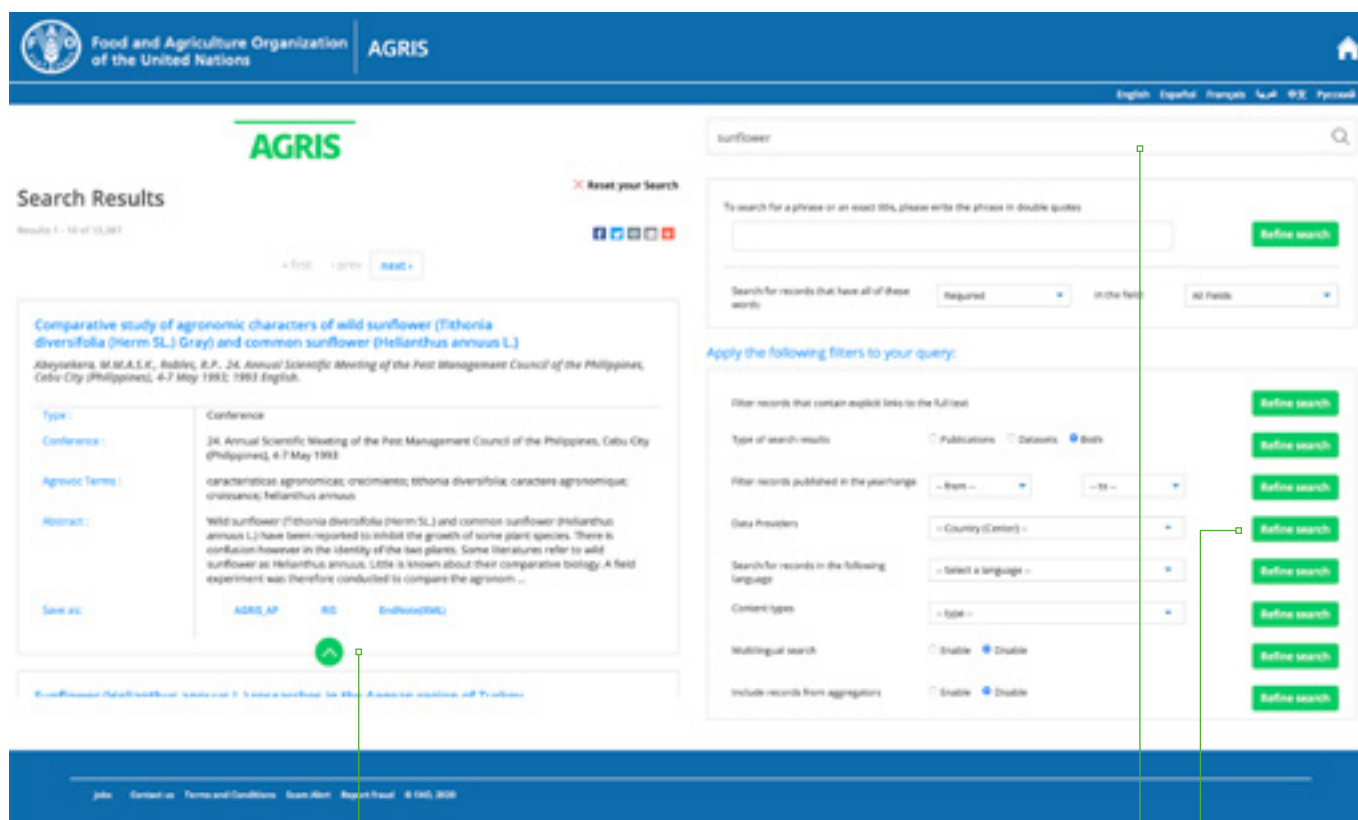
Figure 4
An individual search
result in AGRIS

Arrows open the records on the same screen as the search options, including options for saving XML records, Save as

Additional search options, building on original term used.

2.4 Boolean operators

Users can also use Boolean operators directly in the search bar to formulate more precise queries or to refine a search strategy (define, limit or broaden a search). Boolean searches combine words and phrases using the words AND, OR, NOT.

The AND operator is the logical operator for intersection, which allows AGRIS to link and combine two or more terms. This operator narrows the search to a smaller number of records than if the search is performed for each separate term. AGRIS selects the records that mention all terms and excludes those that contain separated terms, see Figure 5.

AND

SHEEP   GOATS
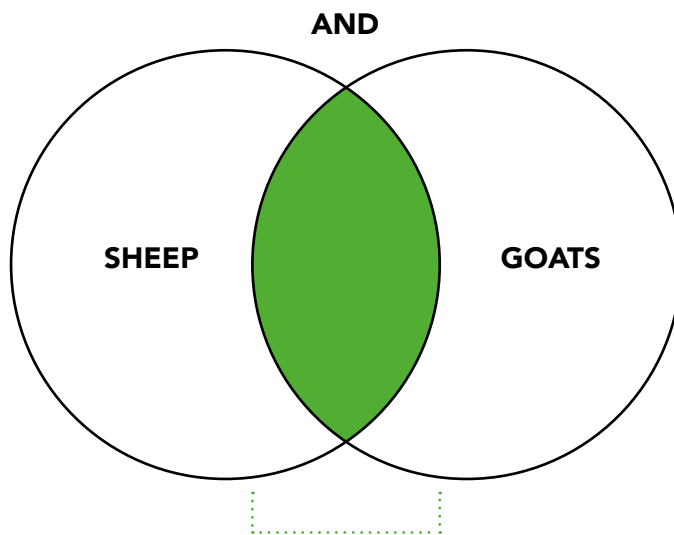
Figure 5
Example of the Boolean Search operator AND

Results with BOTH terms

OR

SHEEP   GOATS
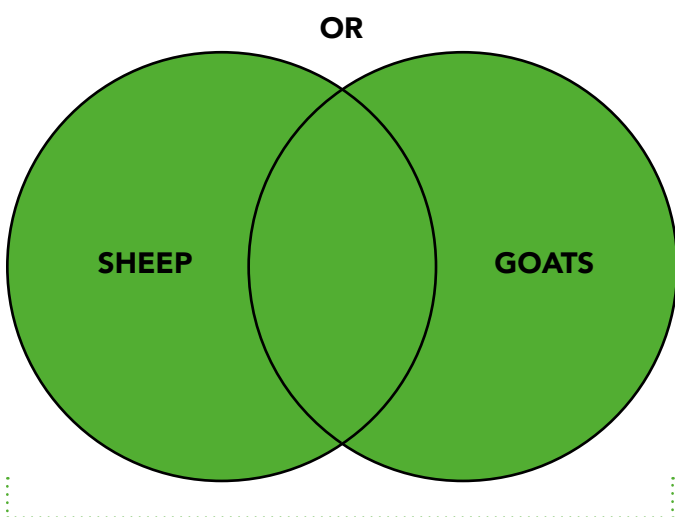
Figure 6
Example of the Boolean Search operator OR

Results with EITHER term (maximum results)

The OR operator is the logical operator of union between two or more terms. The operator widens the search and is very useful in specifying synonyms for a topic. AGRIS returns the results that correspond to either the first or the second criterion. Unlike the AND operator, the two words should not both appear in the same record, see Figure 6.

