

# Information Technologies and Standards for Agricultural Information Resources Management:

## *AGRIS Application Profile, AGROVOC and LISAGR*

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**Abstract:** The new AGRIS initiative, which was launched at the Expert Consultation in October 2005, has defined three main areas of intervention to improve international information systems in agricultural science and technology: Advocacy, Capacity Building and Content Management. Content management, the management of agricultural science and technology information, has various needs: standards and methodologies for interoperability and facilitation of knowledge exchange; tools to enable information management specialists to process data; information and knowledge. This paper describes some of the efforts that have been made in this area over recent years.

**Resume:** La nouvelle initiative de l'AGRIS, qui a été inaugurée lors de la Consultation des Experts en octobre 2005, a identifié trois domaines qui nécessitent une intervention à fin d'améliorer les systèmes d'information mondial en agronomie et en technologie agricole: la soutenance, le renforcement des capacités, et la gestion du contenu. Cette

dernière, qui concerne la gestion de l'information en agronomie et en technologie agricole, nécessite des normes et des méthodologies qui soient interoperables pour faciliter l'échange de connaissances; et des outils pour analyser les données, l'information et la connaissance. Ce document présente les efforts au cours des dernières années.

**Resumen:** La nueva iniciativa de AGRIS, que fue lanzada durante la Consulta de Expertos en Octubre del 2005, ha definido tres áreas de intervención para mejorar los sistemas de información internacionales en ciencia y tecnología agrícola: sensibilización, fortalecimiento de capacidades y gestión de contenidos. La gestión de contenido se refiere a la administración de la información en ciencia y tecnología agrícola, y que involucra varias necesidades: estándares y metodologías para la interoperabilidad y la facilitación de la gestión del conocimiento; herramientas para permitir a los especialistas en gestión de información su procesamiento de datos; información y conocimiento. Este documento describe algunos de los esfuerzos que han sido realizados en años recientes en esta área.

### Introduction

THE AMOUNT of digitally available information is growing exponentially and appropriate steps need to be taken to facilitate sharing and consequently, to reduce costs. These information resources, sometimes located in proprietary applications and using dissimilar data models, hamper information sharing. Additionally, information system designers are sometimes unaware of exist-

ing design methodologies, data description standards, or freely available tools or applications. Efforts in the development of methodologies, standards and application development in the areas of Agriculture and Rural Development are at present widely dispersed.

An Expert Consultation on "International Information Systems for Agricultural Science and Technology", which is part of a series of meetings from 2000 in the context of "Coherence in Agricultural Information"<sup>1</sup>, was held in October 2005 and brought together key stakeholders to address the goal of developing coherence in international information systems for agricultural science and technology (*International Information Systems*, 2006). The consultation comprised representatives from key organizations providing information services in the fields of agriculture, natural resources, and rural development, with the objectives of discussing the endemic problem of access to agricultural information, especially in developing countries, and the emergence and adoption of new information and communication technologies (ICTs), which will reduce costs and catalyze the migration of content to digital formats.

The participants attributed a high priority to intervention in three major areas—Advocacy, Capacity Building, and Content Management—

while recognizing that they are in fact closely inter-related.

The Content Management participants identified four priority areas for action:

- development of the Agricultural Information Management Standards (AIMS) Web site as a shared resource;
- development of systems for Project-related information;
- development of public domain software tools and applications; and
- development of electronic repositories in Learning Resource Centres.

Participants also formulated “demonstration projects” in three areas to show the benefits of cooperation for content management, namely, a common metadata exchange format, a community directory for information on organizations and for newsfeeds/RSS, and multilingual ontologies.

In the light of these requirements, the Agricultural Information Management Standards Web site (AIMS) was designed with the primary purpose of sharing and promoting the uptake of common methodologies, standards and applications while simultaneously providing mechanisms that facilitate information sharing, consensus building and awareness-raising.

This paper presents some of the initiatives the Food and Agriculture Organization of the United Nations (FAO) has undertaken to alleviate problems in information collection, management, and exchange:

- AGRIS Application Profile, a standard for describing and sharing information
- AGROVOC, the multilingual agricultural thesaurus managed by the FAO and used for information description
- LISAGR, a system that combines

the previous two in a concrete application

## AGRIS AP

The AGRIS Application Profile (AGRIS AP) is a metadata standard created specifically to enhance the description, exchange and subsequent retrieval of agricultural Document-Like Information Objects (DLIOs). It is a metadata schema that draws elements from well known standards, such as Dublin Core (DC), the Australian Government Locator Service Metadata (AGLS) and Agricultural Metadata Element Set (AgMES) namespaces. It provides guidelines on recommended best practices for cataloguing and subject indexing. The overall goal is to facilitate interoperability of metadata formats, i.e. data exchange is facilitated through a common layer to which all different data providers can map. Linking

