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Opportunities for greater coherence in agricultural information systems

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INTRODUCTION

As the number of ICT-enabled information services increases, the intended user risks being swamped with possibilities to address his or her information needs. The challenge faced by donor-supported agricultural information services is to make it easier for those who need information to find what they are looking for by working together to build a more coherent total system.

This report looks at the issue of coherence among agricultural information services from three perspectives:

- Service providers – institutions providing development-oriented information services in the agriculture sector;
- Agriculture stakeholders in the South – information workers addressing the needs of the main clients for the services provided, such as extension workers, researchers and policymakers;
- Donors – providing financial support to many of the major agricultural information services and systems.

What emerges is a picture of an overall system in which there are striking gaps, areas of inefficiency, and duplications, as well as a certain mismatch between the information needs of the South and what is being provided by the current donor-supported services. To address these issues, the authors suggest both practical and policy-oriented actions that all three stakeholder groups can take to ensure a more coherent approach to matching supply and demand. Technical options for ensuring greater flexibility in mixing and matching information from different sources are explored in some detail.

The survey and analysis as well as the recommendations presented in this report were verified in a stakeholder workshop hosted by the United Kingdom Department for International Development in London, June 2003.

The authors wish to acknowledge the following people for their kind cooperation towards the research, for their active participation in the workshop, and for their valuable input to this report: Dylan Winder, DFID; Remigio Achia, FAO/NAADS Uganda; Barnabas Kapange, DRD Tanzania; Joel Sam, GAINS; John Villars, Ghana; Peter Ballantyne, INASP. Diana Ridley, DFID, for her patient support in arranging logistics and helping the workshop to run smoothly. Katherine Morrow and Judith Veldhuizen, IICD for their editorial support. And last but certainly not least, we emphatically thank all workshop participants for sharing their knowledge, experience and vision towards a more coherent approach to providing demand-driven agricultural information services.

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EXECUTIVE SUMMARY

This report presents a survey and analysis of information systems in the field of agriculture and national resources for development. The findings were discussed and validated at an expert meeting hosted by the UK Department for International Development in London, June 2003.

The objectives of this study are to examine the current landscape of Internet-based agricultural information services, to identify gaps and inconsistencies, and to suggest avenues for bringing greater coherence to the system as a whole.

Roots of Incoherence

The Internet drastically changed the information landscape in the field of agriculture and natural resources. The relatively small investment required to set up a website enabled a great many institutions to become instant information providers. After the initial rush to get online, the priority was to 'bring content to the web', and as a result project proposals to meet that need could expect a willing ear from donors. Due to a lack of real world experience upon which to base a strategy, the questions of complementarity, sustainability, and demand-responsiveness were not always given priority.

The trend of proliferation of websites has continued for a number of years. As a result, the current system of agricultural information services is at times rather incoherent, and those in search of high quality information often have difficulty separating the wheat from the chaff. There are a great number of services, but potential users often have problems finding and accessing relevant information in usable formats.

The proliferation of services over the last ten years has led to a number of lessons learned:

In some projects the strategy for creating, acquiring or maintaining the information proved to be unsustainable or unrealistic. This has led to a number of 'empty shells' – websites and online databases with little or no up-to-date content.

Many of the services are portals that point to secondary sources (such as other portals), rather than to the full-text primary source. Among these portals there is much duplication.

Structured web-access to existing high-quality databases proved to be difficult to accomplish and costlier than expected. These databases provide a roadmap through the labyrinth of full-text documents that have suddenly become available online.

Emerging Opportunities

In this study ten major agriculture information services were analysed by questionnaire. Interviews with representatives of the organisations supplying information provided further insight.

It was striking that none of these services are linked, although one of them provides a method of incorporating data from another site. Six services provide fact sheet services independently of

each other. The situation arises not from competition among the services but from the well-known challenges of collaboration and the lack of shared information standards and technical compatibility among the underlying information systems.

We find ourselves at a turning point at which these lessons can be translated into an overall strategy that is more effective and responsive to demand. The similarity in objectives and aims identified among the services profiled creates fertile ground for more effective information packaging and dissemination and the provision of joint services. There is the potential to cross-promote services and ensure a wider audience is reached. In addition, there are new possibilities to link information collections without having to create a new, centralised 'one stop shop'.

Stakeholder Perspectives

Examining the situation more closely, the limits to coherence and possible solutions were looked at from the point of view of three stakeholder groups: service providers, users in the South, and donors and policy-makers.

Services perspective

Many of the current service providers maintain structured data collections, but these tend to exist in isolation from complementary services provided by other partners. Collaboration is needed in order to provide integrated access to users. Some models exist for closing the gap between information providers and users, including:

- Integrated data retrieval, where one search engine operates across several databases.
- 'Narrowcasting', where major information providers in the agricultural sector produce a feed of information on a specific subject, which can be made available to specialist or locally-focused sites.

This picture is not unique for the agriculture sector or even to development information services. In response to the general lack of meaningful structure on the Internet, technical mechanisms and information standards are being developed that facilitate the retrieval of information and enable the creation of meaningful groupings of content.