The NOT operator is the logical operator that narrows down the search so AGRIS can return the results that correspond to the first criterion, excluding those results in which the second search term appears, see Figure 7.

NOT

SHEEP   GOATS
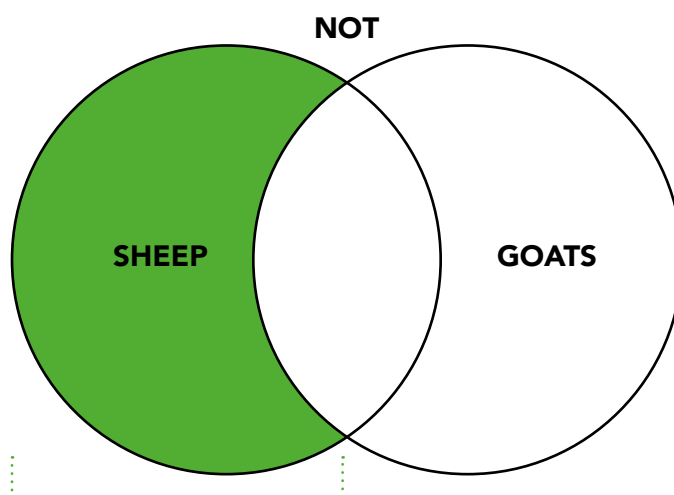
Results with ONE term (excluding results)

Figure7
Example of the Boolean Search operator NOT

2.5 AGRIS filtering options

Depending on the topic that the user is interested in, it is possible to save time in performing a search by using specific filters to refine the search. In order to narrow down the number of results, it is recommended to filter and customize the search results to find exactly what the user is looking for. There are several filtering options on the right side of the AGRIS advanced search page, see Figure 8.

2.5.1. Filtering by full text
In some cases, AGRIS provides access to the web addresses (URLs) of the documents. While searching, a user can use the option 'Filter records that contain explicit links to the full text' to retrieve only records that lead to the full text. About 1.3 million out of 12 million records in AGRIS provide access to the full text.

2.5.2. Filtering by type of search
It is possible to use the option 'Type of search results' when a user wants to select only publications or datasets.

Figure 8
The filtering options on the AGRIS search results page
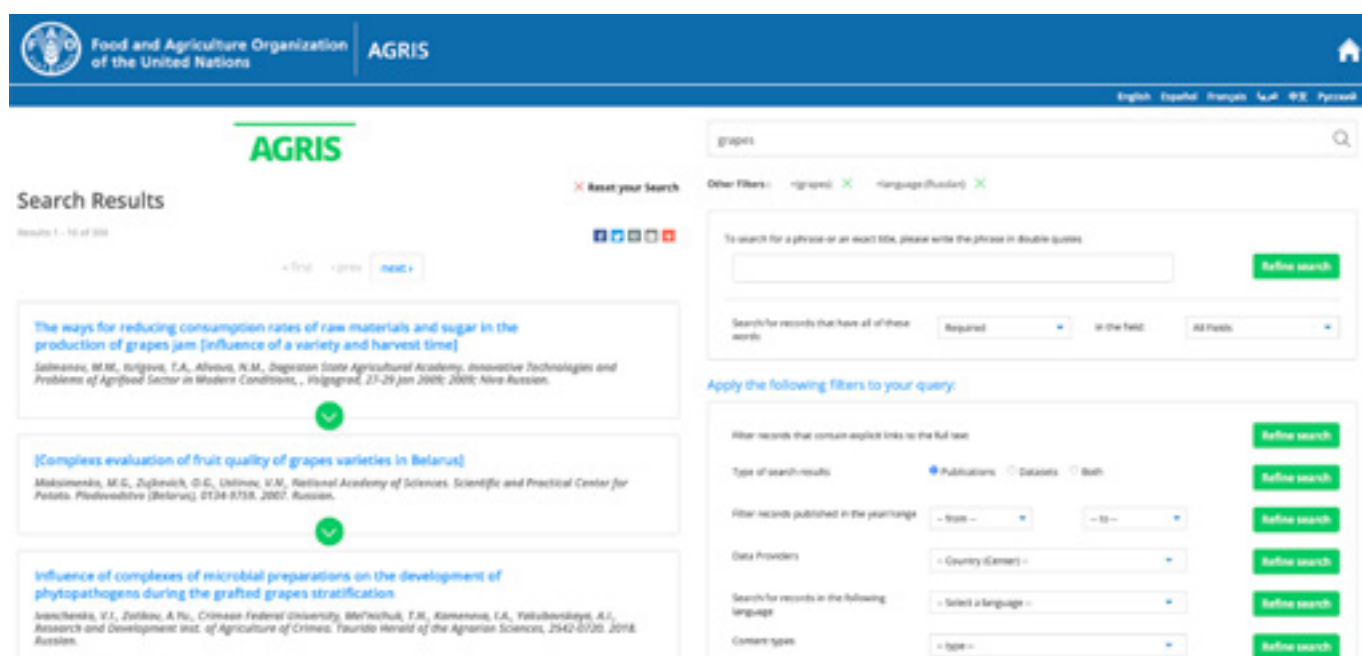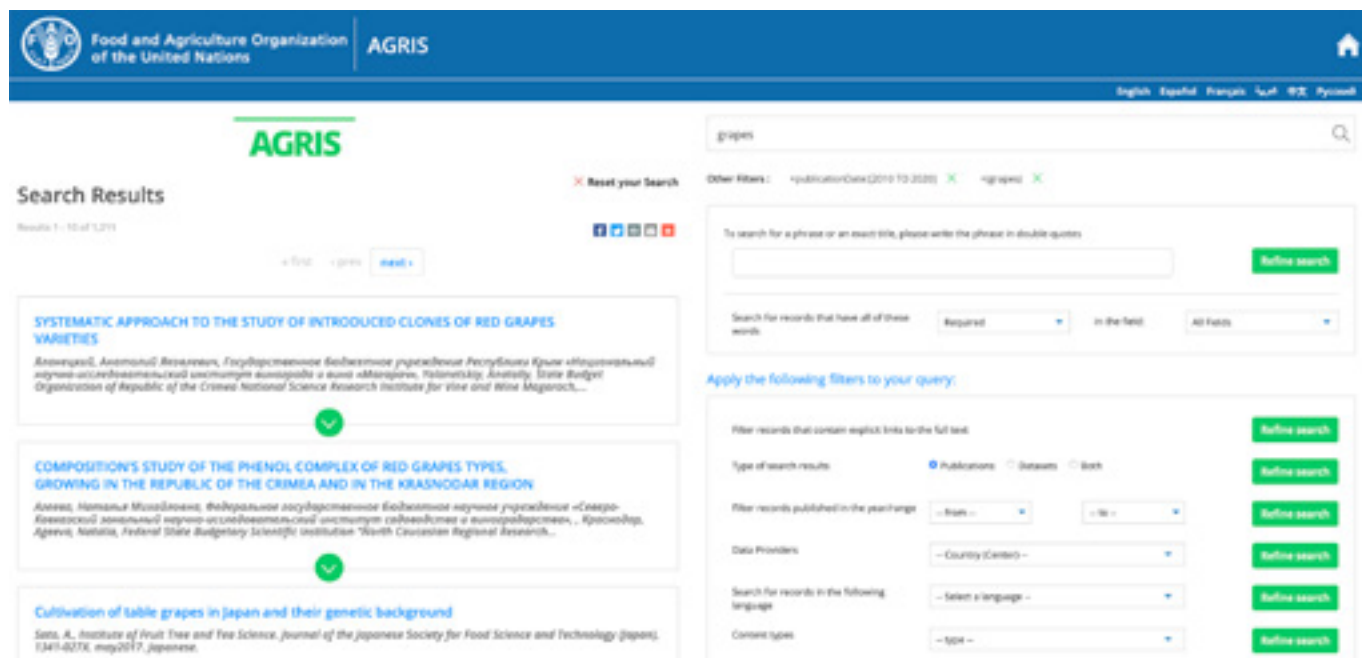
Figure 9
Example of advanced
search page results