Figure 1 – Sample XML output from LISAGR in AGRIS AP Compliant XML

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE agrisResources (View Source for full doctype...)>
- <agrisResources xmlns:ags="http://purl.org/agmes/1.1/" xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:agls="http://www.naa.gov.au/recordkeeping/gov_online/agls/1.2" xmlns:dcterms="http://purl.org/dc/terms/">
- <agrisResource ags:ARN="XL1986008004">
  <dc:title xml:lang="es">Plan operativo reserva de la Biosfera Río Plátano 1981 a 1983</dc:title>
- <ags:creator>
  <ags:creatorPersonal>Erazo, M.</ags:creatorPersonal>
  <ags:creatorPersonal>Ramírez, J.A.</ags:creatorPersonal>
  <ags:creatorPersonal>Lind, J.</ags:creatorPersonal>
  <ags:creatorPersonal>Aguilar, W.</ags:creatorPersonal>
  <ags:creatorPersonal>Morales, R.</ags:creatorPersonal>
  <ags:creatorPersonal>MacFarland, C.</ags:creatorPersonal>
  <ags:creatorCorporate>Dirección General de Recursos Naturales Renovables, Tegucigalpa (Honduras)</ags:creatorCorporate>
  <ags:creatorCorporate>CATIE, Turrialba (Costa Rica). Departamento de Recursos Naturales Renovables</ags:creatorCorporate>
</ags:creator>
<ags:publisherPlace>Tegucigalpa (Honduras)</ags:publisherPlace>
- <dc:date>
  <dcterms:issued>1981</dcterms:issued>
</dc:date>
- <dc:subject>
  <ags:subjectClassification scheme="ags:ASC">P01</ags:subjectClassification>
  <ags:subjectThesaurus xml:lang="en" scheme="ags:AGROVOC">WILDLIFE</ags:subjectThesaurus>
  <ags:subjectThesaurus xml:lang="en" scheme="ags:AGROVOC">HONDURAS</ags:subjectThesaurus>
  <ags:subjectThesaurus xml:lang="fr" scheme="ags:AGROVOC">FAUNE ET FLORE SAUVAGES</ags:subjectThesaurus>
  <ags:subjectThesaurus xml:lang="fr" scheme="ags:AGROVOC">HONDURAS</ags:subjectThesaurus>
  <ags:subjectThesaurus xml:lang="es" scheme="ags:AGROVOC">VIDA SILVESTRE</ags:subjectThesaurus>
  <ags:subjectThesaurus xml:lang="es" scheme="ags:AGROVOC">CONSERVACION</ags:subjectThesaurus>
  <ags:subjectThesaurus xml:lang="es" scheme="ags:AGROVOC">HONDURAS</ags:subjectThesaurus>
</dc:subject>
<dc:type>V</dc:type>
- <dc:format>
  <dcterms:extent>70 p.</dcterms:extent>
</dc:format>
<dc:language scheme="ISO639-1">Es</dc:language>
- <ags:availability>
  <ags:availabilityLocation>XL</ags:availabilityLocation>
  <ags:availabilityNumber>BCO, Turrialba (Costa Rica)</ags:availabilityNumber>
</ags:availability>
</agrisResource>
- <agrisResource ags:ARN="XL1986008051">
```

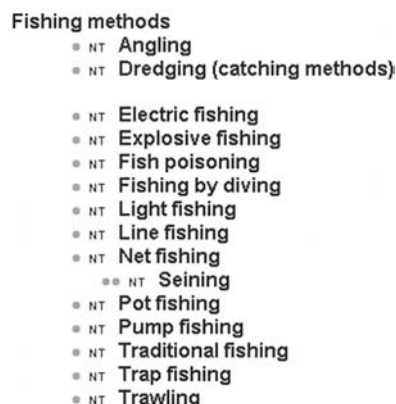
of various types of agricultural information, cross-searches and other value-added services are made possible. The AGRIS AP also facilitates harvesting of data through the Open Archives Initiative-Protocol for Metadata Harvesting<sup>2</sup>, enabling agricultural research output to have greater readership and impact within the OAI community.

The AGRIS Application profile is now an established metadata exchange format for the AGRIS network. The AGRIS resource centres have the possibility to export AGRIS AP compliant records either through the WebAGRIS software, in which the AGRIS AP is one of the export formats, or by generating an export using a crosswalk with the repository in question (see Figure 1). Some AGRIS resource centres have implemented an OAI harvesting procedure using the AGRIS AP.

## AGROVOC

AGROVOC is a multilingual, structured vocabulary designed to cover the terminology of all subject fields in agriculture, forestry, fisheries, food and related domains (e.g. environment). Its main role in the past was to standardize the indexing process in order to make searching simpler and more efficient, and to provide the user with the most relevant resources. With the arrival of the Web, AGROVOC has come to offer many new functions: to cross-

Figure 2 – Narrow the search “Fishing methods” from AGROVOC.



link different web-applications; to facilitate multilingual access; and to allow for query expansion and restriction. AGROVOC is now available in more than 10 languages.

Knowledge Organization Systems (KOS) such as the AGROVOC Thesaurus, help to resolve two main issues:

- The problem of two or more words that can be used to mean the same concept, like Fishing vessels/Fishing boats or Health risks/Health hazards.
- The problem of two or more words that have the same spelling but represent different concepts, like vessel (blood)/vessel (fishing) or Ling (a heath plant)/Ling (fish of the cod family).

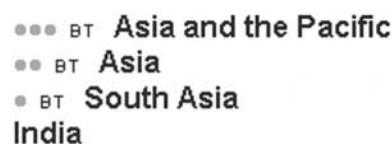
Controlled vocabularies include simple word lists, authority files, thesauri, classification schemes, gazetteers, and so forth. These resources fall along a continuum, according to the explicitness of their semantics and their amenability to machine interpretation.