If a higher level of interoperability between services is to be pursued we may need to rethink the different roles that information services play. A system with different layers may evolve, consisting of a *data layer*, where data providers make information accessible in open archives that can be interrogated using a standard protocol, and a *services layer*, where specialised views on the data are created for specific user groups.

Both the creation of integrated data retrieval systems and the concept of narrowcasting call for strategic and technical cooperation among service providers. A clearinghouse mechanism would enable service providers to identify opportunities for integrated access and collectively develop and publish information markup and exchange standards. Such a clearinghouse would also provide a collective forum for addressing the critical related issues of intellectual property rights and preservation of digital resources.

Southern perspective

A cursory review of the situation in Uganda, Ghana, and Tanzania shows that lack of coherence is most acutely felt in the South. Despite an urgent need for reliable information, users are often not aware of relevant sources because the information is scattered across the Internet and is not organised in the manner most relevant to those working in a particular national context.

There are concerns as to whether the type of information exchanged in international agricultural information systems is relevant to intermediaries at the national level and how 'local' content and research results can be included. International services do not always link with national information networks, and therefore information is either duplicated, not available or cannot be found by the intended audience. Furthermore, the difficulties of Internet access in Southern institutions are often not fully considered in the design of online systems and in the choice of document formats, restricting possible use.

A national stakeholder forum of intended beneficiaries could help clarify and address the demands for agricultural information systems in terms of national activities. As a result, international information systems will be able to serve these needs better locally, nationally as well as internationally.

This set of issues should be further explored by a series of national studies supporting input into COAIM (Consultation on Agricultural Information Management) and hence the agenda of FAO information systems.

Donor policy perspective

Current donor and policy approaches to supporting agricultural information services profiled in this research include DFID, FAO, GFAR, DGIS, EIARD and Swiss Development Cooperation.

Three major motivations can be identified for donor support to agricultural information services. Primarily, in order to support food security and poverty alleviation in developing countries. A secondary purpose is to ensure better-informed policy and improve the effective dissemination of research results of development projects. Third, the services also play an important part in informing donors and other development partners, and there is an increasing emphasis on networking platforms and discussion as a complement to static information.

There are two critical lessons we can draw from these findings. First, donors need to bear in mind that the audience of the Internet services are rarely farmers or rural communities themselves. Present in the information chain are information brokers with access to the Internet who will often repackage the information in a variety of ways. Second, the management of support to services is often not coordinated, as financial support may be split across a number of departments, leading to ineffective management of resources and competition.

A donor dialogue to exchange approaches to agricultural information services might be an effective way to ensure that future policies and services are developed in a more coherent and complementary manner.

Recommendations

To take the recommendations of the workshop and report forward three groups of activities are proposed and elaborated in the pages that follow:

- A clearinghouse for agricultural information standards and information exchange;
- Support for input into the next COAIM meeting from the perspective of national information services in the South;
- A policy dialogue involving donor support to agricultural information services.

To implement the next steps in an effective manner, the stakeholders (service providers, southern users and policy makers) should be linked, but not lumped together in discussions and policy formulation processes. Although the stakeholders complement one another, their different needs lead to different prioritisation, and therefore should perhaps be addressed separately.

BACKGROUND

The Internet has drastically changed the information landscape in the field of agriculture and natural resources. Before the advent of the Internet, online information was available only through highly centralised systems hosted on mainframe computers. Services providing primary, full-text information could be counted on one hand, while databases containing secondary, bibliographic information such as CABI or AGRIS were predominant. Users were faced with the problem of 'bridging the last mile': bibliographic references were available, but the documents themselves had to be located through traditional library systems.

The Internet enabled many institutions to become not only recipients but also disseminators and producers of information. The technology investments required to achieve this were relatively low. In the late nineties, when the number of connections had reached a critical mass, institutions rushed to bring content to the web. Project proposals to fill the content gap could expect a willing ear. Policy formulation amongst donors and policy makers was challenging, with little or no experience to build on. The result: a donor-supported information explosion, making it increasingly difficult to discern what are valuable and relevant sources, and what aren't. However, this proliferation of online content was not necessarily a bad thing, or, to use an agricultural metaphor: "one should not weed spinach too early but let it grow, until one can see the difference between the spinach and the weeds."

Almost a decade later, it is becoming more obvious why a number of the investments did not produce all the results that the projects were aiming at:

- Technology focus: the technology to repackage and transfer information was readily available, but in many projects there was no clear policy on how the information itself would be acquired. This led to a number of empty shells
- Portals, not information: There are many portals that point at sources of information rather than the information itself. For the user this is equivalent to asking for milk and being given the location of a cow.
- Lack of integrated access: Full text indexes provide an increasingly intelligent integrated access point to online documents. An integrated access to structured data held in databases has proven to be more difficult to accomplish.¹

All in all, the information landscape shows a confused picture with a great number of scattered and overlapping services. Potential users have problems finding relevant services, and services have difficulty getting in touch with potential users.

This lack of coherence between information services is certainly not unique to the agriculture sector. There is an increasing awareness in many parts of the information society (both in the public and the private sector) of the need for a higher level of integration between information services on the Internet to make investments more cost-effective.