Figure 10
Search results filtered
by language

2.5.3. Filtering by publication date

AGRIS includes publications dating back to 1965. In order to find publications on the topic of '*grapes*' for instance, published over a period of time, it is recommended to use the 'Filter records published in the year/range'. For example, it is possible to select publications edited in the last ten years by narrowing the search with the help of the buttons shown in Figure 9.

2.5.4. Filtering by language

To search for publications in a specific language, a user should choose the desired language from the option 'Search for records in the following language', see Figure 10.
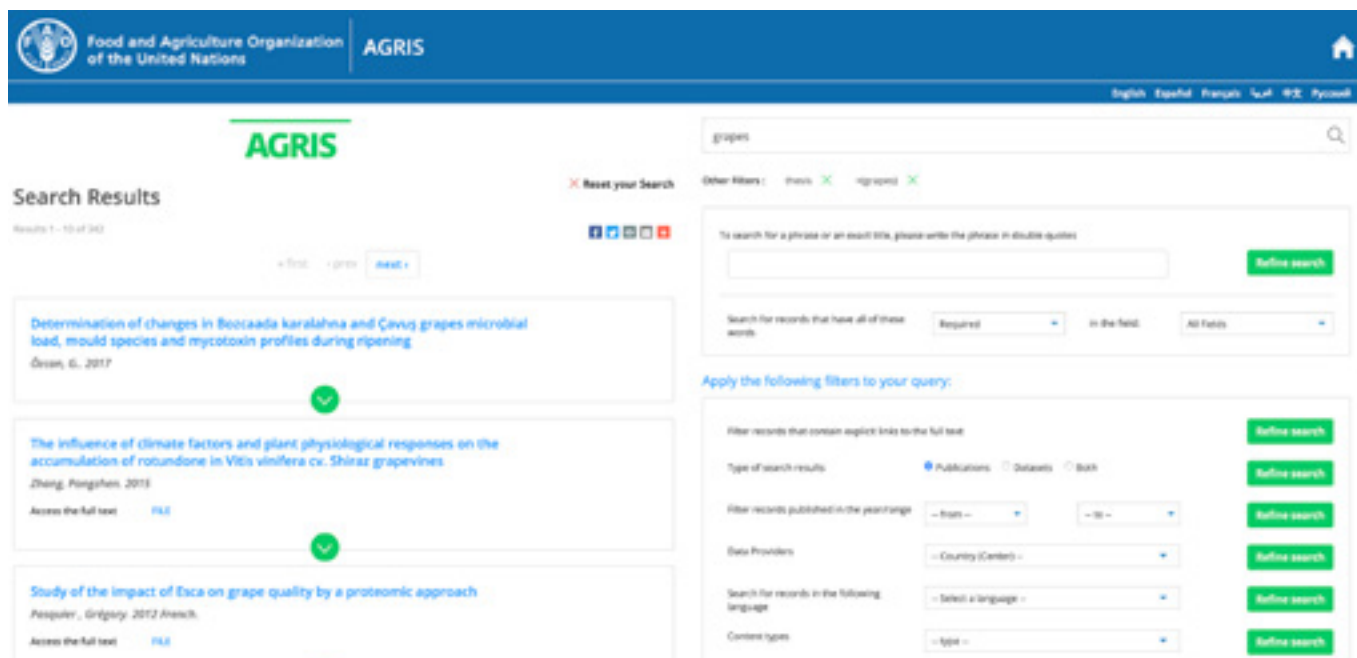
Figure 11
Search results filtered
by content type of
thesis

2.5.5. Filtering by content types
In order to refine search results, it is also recommended that a user chooses a specific content type as a filter, such as: books, theses, journal articles, conference materials, references, see Figure 11.

2.5.6. Filtering according to multilinguality
Multilingual search is an advanced filtering option that allows a user to query the AGRIS database in their native language, but to also get results in different languages, see Figure 12. This function is available in the classic search in the left column before the top ten keywords.

AGRIS uses the AGROVOC multilingual thesaurus to translate the user query into all available languages. For example, if a user inputs the keyword '*grapes*' in the search bar in Romanian, they will only get records in Romanian.

If the user then activates the filtering option for multilingual search, the AGRIS system performs the query in the languages available in AGROVOC and presents the records for all possible translations of the keyword.

This filter feature works well when the search is based on keywords. Using AGROVOC, AGRIS is able to obtain the translation of each keyword in another language. However, it does not offer great results if the search is a sentence, a title, etc; therefore, a combination of keywords is the best option.

2.5.7. Filtering by other content aggregators
AGRIS also includes records from other content aggregators, e.g. AGRICOLA or Avano, see Figure 13. When performing the search for '*grapes*', AGRIS gives 12 777 results. When enabling the filtering option to include records from aggregators, it is possible to obtain 29 619 results.

Figure 12
The Multilingual feature
option for filtering
results from AGRIS
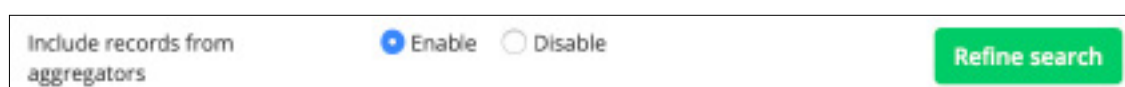
Figure 13
The 'Include records
from aggregators'
option for filtering
results from AGRIS

2.6 A result in detail

As shown in Figure 14, individual AGRIS results contain the title, author(s), publication date, an abstract, and information about the data provider. Above the title, the name of the data provider is linked to a website (if available). Methods of sharing AGRIS results are available using either the 'Add This+' options for social media or email, as well the options for saving results in AGRIS AP, RIS, or Endnote XML formats. These formats allow bibliographic reference management software to exchange data. Applications, such as Zotero, Citavi, Mendeley and EndNote, can export and import citations in these formats.