The use of controlled vocabularies allows for creation of more specialized services such as:

- Browse by keywords, country of coverage
- Search by type of document (patent, book, etc.)
- Limit search results to one or more specific years or language
- Semantic navigation within the result set, based on the identified keywords in controlled vocabularies (see Figures 2 and 3)

These services are enabled by the use of controlled vocabularies and their explicit reference in the exchanged data, a possibility provided by the AGRIS AP.

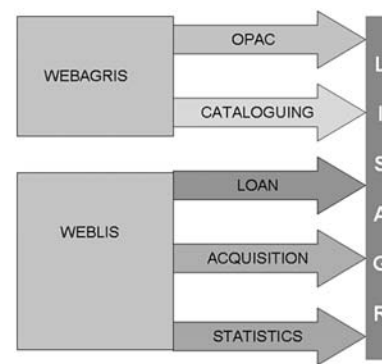
Figure 3 – Broaden the search “India” from AGROVOC.



## LISAGR

In response to the expressed need for tools to enable information management specialists to process data, FAO has developed, in collaboration with partner institutions, the WEBAGRIS system for the management of textual metadata. From the start of this development, there were requests, especially from AGRIS centres in Latin America, to extend the functionalities of WEBAGRIS (OPAC and Data Entry) to other library management functions. Based on these requests, FAO and the Inter-American Institute for Cooperation on Agriculture (IICA) agreed in 2005 on a feasibility study to extend WEBAGRIS to an Integrated Library Management System. During the feasibility study, it became clear that it was possible to release a prototype of an Integrated Library Management System, along with the study itself. As a starting point, a WEBAGRIS version in Spanish was developed (August 2005), which was then integrated with WEBLIS module (developed by Institute for Computer and Information Engineering for Integrated Library Management), in order to release a LISAGR prototype (September 2005). The WEBLIS module brings in acquisition, loan and statistics functionalities to existing Online Public Access Catalogue and cataloguing modules (see Figure 4). The application uses the CDS/ISIS platform in the WEB environment (based on WWW-ISIS software) and is available free of charge.

Figure 4 – Integrated Library System for Agricultural libraries.



LISAGR incorporates the international methodology of AGRIS (AGRIS AP and AGROVOC) to collect, input, retrieve, and exchange agricultural information worldwide. The current version of LISAGR consists of:

- Online Public Access Catalogue (OPAC)
- Cataloguing system
- LOAN subsystem
- Acquisition subsystem
- Statistical module

**Online Public Access Catalogue (OPAC)** – The OPAC provides:

- basic and advanced search
- history
- saving queries function
- ISIS Query language facilities
- thesaurus based search

Additionally, it includes other functions for printing and downloading the metadata in various formats (ISO2709, text, rtf).

**Cataloguing system** – The cataloguing system allows users to catalogue the following record types:

- books —monographic and monographic-series levels (M and MS)
- papers from books (AM, AMS)
- papers from journals (AS)
- journals (S)
- others (slides, photos, audio, video, etc.).

It provides powerful validation tools and a user-friendly interface with lookup tables, a connected online thesaurus, possibilities to define default values, and much more.

**LOAN subsystem** – The LOAN subsystem provides:

- usage of the catalogue database
- creation of ITEMS for loan
- management of users and privileges

**Acquisition subsystem** – The Acquisition subsystem controls the processes of book acquisition in the library, integrated with the cataloguing subsystem. It includes the following main features:

- quick checking (whether a given book is already in the catalogue or has been ordered);
- generates a variety of e-mails and/or letters in RTF format addressed to the book suppliers, publishers, book requestors and recipients;
- classifies the request for “urgent action needed” and provides an online list of such requests for quick action;
- generates a number of statistical reports concerning the acquisition process; and
- prompts for automatic copying of the bibliographical data to the catalogue.

**Statistical module** – LISAGR produces statistics on overdue loans, holds, renewals, returns, and so forth. It generates different reports concerning the acquisition process and other operations in the library, classifies the request for “urgent action needed” and provides an online list of such requests for quick action.

LISAGR would help many AGRIS resource centres to organize their libraries more efficiently and at the same time maintain compatibility with established AGRIS data standards, thereby guaranteeing continued participation in the AGRIS network.