¹ An example from the development sector is AIDA (<http://aida.developmentgateway.org/AidaHome.do>), the Development Gateway initiative providing integrated access to the project databases of many development organisations. AIDA is managed relatively easily, pointing to different sources and providing an answer to such questions as 'who does what, where'. Much more data harmonisation is required to produce aggregate statistics and allow detailed analysis. If AIDA manages such a level a harmonisation it can serve as an important example of the benefits of information sharing amongst institutions.

The Role of Standards

In response to this need, a new set of exchange standards is now evolving in the Internet world, facilitating exchange of data between different computer platforms and software applications. These standards act on different levels. Some of these standards do make life easier by allowing interoperability between different systems, but are not sector-specific:

- TCP/IP: the most basic Internet protocol allows exchange of data between computers from different vendors and with different operating systems;
- HTTP: navigation is standardised by the HTTP protocol that forms the backbone of the World Wide Web.

There is another category of standards that cannot be used just as they come and do need modification to meet specific needs. In this category, communities need to agree how they want to apply them and modify accordingly:

- SGML & XML: the world has realised for some time that we are producing documents and other data that we still want to use when the software with which we have produced it is obsolete. SGML and its Internet variant XML have been developed as exchange / storage formats independent of software application and platform. These are languages to define markup for the different elements in documents according to their contents. Communities need to agree about the standards for the specific markup for the types of content that they want to exchange.
- Interrogation protocols: there are a number of interrogation protocols under development such as 'OpenURL', 'web services'² or the 'Open Archival Information Systems (OAIS) protocol. These protocols are highly customizable and communities need to agree on how they want to apply them.
- Ontologies: meaningful exchange is not possible if different words and terms are used for the same concepts. Therefore perhaps the most pressing is the need for communities to harmonise their common vocabularies. There are a number of initiatives in the Internet community to enhance the development of such vocabularies with new techniques (e.g. the Semantic Web, work on ontologies, the Resource Description Framework (RDF)) but the domain specific intellectual work needs to be done within the communities.

If the agriculture sector achieves an increased level of interoperability between different information systems, we may need to rethink the different roles that information services play. Presently the services that collect the data are the same services that design the user-interface and provide access. In the future, a system with different layers may evolve: into a data layer, where data providers store data in open archives that can be interrogated using a standard protocol, and a services layer where service providers provide the end-users with views on the data that might be stored physically in different archives. This model is foreseen for the Open Archival Information System³ where universities are working together to give access to the documents that they produce.

Scenarios

In order to encourage more effective use of resources and more efficient use of information, information policies and strategies may need to be revisited to curb the information explosion in the field of agricultural and natural resources for development. What follows are a number of scenarios showing the evolving models of information service as they could be applied in the agriculture sector.

² *Web services: Application to application communication over the World Wide Web using standard protocols such as HTTP and XML.*

³ See for example: <http://www.classic.ccsds.org/documents/pdf/CCSDS-650.0-B-1.pdf>

Specialised views: An agency has been commissioned to create a website providing specific target group information on a subject, for example, a site for development workers on HIV/AIDS and rural women. The site owner can work together with a data provider who collects annotated links on development related subjects. This data provider will agree to co-operate if this initiative fits in with its general data collection policy. They work together to adapt the data collection policy and indexing methods. Together they produce a number of 'synthesis pages' that introduce the theme and gives access to the latest and most relevant resources as canned searches on the database⁴. The Website creator pays the data provider for these services. The data is provided in a special format according to the "look and feel" of the sites that they create, but uses the brand of the data provider to show that this is selected quality information.

Web services: A data provider maintains an authority database on organisations relevant for development in certain areas or certain parts of the world. They store data about a wide range of organisations ranging from intergovernmental organisations to Southern NGO's. Development organisations can subscribe to this service. They store in their project administrations and mailing lists only the data provider's identifier of a particular organisation. Through an interactive webservice they will always have the current name and address of the organisations in their system. One can imagine similar authority files for names of crops, pests, pesticides or agricultural products.

Newsfeeds: Official development organisations can make their Websites more attractive if they commission a specialised news agency to produce newsfeeds for their site with the latest information on specific subjects.

Expertise profiles: Information on experts is notoriously difficult to compile and maintain. A specialised agency can produce an intelligent full-text index on the document archives of relevant institutions. The system returns the experts who have published documents that match best the search request of a user. Organisations can commission this specialised agency to create special views on the expertise of their organisation.

Policy Options

What is the donors' role in these scenarios, and what policy choices should they make? To enhance coherence between services, initiatives might be supported that make the most efficient use of existing data resources and provide specific views for niche groups. Information services should include a content acquisition strategy to become eligible for donor funding. It is sometimes more attractive to fund the 'services layers' where the needs of specific target is addressed, than the data layer where providers maintain general collections. They should make sure that these services make an optimal use of the data layer. In this way data providers can be funded to produce information for which there is a demand. Donors play an important role, as they are the ones who can address the demand of the users in the South, these are not (yet) in a position to pay for the information they need.