Note: The bibliographic information will state which language the AGRIS record is indexed with and not the language in which the original referenced work is written.

A result also displays AGROVOC keywords at the bottom of the screen. Each AGROVOC keyword is hyperlinked to a new search result list, with additional records pertinent to the keyword.

The AGRIS interface provides the '*Translate with Google*' option to translate the information from the selected record. Note: as this translation tool is provided by Google, FAO is not responsible for the accuracy and precision of the translations.

Each record of AGRIS includes information about its data provider
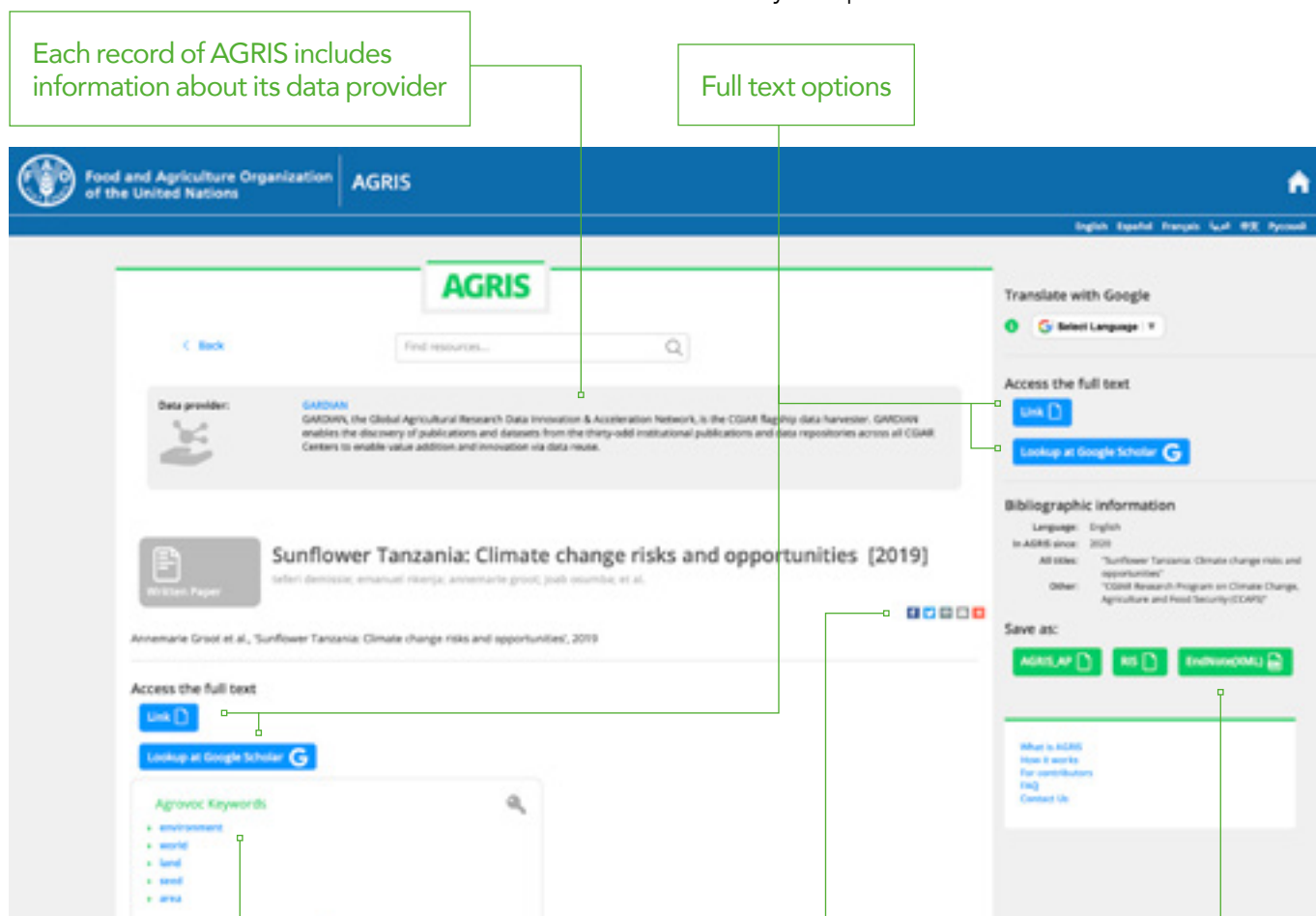
Full text options

Figure 14
AGRIS bibliographic record annotated

Related keywords for further searching

Social media and email options to share bibliographic record

Options for saving the bibliographic record in XML formats

2.7 Browse and search by AGRIS data provider

The bottom section of the homepage includes the 'Filter by data providers' option, which allows a user to navigate through different data provider collections, see Figure 15. A country must be selected from the left hand drop-down menu, which will then activate the data provider drop-down menu.

An alphabetical list by country is also available for viewing, with each provider name hyperlinked to the associated collection and a search box, see Figure 16.

The option for searching or filtering by data provider is also available on the results page, see Figure 17, or the advanced search page, see Figure 18.
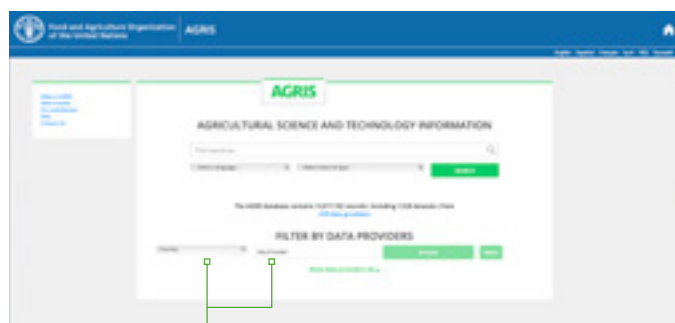
Figure 15
AGRIS homepage annotated for Data Provider option

Choose a country, then a data provider

Figure 17
Filter results by data provider on results page of AGRIS

Filter by data provider

Figure 16
AGRIS homepage annotated to show list of countries

An alphabetical list by country is also available for viewing, with each provider name hyperlinked to the associated collection and a search box
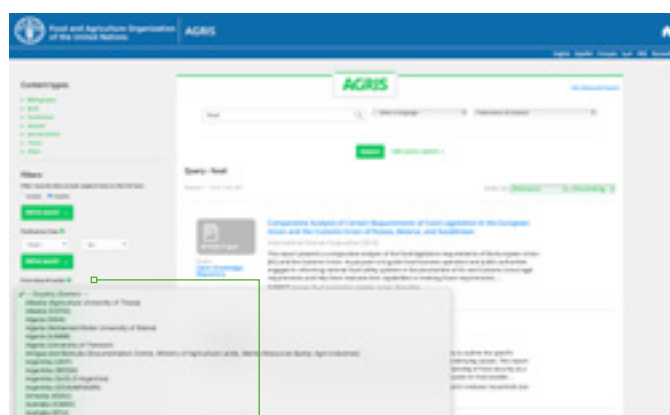
Figure 18
Filter results by data provider on advanced search page of AGRIS

Select a specific collection from a data provider, listed by nation (full names listed on the home page search of AGRIS)

3. Contribute to **AGRIS**

AGRIS exists thanks to the sharing of bibliographic references by a collaborative network of institutions. This global collaboration depends on continued contributions, especially to strengthen multilingualism and equitable representation. AGRIS accepts organizations publishing content related to FAO's areas of interest. The benefits of joining AGRIS as a data provider include further visibility through indexing by AGRIS.