LISAGR was launched in English and Spanish at the Orton Library (Tropical Agricultural Research and Higher Education Centre) in Costa Rica in October 2005. It has since been tested there with a complete database. After necessary modifications, a Beta version will be made available to other institutions and libraries.

**Beneficiaries and Impact of the Information Management Standards and Tools** – There is an expressed need for tools to manage operations in small—and medium-sized libraries that cannot afford to buy a commercial Integrated Library Management System. Expanding the existing WEBAGRIS tools would help not only the AGRIS resource

centres, but also many other small—and medium-sized information centres to organize their libraries more efficiently while, at the same time, maintaining compatibility with established AGRIS data standards. Several documentation centres and libraries throughout the region expressed their interest in evaluating and implementing LISAGR following the launch of the system.

In addition, the use of standards such as the AGRIS AP and AGROVOC for the description of agricultural information documents improves overall quality by offering better possibilities for building enhanced services using the collected metadata for the users. All these standards and tools guarantee an easy and efficient exchange of agricultural information.

## Conclusion

Information technologies and standards for agricultural information resource management, such as those covered in this document, are aimed at alleviating problems in information management and sharing. LISAGR is an Integrated Library System for Agricultural Libraries, created to manage library operations in small—and medium-sized libraries that cannot afford a commercial Integrated Library Management System. The fact that it incorporates standards for information management, namely the AGRIS AP and AGROVOC, gives it an added advantage.

Even though FAO has played a leading role in the development of the LISAGR prototype and Beta version, it is envisaged that the sustainability of the system depends on further development and maintenance being user driven. This will create a scenario where FAO plays an advisory role, ensuring that the development of LISAGR conforms to international data exchange standards, and that any further improvements made are available to member countries in other parts of the world.

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Some possible future trends in the further development of LISAGR include:

- identification of a funding mechanism through discussion among all interested partners,
- 3–4 pilot implementations of the Beta version for testing,
- support and maintenance of LISAGR,
- continuous eDiscussion about the possible development of LISAGR,
- meeting of interested partners at RIBDA to discuss the consortium, the principal coordinator and possible funding mechanisms,
- start of the implementation project after RIBDA once an agreement has been reached, and
- publicity and advocacy.

The use of Knowledge Organization Systems such as the AGRIS AP and AGROVOC for content description and exchange is also taking root in the agricultural domain. The AIMS Web site has played an important role in making these tools and standards visible and easily available to the wider agricultural community and there is a concerted effort to advocate their use.

**Authors' Note:** *The AgStandards Group discusses issues related to Agricultural Metadata and Ontologies. To join the forum, send an email to:*

agstandards-subscribe@  
yahoogroups.com

#### NOTES

1. For more information about the “Coherence in Agricultural Information” initiative, go to:  
[ftp://ftp.fao.org/gi/gil/gilws/aims/references/coherence\\_in\\_ag\\_proposal.doc](ftp://ftp.fao.org/gi/gil/gilws/aims/references/coherence_in_ag_proposal.doc)
2. For more information on the Open Archives Initiative, go to:  
<http://www.openarchives.org/>

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AGRIS Documentation Tools Web site:  
[http://www.fao.org/agris/Centre.asp?Content=DT&Menu\\_1ID=DT&Menu\\_2ID=DT1&Language=EN](http://www.fao.org/agris/Centre.asp?Content=DT&Menu_1ID=DT&Menu_2ID=DT1&Language=EN)

Food and Agriculture Organization of the United Nations (FAO). AGROVOC Flyer:  
[ftp://ftp.fao.org/gi/gil/gilws/aims/references/flyers/agrovoc\\_en.pdf](ftp://ftp.fao.org/gi/gil/gilws/aims/references/flyers/agrovoc_en.pdf)

FAO. Metadata Flyer:  
[ftp://ftp.fao.org/gi/gil/gilws/aims/references/flyers/metadata\\_en.pdf](ftp://ftp.fao.org/gi/gil/gilws/aims/references/flyers/metadata_en.pdf)

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