Finally, there will always be a limited need to fund initiatives to fund standard-setting initiatives, as these are a prerequisite for efficient information exchange between services.

⁴ Canned search - A web link directly to the results of a search in a database or collection, e.g. <http://www.google.com?q=HIV+Agriculture+kenya>

SURVEY AND ANALYSIS OF INFORMATION SERVICES

Agricultural information services surveyed

Name	Service provider	Main type of content	Scope of content
AGRIS www.fao.org/agris	FAO	Bibliographic	Agriculture Science & technology
Dgroups www.dgroups.org	Bellonet	Topical discussions	General development including agriculture
CABI Compendia www.cabi.org	CABI	Factual	Plant protection, Forestry, Veterinary
CAB Abstracts and Global Health (databases) CABDirect (platform) www.cabi.org	CABI	Bibliographic	Agricultural (broad sense)
AgNIC www.agnic.org	AgNIC / NAL	Meta-data	Agricultural (North-America and international)
Development Gateway www.developmentgateway.org	DG Foundation	Metadata	General development including agriculture
EIARD-Infosys www.eiardinfosys.org	EIARD	Metadata	Agricultural research
EGFAR www.egfar.org	GFAR	Organisational	Agriculture
BIOME	Univ Nottingham UK	Metadata	Agriculture Forestry
FAO InfoFinder www.fao.org/waicent/search	FAO	Metadata	Agriculture
OneSite www.euforic.org/by_place/	ECDPM	Organisational	General development
ELDIS www.eldis.org	IDS UK	Metadata	General development including agriculture
AIDA www.developmentgateway.org/aida	WorldBank	Project	General development including agriculture
Onefish www.onefish.org	SIFAR	Project	Fisheries research
WISARD www.wisard.org	WIS International	Project	Agricultural research
CARIS www.fao.org/caris	FAO	Project	Agricultural research

Overview of Agricultural Information Services

In this study a number of agricultural information services were explored, in order to identify the potential for synergy and cooperative services. Results indicate that general services for development information contain a significant amount of information on agriculture, especially in the area of project information and metadata referring to online resources. This is why not only agricultural information services but also several more broad development information services are included in this study.

In order to map out the information services available, a number of current agricultural information services was studied and surveyed in some detail. Interviews with representatives of the organisations supplying information provided further insight into the results of the survey. The list of services included here is certainly not exhaustive, but represents a good mix of the different services that form the contemporary information landscape. The selection criteria included:

- *Status*: existing rather than proposed services. The survey included a number of important initiatives in a pilot phase (e.g. OKN) but excluded those projects without any online services available.
- *Content types*: content types where feasible synergies might be expected, such as bibliographic data, online metadata resources, contact data, activity data and news items. Many services go beyond these content types in their coverage (see appendix), but for the sake of comparison restrictions were made in terms of scope.
- *Coverage*: rural development and natural resources benefiting developing countries.
- *Internet based services*: services with an Internet presence.

The contents of the questionnaires, results and details of the services analysed can be found at the end of this report.