The AGRIS network itself is a key element in ensuring that AGRIS, as a database and a web portal, continues to contain appropriate content from relevant stakeholders. The involvement of AGRIS users and further collaboration on technical developments also provide an invaluable opportunity to strengthen and develop new functionalities for the AGRIS portal. Feedback received from data providers, stakeholders and users is important for continued improvements to the AGRIS portal and the knowledge base.

3.1 The AGRIS Network

AGRIS is supported by a community of data providers. Institutions including research centres, academic institutions, publishers, governmental bodies, development programmes, and international and national organizations that contribute knowledge and data to the AGRIS

platform. By contributing to AGRIS, organizations help to address the lack of access to scientific literature in low and middle-income countries, and increase the flow and overall access to information in the domain of food and agriculture.

Figure 19
The AGRIS Network

Data providers in the AGRIS Network include academic publishing houses, associations, governmental organizations, international organizations, journals, libraries or information centres, non-governmental organizations, private agencies, publishers, research institutes, training centres and universities.

"...in Serbia, we primarily use AGRIS ... to share and spread scientific agricultural information from our country both in full text and metadata."

Marina Djacic, Matica Srpska Library (Serbia)

Joining AGRIS is free. By contributing to AGRIS, data providers benefit from being able to:

• be part of a dynamic international network with agricultural content which is accessible, intensively used and massively distributed in the global information space;

• jointly contribute to international science;

• exchange information and data between different countries and stakeholders and increase visibility to a broader international audience;

• share unique materials, such as unpublished scientific and technical reports, governmental publications, conference materials, data sets, maps, etc.

3.2 Joining AGRIS

3.2.1. Eligibility criteria
The first step in becoming an AGRIS data provider is to check the eligibility criteria. The applicant institution should be involved in the production and publication of information or data, as well as possess the technical capacibilies to export metadata.

An organization can contribute to AGRIS as:

• a national or specialized institution in the related FAO areas of interest;
• an institutional repository (a collection of bibliographic metadata and full content of scientific publications);
• an individual or corporate journal publisher; or
• an aggregator.

> **AGRIS does not accept contributions from individual authors**

3.2.2. Registration as an AGRIS data provider
In order to become an AGRIS data provider, it is necessary to fill in a registration form.[1]

Completion of the fields in the form marked with an asterisk in green (*) is mandatory, and of the unmarked ones is optional, as demonstrated in Table 1.

After registration and validation of the quality of metadata to be submitted, the organization will receive a confirmation and an AGRIS ID (*identity number*). This ID needs to be provided whenever the institution is in contact with agris@fao.org to facilitate the processing of requests.

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[1] http://aims.fao.org/interested-become-agris-data-provider

Information for an AGRIS data provider application

Fields	Field description
Name of the data provider*	Name of the organization that owns or is responsible for the resources, the data to be provided to AGRIS. For example, if submitting data about a journal, indicate the organization that is responsible for publishing the journal, not the title of the journal itself.
Acronym	Data provider acronym of an organization, if appropriate.
Description*	Short description of the responsible organization.
Type of data provider*	Data provider type to be selected from the list. If a data provider's type of organization is not listed, select the option "Other".
Website*	URL of the organization's website
Contact person	Name and surname of a contact person.
Contact e-mail*	Contact email of the data provider, to be added to the AGRIS distribution list. In this way, the data provider will be informed about AGRIS releases, and about the latest developments and complementary agricultural information services managed by FAO. If a data provider does not want to be part of the distribution list of AGRIS, this should be indicated in the "Notes" section below. Data providers can unsubscribe from the AGRIS distribution list at any time without affecting their AGRIS status.
Address*	Postal address of the organization.
Would you like your data to be included in the AGRIS Open Data Set (AGRIS ODS)?*	AGRIS Open Data Set (ODS) represents an initiative that aims to promote the free exchange of metadata transmitted to AGRIS, for all, without restrictions. To learn more about the AGRIS ODS license agreement, see Section 4. If a data provider wants to include data in the AGRIS ODS, they should select the 'yes'option. If a data provider does not want to contribute data to the AGRIS ODS, they should choose the 'no' option.
City*	City where the data provider's organization is located.
Country*	Country where the data provider's organization is located.
Notes	Any other information that the submitted considers relevant. This is also the section where a data provider can indicate if they do not want to be included in the distribution list of the AGRIS network.

Table 1
Information for an AGRIS
data provider application

CONTENTS   1. ABOUT **AGRIS**   2. The **AGRIS** search   3. Contribute to **AGRIS**   4. Re-using **AGRIS**   5. Additional resources
                                                       interface   data in other   about **AGRIS**
                                                                                                                              information systems

3.2.3. Registration for AGRIS data providers' institutional subportal

If an organization is already an AGRIS data provider and wants to register for the customized institutional subportal, it needs to fill in the following details in the form below: AGRIS ID number, name of the organization and contact e-mail, see Figure 20.

The AGRIS ID number consists of three characters, for example: MD1, TRC, IRO, etc. If a data provider has forgotten the organization's identity number, it can be located in the list of data providers.[2] After submitting the form, an email will be sent with a link to complete the registration. The access to the institutional subportal ensures the real-time display of statistics on registrations within AGRIS and the number of record views, including the most accessed/viewed. These statistics help to monitor and generate reports on the visibility and accessibility of data providers' records through AGRIS.

By using the 'Filter data provider option', content providers can view and browse their own metadata collection, see Figure 21. This search filter can be selected from the AGRIS homepage, providing direct access to the data provider's records.