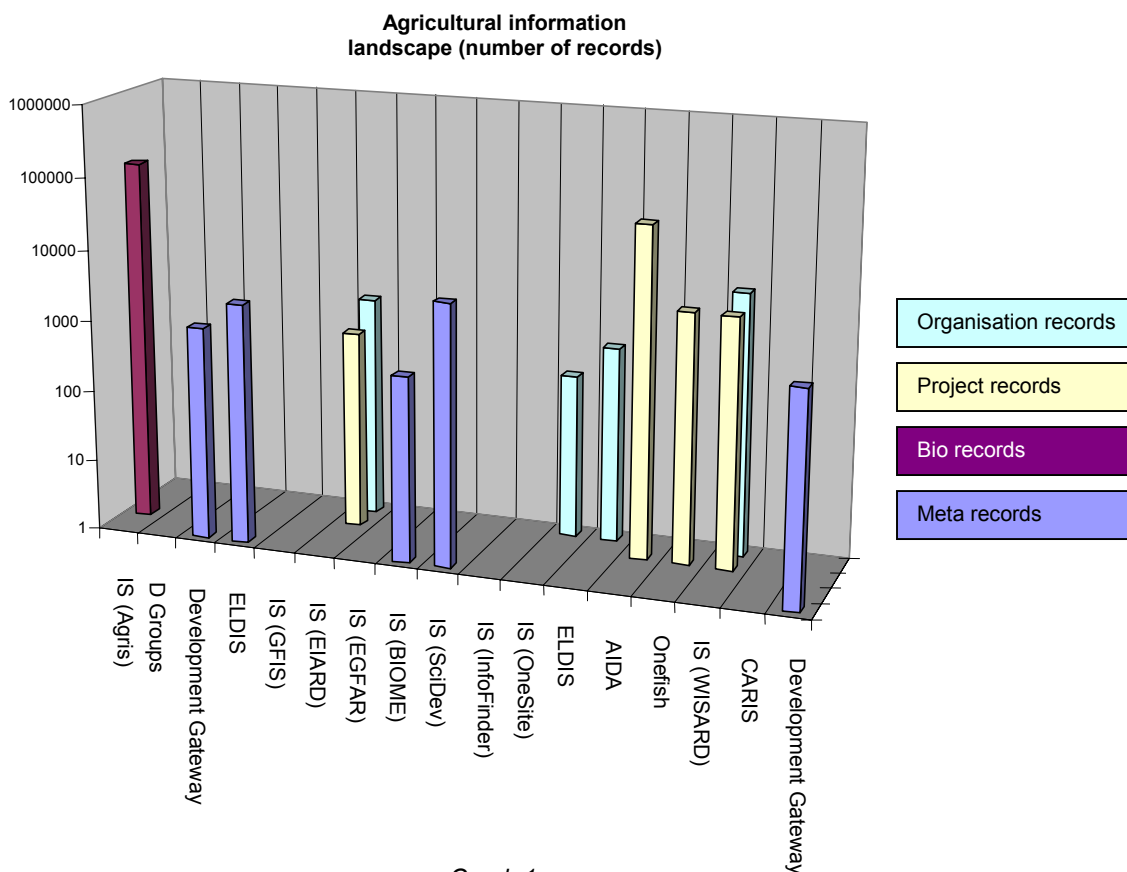
Services Providing Similar Content

There are some areas where several systems are working with the similar content types, although they do not yet provide joint services. Generally classified into data types, these include:

- *Metadata for on line resources*: oneFish, Eldis, OKN, AGRIS, CABI Internet Resources, WISARD, EIARD, Biome, TECA, FAO Infofinder, GFIS Africa
- *Fact sheets / news sheets*: CABI Compendia, oneFish, Eldis, EIARD Infosys, OKN
- *Contacts / Information descriptions*: CARIS, Eldis, Onsite Europe, WISARD, EIARD Infosys
- *Project/ activity data*: EIARD Infosys, WISARD, CARIS, whereby the latter two services are already participating in the collaborative service portal AIDA.

Number of Records

The graph below provides an impression of services in the agricultural information landscape and the content areas in which they operate.



Graph 1

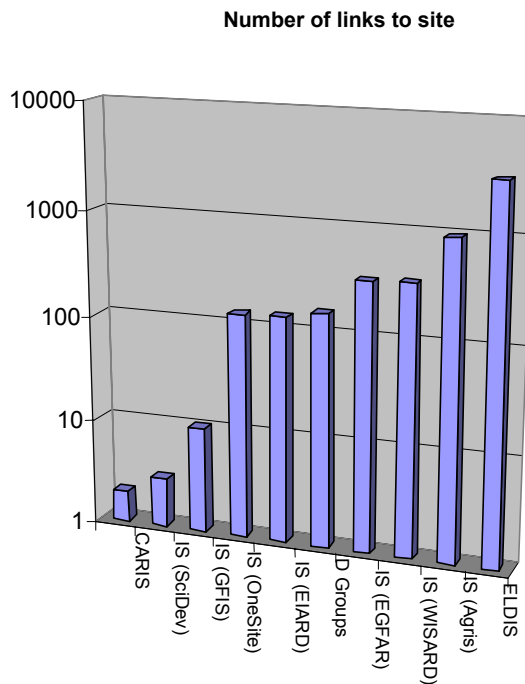
Please note that numbers have been omitted where they could not be obtained

Quantifying the overlap between the different services is rather challenging because of a lack of standardised indicators. Nonetheless, it is reasonable to assume that there is a potential for synergy if services can co-operate more easily and can create collaborative views on their information, for example through smarter use of vocabulary or metadata.

- For full services survey results, please see Appendix 1.
- Detailed services descriptions and numbers are summarized in Appendix 3.

Exposure

Usage statistics are not always available and it is difficult to compare exposure in view of different measurement indicators. A quick indication of the exposure of different services can be obtained by analysing the number of links to their sites. In this respect, the area of metadata for online services seems promising as it would provide the linking mechanisms for a more coherent approach to different services, and enhance the exposure to services along the way.



Graph 2

Please note that number of links is on a logarithmic scale

As illustrated in the graph, the exposure of the services varies considerably, ranging from single-digit linkages to over a thousand. Although qualitative analysis of these linkages is not included in this research, the area of service marketing could prove fruitful for possible synergies.

Technical Mechanisms to Support Coherence

Exchange Protocols / Architecture for Integrated Access

The Internet can be a powerful tool for integrating access to web-based documents through generic search engines (such as Google). Integrated access to information held in databases is generally lacking. There are a number of architectural options for integrated access to databases:

- *Harvesting*: remote databases are regularly harvested by a central engine and the data is stored in a central databases. We are all familiar with search engines that harvest documents; in the agriculture information community, AIDA and FAO Infofinder harvest from databases linked to the initiative.
- *On the fly integration*: data is requested form remote servers at the moment that the user submits a request; data is aggregated on the central server and sent back to the user. In the agriculture information community EIARD Infosys works this way.