First, a specific country from the drop-down menu, e.g. Republic of Moldova, needs to be selected. Next, from the second drop-down menu, the specific data provider, e.g. State Agrarian University of Moldova Library should be chosen and then the user must click the 'Browse' button, see Figure 22. The user is redirected to the data provider page that has a permanent URL, e.g. https://agris.fao.org/agris-search/searchIndex.do?dataProvider=MD1

On this new page, users and content providers have the option to refine their search with multiple filters, including the date of publication and the selection of records with links to full text of documents. At the same time, in order to refine the search results, the user can select specific fields as query options, such as: document title, authors, journal title, AGROVOC terms, ISSN, ISBN, etc.
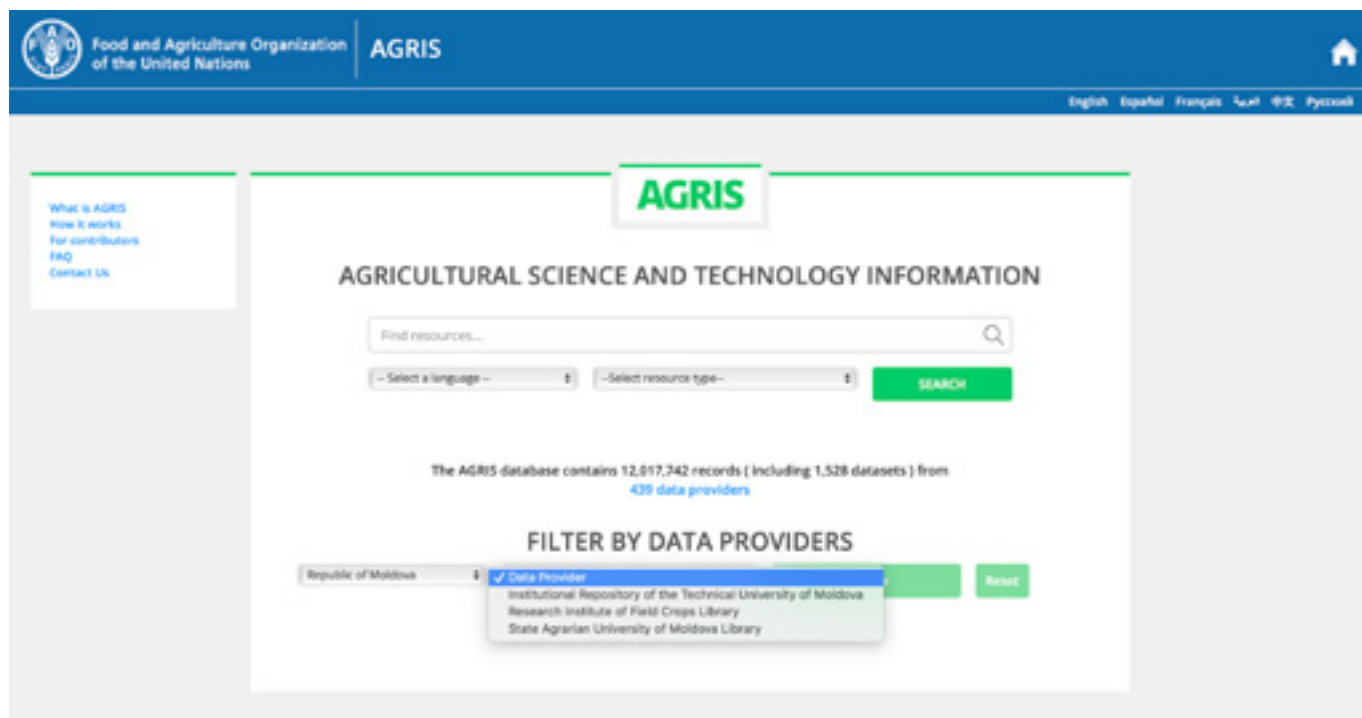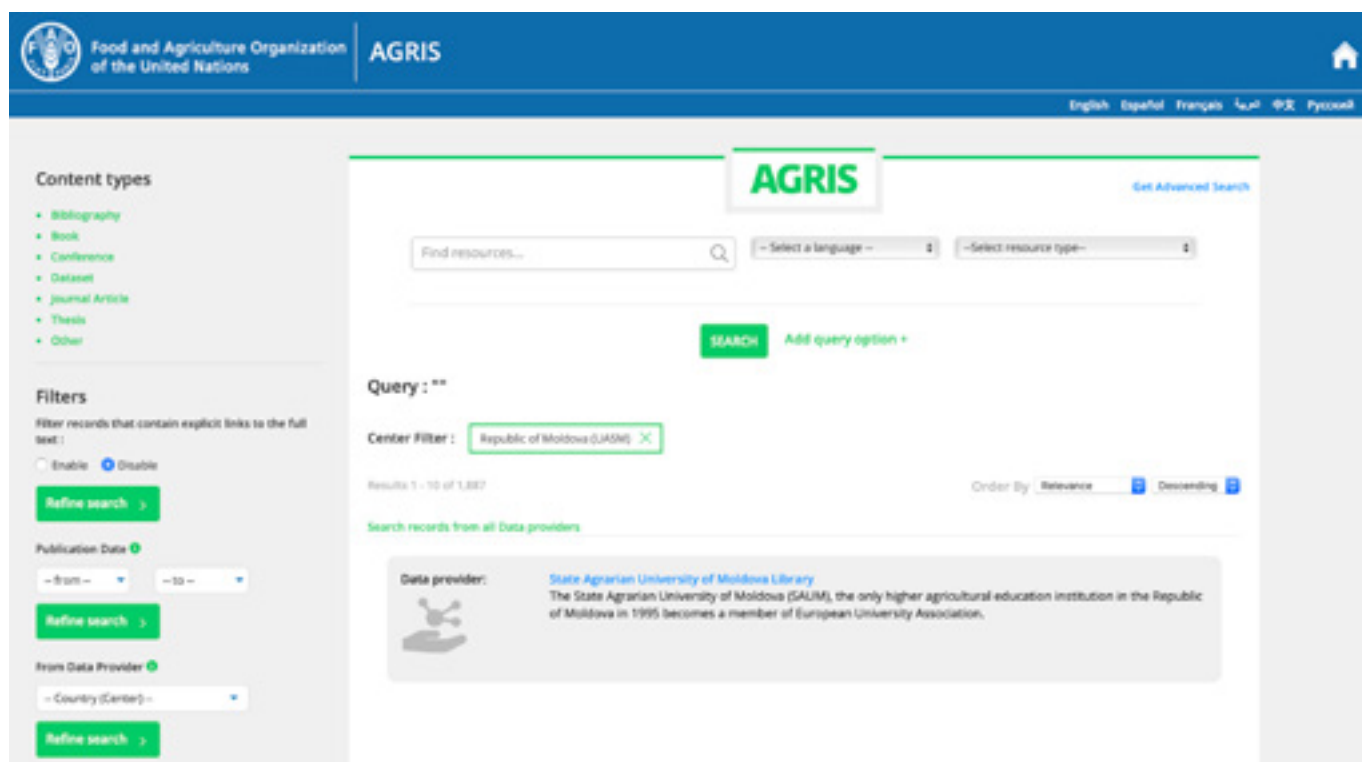

Figure 20
Form to apply for an AGRIS data provider's customized institutional subportal

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[2] http://aims.fao.org/find_agris_id

Figure 21
Location of filter by
data providers on the
AGRIS homepage

Figure 22
AGRIS search results
view after using the
data provider browse
feature

3.3 Criteria for selecting resources in AGRIS

The process of preparing the information for AGRIS requires a thorough analysis, an objective evaluation and a rigorous selection of the information in accordance with AGRIS requirements.