For communications between servers there are two options:

- *Requests are encoded in a URL*. The syntax is being standardised in the OpenURL protocol. It is applied in commercial products like SFX and Metalib, but it is also used in the Open Archival Initiative MetadataHarvesting P Protocol (OAI MHP) In the development community Eland applies this approach.

- *The servers exchange requests and data as XML encoded messages.* EIARD Infosys has developed NodeXML that applies this method. The Internet community is standardising the format of these messages (“ Web services” using SOAP⁵ messages”) FAO has been experimenting with Web services in its “ Information Bus” prototype for country profiles.

In the survey we found a remarkable convergence of services planning to investigate Web services. This therefore is a fertile area for co-operation.

Markup Standards

A number of technical standards is used to create collaborative services. A well-known standard is markup, the language used to define Extensible Markup Language (XML) tags. Such tags may form the basis for collaborative services. XML is designed to improve the functionality of the web by providing more flexible and adaptable information identification.

It is called extensible because it is not a fixed format like HTML (a single, predefined markup language). Instead, XML is actually a ‘metalanguage’ —a language for describing other languages—which lets you design your own customized markup languages for limitless different types of documents.

There are three “standards” in Agricultural Information Systems, with differing degrees of standardisation:

- *Markup based on Dublin core:* Mark-up for metadata on online resources is always to some extent based on Dublin core. Dublin Core metadata is used to supplement existing methods for searching and indexing Web-based metadata, regardless of whether the corresponding resource is an electronic document or a “real” physical object⁶. However, this still leaves room for different interpretation. For exchange purposes within the agricultural information systems community, the applicability of the Agricultural Metadata Element set (AgMES) Application Profile can be investigated within our community. The AgMES initiative “aims to encompass issues of semantic standards in the domain of agriculture with respect to description, resource discovery, interoperability and data exchange for different types of information resources”⁷.
- *Markup of fact sheets and news sheets:* an exchange standard for the markup of factsheets / newssheets still needs to be explored
- *AIDA schema / IDML:* The AIDA can export data to XML files that are compliant with the International Development Markup Language (IDML). IDML is an XML Schema for the exchange of development related information. The AIDA schema/IDML is not used in our community for project descriptions except for submission to AIDA.

Shared Vocabularies and Ontologies

The development of common vocabularies when customising markup language can help communities achieve integrated access and develop qualifying standards.

Within the agricultural information community, most subject-oriented vocabularies are either based on CABI thesaurus/CABI codes or AGROVOC/AGRIS/CARIS subject categories. AiDA is

⁵ SOAP: Simple Open Access Protocol, see <http://www.fao.org/agmes>

⁶ For more on this, see for example <http://dublincore.org/resources/faq/>

⁷ For more of AgMES, see <http://xml.coverpages.org/ni2003-05-12-a.html>

an exception, and applies standard values to index development activities by sector so they can be found through the search by Sector⁸, also known as DAC 5 codes. AiDA also uses Creditor Reporting System purpose codes (CRS Purpose Codes) to classify activities by sector in AIDA).

Ontology is a system that contains terms and the definitions of those terms, and the specification of relationships among those terms. It can be thought of as an enhanced thesaurus, providing all the basic relationships inherent in a thesaurus, plus it defines and enables the creation of more formal and more specific relationships. It is designed to serve as a central focal point for the vocabulary of a particular domain, and to codify and standardise the knowledge within that domain. It enables better communication within and across domains, and structures meaning contained in the domain.⁹

The Agricultural Ontology Server project functions as a central common reference tool for serving ontologies. Initiated by FAO, this seems to be a promising initiative to reconcile these approaches.

Approaches

Different Information systems take different approaches to acquiring, storing, analysing, displaying and disseminating information. As discussed in the Introduction these roles may not be concentrated in one organisation. One group may specialise in providing a portal which may serve a specific community of users. This portal may in turn draw on data from a broader indexing site. Dissemination of information may happen through an email alert service or a group workspace such as Dgroups.

Conclusions & Recommendations – Services Dialogue

A number of actions are proposed in order to create an enabling infrastructure to enhance interoperability and opportunities for collaborative services.

Clearinghouse Mechanism

Service providers recognised that there are several opportunities as well as initiatives underway to develop common standards. These activities need a “home” that provides a clear mechanism enabling services providers to liaise with them. This can be done in the form of a clearing house for sharing information standards within the agricultural community.

FAO volunteered to act as a host for the clearinghouse and set it up practically. Although the mechanism should be open, there is a recognised need to form a consortium with member-services that form the clearinghouse. The existing public UDDI registries for web services¹⁰ illustrate the need for such a consortium: these registries are so open that the services

⁸ See <http://www.developmentgateway.org/tools/>

⁹ See http://www.fao.org/agris/aos/Conferences/SemanticsPosition_Paper.htm

¹⁰ Universal Description, Discovery and Integration (UDDI) protocol creates a standard interoperable platform that enables companies and applications to quickly, easily, and dynamically find and use Web services over the Internet. UDDI also allows operational registries to be maintained for different purposes in different contexts. UDDI is a cross-industry effort and takes advantage of World Wide Web Consortium (W3C) and Internet Engineering Task Force (IETF) standards such as Extensible Markup Language (XML), and HTTP and Domain Name System (DNS) protocols. Additionally, cross platform programming features are addressed by adopting early versions of the proposed Simple Object Access Protocol (SOAP) known as XML Protocol messaging specifications (source: <http://www.uddi.org/about.html>)

registered cannot be taken as ‘trusted services’ with guaranteed quality, and are thus of limited use. A proposal for a structure of the consortium with potential stakeholders has been in Appendix 5.