The general criteria for information to be submitted to AGRIS include that it should:

• have a technical-scientific character;
• be accessible and available online;
• be intended for a wider community of users; and
• be of interest not only for the local community, but also an international audience.

3.3.1. Eligible areas
AGRIS accepts records related to any of FAO's areas of interest such as agriculture, food industry, animal husbandry, fisheries and aquaculture, forestry, food security, plant protection, veterinary medicine, environment, etc.

3.3.2. Categories of eligible documents
Data providers can submit records describing documents such as journal articles, monographs, conference materials, book chapters, scientific and technical projects, technical reports, theses, bibliographies, multimedia materials, and data sets.

3.3.3. Categories of ineligible documents
Documents ineligible for AGRIS include the following:

• ephemeral materials (short-term information);
• restricted or confidential materials;
• news about local events (interviews, announcements, calls, etc.);
• short-term legislation on local subjects (resolutions, decisions appointing officials, awarding officials, provisions for the pricing of agricultural products, etc.);
• press releases from exhibitions;
• interinstitutional agreements;
• book reviews;
• textbooks for secondary education;
• advertising articles on the promotion of sales of agricultural equipment and consumables;
• preprints of conference proceedings (especially if conference proceedings are expected to be published in about six months); and
• preprints of journal articles.

3.3.4. Specific criteria for selecting journals
Not all journals are accepted for inclusion in AGRIS. To be eligible, the journal must adhere to the following criteria:

• have an ISSN identifier;
• published regularly;
• applied the peer-review procedure;
• include the title of the article in the original language (highly recommended to also include in English), and the name and surname of all authors;
• follow the structure of a scientific article with the following obligatory elements: abstract, keywords, introduction, materials and methods, results and discussions, conclusions and bibliographical references; and
• have a website or a webpage.

3.4 Submitting metadata to AGRIS

Metadata should be written in the same language used for the document it describes. All languages are welcome and highly encouraged. In addition, in order to enhance discoverability and visibility, it is also recommended to provide titles, keywords and abstracts in English for a more accurate retrieval of the resources from the web.

3.4.1. Minimum metadata requirements

The minimum requirements for AGRIS metadata are specified in '*Meaningful Bibliographic Metadata*' (M2B) as part of the LODE-BD Recommendations[3] 3.0. M2B is a set of recommendations designed to assist data providers in selecting appropriate metadata properties for creating, managing and exchanging bibliographic information. Its objectives include:

- ensuring a set of common metadata properties;
- encouraging the use of authority data, controlled vocabularies and syntax coding standards; and
- recommending the use of Uniform Resource Identifiers (URIs) as names for things, especially for data values, when available.

Two special styles are used to highlight the importance of metadata properties, see Table 2.

- two plus signs "++" (in red) for the mandatory property;
- a plus sign "+" (in blue) for the property recommended in the context of the exchange of bibliographic information.

The rest of the metadata properties are recommended or optional.

3.4.2. Data export and harvesting

Data providers produce metadata using various methods and systems. In some cases, AGRIS can use OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) to harvest metadata of records and aggregate them. OAI-PMH provides data providers with an interoperability framework based on metadata collection and a simple technical alternative to make metadata available to services based on HTTP (Hypertext Transport Protocol) and XML (Extensible Markup Language).

If an organization wants to contribute to AGRIS with records from an institutional repository, it should implement OAI-PMH as a means to expose metadata. If a journal uses the Open Journal System (OJS) platform, it is possible to export the data directly to AGRIS in various standard formats.

If a data provider has a collection of resources without metadata, the user can create XML metadata using a reference management tool such as Mendeley or Zotero and submit it to AGRIS by e-mail. AGRIS supports and validates various XML metadata formats.

Among the most frequently used standard formats: DOAJ, Crossref, MARCXML, MODS, Simple DC. Data providers should submit the selected data in one XML file. If this is larger than 1, 2 MB, it should be compressed in one zip or rar file.

Every month, AGRIS is published with the latest metadata sent by the data providers. In order for XML files to be indexed on time, it is recommened to submit data by the 15th of the month.

To send data to AGRIS, it is recommended to use agris@fao.org.

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[3] Citation needed

| Group of elements	Properties	Detailing of elements
Title of the information	Title ++ Alternative title	The title is the name given to the resource and is one of the most important and relevant access points for any resource. The information is usually provided by a number of properties, including title, alternative title, subtitles, parallel titles, translated titles, transliterated titles.
Statement of responsibility	Creator Contributor Editor/volume +	This group contains the properties associated with any entity that is responsible for creating and/or publishing the content of the resource, for example, the creator, contributor, and publisher or issuer of a resource.
Physical description	Date ++ Identifier + Language ++ Format/ environment + Edition/version Source +	These properties describe the aspect and characteristics of the physical form of a resource: *Date* - a calendar date associated with an event in the resource's lifecycle. A resource can have several data: the date of creation, the date of editing, the date of modification, the date of revision, the date on which the information resource was published to the network, etc. *Identifier* - a number or string that allows the unique identification of the information resource in accordance with an official formal identification system (DOI, ISSN, ISBN, etc.). *Language* - the language of the digital content of the information resource. *Format/environment* - the file format, physical environment or resource size. *Edition/version* - when describing an edition or version of a resource, the relationship between a resource and its related version or versions should also be described. *Source* - a related resource from which the described resource comes. The source may consist of a combination of elements, such as bibliographic information, combined with an official identification system (ISBN, ISSN, URL). The described resource may derive entirely or partly from the related resource.
Location (physical location)	Location +	This element records information about the *location and availability* of the information resource, as it is quite important for a resource to be located and obtained in the process of information exchange.
Subject	Subject term + Classification Keyword + Geographical term	The *Subject* group contains properties that describe or help discover what the resource is or denotes, in the form of a subject heading, classification/category, keywords, and geographical term. The best-recommended practices to determine the subject of resource content consist in selecting a value from a controlled vocabulary or formal classification scheme. In the case of the AGRIS database, it is advisable to use the multilingual AGROVOC thesaurus.The use of controlled vocabularies and formal classification schemas is encouraged. More and more name authority files, controlled vocabularies, and resource datasets are becoming available as Linked Open Data (LOD).
Content description	Description/ Abstract + Type/form/ category	Two major types of descriptions are considered in this group, which focus on the content of the resource and not on the physical object: a) any representative description of the content; b) the type or category of resource. The *description* may include, but is not limited to: an abstract, a table of contents, a note, a graphical representation or a free-text account of the resource. The *type* reflects information about the nature or category of the resource content. The type includes terms that describe general categories, functions, types or levels of aggregation for content. The *Format* item is used to describe the file format, resource size, physical or digital media of the resource.

Group of elements	Properties	Detailing of elements
Intellectual property	Rights +	The *Rights* item records information about the rights to use and manage a resource. It usually contains a statement about resource management or a link to a service from which this information can be obtained. Declarations of rights often include intellectual property rights, copyrights and other property rights. This group includes any property that deals with an aspect of intellectual property rights related to the conditions of access and use. The *Rights* item can be used for either a text statement or a URL that indicates a rights statement. *Note: The lack of the Rights element cannot serve as a basis for any hypothesis or conclusion regarding the rights of use and management of the resource.*
Use	Audience Literary indication	This group includes the properties that are related to the use of a resource. *The audience* represents the class of entity for which the resource is intended or useful. An entity class can be determined by the creator, publisher, or by a third party. *The level of public education* is a class of entity, defined in terms of progression in an educational or training context, for which the described resource is intended.

Table 2
The minimum requirements
for AGRIS metadata

3.5 AGRIS data processing flow

Data processing flow is an essential part of data integration in AGRIS, which includes extraction, transfer, testing, transformation and uploading of records. It is followed by metadata validation and mapping, and data cleaning comprises data disambiguation, replacement or removal of semantic errors, and of incomplete, incorrect, duplicate, inaccurate or irrelevant data records. Data providers can submit data in different standards, that will be converted to AGRIS AP (AGRIS Application Profile), an internal format used by AGRIS. Before publication, data is converted to RDF (Resource Description Framework) and disseminated from the AGRIS web portal.
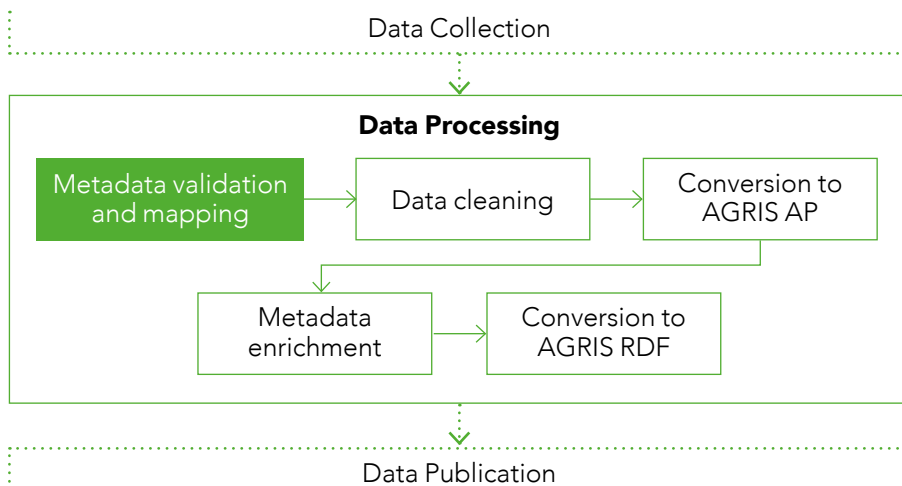
Figure 23
The data processing
flow of metadata
harvested by AGRIS

4. Re-using **AGRIS** data in other information systems

An additional feature of AGRIS is the option to download the AGRIS Open Data Set (ODS), which is a collection of AGRIS records that can be freely used, re-used and redistributed by anyone. The AGRIS ODS has been set up thanks to the many AGRIS data providers who have agreed to include their metadata in downloadable formats for libraries to integrate into their own information systems.

Why should an organization consider downloading the AGRIS ODS? The AGRIS ODS increases data visibility and also offers the opportunity to enrich data. Library users and information seekers increasingly expect a one step process, either with a search engine, such as Google, or a library discovery tool combining its catalog with other resources. In response to this evolving world of information, the AGRIS ODS brings bibliographic references directly to library systems. The available formats can be used in many different software applications. The advantage of open data, specifically the AGRIS ODS, is the important opportunity to increase analysis of agricultural performance and, consequently, help inform agricultural investment, innovation and policy to drive changes toward increasing sustainability in the agriculture sector.

The AGRIS ODS comes under an open license, CC-BY IGO 3.0. The AGRIS ODS is downloadable as a zip file at https://agris.fao.org/agris_ods/. It is available in different formats, including AGRIS AP and RDF formats. Once downloaded, the files can be filtered to best serve organizations and their information systems.

Joining the AGRIS Open Data Set (ODS) initiative is not binding; a data provider can ask to be removed at any time.

"There are many benefits of participating in AGRIS. First of all, it is an international collaboration and partnership. The participation of the University library in AGRIS helps to increase visibility and accessibility of agricultural contents issued in the Republic of Moldova in the information global space. It also helps to facilitate the information and data exchange in the field of agricultural sciences and provides reliable AGRIS user services."

Viorica Lupu, State Agrarian University of Moldova (Republic of Moldova)

5. Additional resources about **AGRIS**

FAO. 2020. *AGRIS Webinar: What is AGRIS Today* [video]. Rome, Italy. http://aims.fao.org/capacity-development/webinars/agris-webinar-what-agris-today

FAO. 2020. *AGRIS Webinar: The role of AGRIS-Moldova Center in the dissemination of agricultural information in the context of Open Access* [video]. http://aims.fao.org/capacity-development/webinars/agris-webinar-role-agris-moldova-center-dissemination-agricultural

FAO. 2020. *AGRIS Webinar: The role of AGRIS in Scholarly Communication Landscape* [video]. http://aims.fao.org/capacity-development/webinars/agris-webinar-role-agris-scholarly-communication-landscape

FAO. 2020. *AGRIS Webinar: Data provider dashboards - a new service to monitor and access statistics of data providers records* [video]. http://aims.fao.org/capacity-development/webinars/agris-webinar-data-provider-dashboards-new-service-monitor-and-access

FAO. 2020. *AGRIS Webinar: AGRIS Open Data Set (ODS) - How it works, how to use it* [video]. Rome, Italy. http://aims.fao.org/capacity-development/webinars/agris-webinar-agris-open-data-set-ods-how-it-works-how-use-it

CONTENTS   1. ABOUT **AGRIS**   2. The **AGRIS** search   3. Contribute to **AGRIS**   4. Re-using **AGRIS**   5. Additional resources
                                                                     interface   data in other   about **AGRIS**
                                                                                                                                                          information systems

"We are the biggest AGRIS data provider in Russia, and this activity is important for our visibility in the field of agriculture. We have become more widely known than before due to our involvement with AGRIS. As users, we can find information about some interesting foreign journals in AGRIS that we can include in the electronic catalogue of our library."

Elena Klimova, Central Scientific Agricultural Library (Russian Federation)

"AGRIS…gives access to world class information databases and plays an important role for information sharing, accessing and distribution among the agriculture communities in Georgia. AGRIS also serves as a unique platform for sharing national scientific and technical information from Georgian academic and research institutions and individuals to…the world."

Marina Razmadze, Techinformi (Georgia)