There are a number of areas on which such a clearinghouse could operate, including:

Vocabularies

It is neither feasible nor desirable to keep people from defining their own vocabularies and encoding schemes. However, it is important that they build upon existing vocabularies wherever possible, and map how these relate to existing ones. A clearinghouse can provide a reliable registry of existing vocabularies and encoding schemes, and might include initiatives for mapping their relations.

Authority File for Organisations

The need for the specific area of authority was acknowledged by several services providers, who indicated that the existence of such a file would enhance their usability. The maintenance of such a file cannot be done by one organisation but it must be done in a decentralised fashion, where services take responsibility for organisations within their area of interest. AIDA will be invited to take the initiative to establish such a collaborative authority list. It could be made available as a webservice (see below).

Best Practice of Markup Definitions

Services providers concluded that there is a need for best practice to develop definitions for the markup of documents and other data. As a starting point a public specification should be used (like Dublin Core for meta-data). If a service then has specific needs not covered in the public specifications, one can investigate whether another community has registered a specific set of elements that refer to the public element set used (like AgMES for the agricultural area that refers to Dublin Core). If those element sets do not cover all needs, a service should define its own set. The abovementioned clearinghouse can provide a home to register such specific element sets. In terms of making agriculture information systems more coherent, metadata and newsheets/factsheets, and their syndication, offer ample opportunity for collaboration. In terms of the latter, the usability of the emerging RSS (RDF¹¹ or Rich Site Summary)¹² standard will be investigated.

Protocols for Interoperability

Several providers showed interest in exploring web services to describe and standardise protocols for interoperability (see for example <http://www.w3.org/2002/ws/>). To address this, the community might look into establishing a registry (“UDDI”) of web services which have passed

¹¹ Resource Description Framework

¹² RSS is a format for syndicating news and the content of news-like sites, but pretty much anything that can be broken down into discrete items can be syndicated via RSS: once information about each item is in RSS format, an RSS-aware program can check the feed for changes and react to the changes in an appropriate way. RSS-aware programs called news aggregators, which, for example, can help you keep up with all your favourite web logs by checking their RSS feeds and displaying new items from each of them (source: <http://www.xml.com/pub/a/2002/12/18/dive-into-xml.html>).

an assessment, in order to guarantee a certain level of quality assurance in terms of the information provided. Suggestions for web services include look-up tables for geographical entities, organisations, and mappings of vocabularies. The abovementioned clearinghouse should provide instructional material, and take initiative to promote the creation of new web services within the community towards establishing protocols.

Areas for Further Discussion

A number of issues were recognised as priorities, but require further discussion. These include:

Intellectual Property Rights

Collaborative services require more than overcoming technical and semantic thresholds, and include agreements between service providers on such issues as intellectual property rights (IPR) of the information they provide collaboratively. The IPR community has come up with a number of interesting proposed licenses to facilitate such agreements, such as the Creative Commons initiative (www.creativecommons.org). However, these licenses neglect a number of situations for information providers in the specific area of agriculture information. For example, not included is the situation in which providers are willing to share information without charge in certain restricted areas (such as developing countries), or with a time restriction (e.g. not the latest issues of a journal). This issue will be discussed further after consultation with legal experts in this area.

Search Engines and Retrieval Strategies

Within the community, service providers are faced with similar questions related to resource discovery strategies. Issues to be explored in more detail include the integration of full text indexes with metadatasearches and the creation of appropriate user interfaces.

Preservation of Digital Resources

Preservation of digital resources is an important related issue, but not necessarily an area of action for the international community for agriculture information. USDA National Agricultural Library will be invited to prepare a position paper on this issue.

POLICY PERSPECTIVES

Introduction

Most agriculture information systems, with the exception of a commercial minority, depend on donor support. Therefore, in order to identify opportunities for more coherence or intensified efficiency, the perspectives, ambitions and wishes of donors and policy makers cannot be neglected. Current donor and policy approaches to supporting agricultural information services included in this research include DFID, FAO, GFAR, DGIS, EIARD and the Swiss Development Cooperation. Supplemented with evaluations of Internet services performed over the last three years, the following priority areas were identified from a donor and policy-maker perspective:

- The purpose of an agricultural information system;
- The target beneficiaries, both direct users and intermediaries;
- The role of the service in the broader information environment;
- The interventions possible to create the service, either a facilitating environment or a technical service/platform;
- The possibilities for assistance through resources and initiatives;
- The inherent exchange systems and broader infrastructure into which any service should fit and
- Management issues surrounding support and strategy for assistance.

Purpose

A priority area identified by policy makers involved an analysis of how well a service addressed identified goals such as ensuring food security, its role in poverty alleviation and its contribution to millennium development goals. This was particularly the focus for development agencies; the European Commission however appears to have additional purposes for their services: European cooperation, research efficiency, and use of new technologies were purposes in their own right with different Directorates Generals (as can be seen from the list of approved projects listed under Appendix 3).

Objectives of the services aimed at achieving these overarching goals covered a range of areas, including better-informed policy and improving efficiency and research results of development projects.

Target Audience & Role

In line with the variety of objectives the systems' intended user base is diverse. Whilst most services initially focused on researchers, developing later down the road towards a practitioner-focus, all around there is a recent emphasis on Southern-based, non-state actors, both from the private sector and civil society. Action on coordination at a national level was identified as being important. This was both in order to coordinate the role of information systems and to ensure that demand at a national level is articulated to the international systems. The target audience is often intermediaries or information brokers (such as extension officers). As such, the role of non-state actors has increased as extension services are in a process of privatisation and with

the increase of ICT-enabled services, the information flows becomes more diverse (see also graph II above).

The target audience may also be local to the donor, either staff within the organisation or project partners.

- *Internal staff:* many of the traditional indexing systems have been developed for improving the access of donor staff to Internet services and materials relevant to their work. By providing specialised feeds of information, a number of general indexing sites resource larger databases.
- *Project partners:* project partners chosen for support and the commissioning of an information system may be a national or regional resource or a broader southern-based community. These have been primarily centred on a theme or commodity but more recent emphasis has been on building capacities on a geographical basis, either supporting national infrastructure or regional initiatives. The information systems are generally seen as a component of capacity building rather than a distinct service.

The role of the service is often alerting or briefing the user, in particular encouraging networking. From a historical perspective, the services appear to have been developed using the Internet with an emphasis on promoting activities and publishing results, more so than supporting a reference base for materials.

Interventions

Particularly valued interventions focus on knowledge management and capacity building in the South, electronic publishing, discussion platforms to seek feedback on policies and development approaches. Directories of Southern-based organisations have also been developed but less interest is shown in such indexing systems, retrieval systems and news feed/email alert systems. This donor approach seems to be at odds with the services being provided on the Internet as a whole, where an interest in syndicating content is growing and an emphasis on views of information across various information sources is emerging.

Funding Assistance

Support for services seems to be shifting, towards serving the direct information needs of the donors and their advisors. Project funding for establishing (new) systems is limited, although still possible through the European Commission. Far more emphasis lies on capacity building in the South, focussing on training, workshops and meetings. The publishing of electronic journals and access to journals and articles has also attracted support. The emergence of discussion platforms, facilitating communities of practice and e-communities, is also incrementally gaining support, although it these have been adopted with varying degrees of success.

The promotion of national resources and capacity available to the development community is also seen as a priority for information services, ensuring better use of local expert resources.

Exchange/Infrastructure

Support to international agreements in terms of Internet standards and international organisations such as devised by the FAO and Development Gateway, imply that donor organisations have an interest in supporting the exchange of data complying with international standards. This is complicated by the fact that the data set is linked with so many disciplines (beyond agriculture, such as health, environment, etc). One possibility to circumvent this complication involves in which conditional funding, depending on contributions being made to major indexes.

The role of agricultural research for *development services*, where the content is already part of *general* agriculture, science and technology research systems, may lead to confusion, as also identified in the “services” survey. An identified need involves ensuring that the coherence of existing international agricultural information systems is addressed at the international level – and to this end it has been raised as an agenda item to be considered at the next COAIM meeting. Hopefully a series of initiatives surrounding this will lead to improved feedback into the design and infrastructure planned at an International level.

Management

The management of support to agricultural information systems is complicated in terms of monitoring and coordination considerations. Measurement against the broad goals and indicators identified in the project purpose is difficult. The value assessment of services has proved complicated precisely because of the many different standards used, and many rely on further comparative studies of services. Increasingly, service delivery agreements are drawn up, in order to identify measurable indicators, particularly for direct use by the donor.

Another complex issue is the coordination of projects, as responsibilities are often split across numerous departments, for example the internal ICT department, policy departments and research departments. It may also be split across ministries, in particular Agriculture and Development. In the case of European Commission support projects are split across Directorates General on Environment, Agriculture, Research, Development and Information Society. This split of responsibilities leads to split reporting, creating a practically impenetrable maze of related projects.

Through periodic reviews by country or by theme, it may be possible to identify synergies or duplication in efforts but so far these reviews have tended to be one-time efforts, and tend to focus on a particular theme, country or region, so do not give an overall, comparative picture of the services and their users.

Conclusions & Recommendations – Policy Dialogue

The need for coherence arises from a general need to enhance the effectiveness of agricultural Information systems. This depends on:

- Coherence
- Complementarity
- Coordination

Articulating End-User Demand

At a national level the key debate amongst policymakers addresses the need to identify, describe and communicate the demand for information so that this can be more clearly articulated to those responsible for international systems. As a result, the latter might be able to serve these needs better locally, nationally as well as internationally. Policymakers emphasized that this should not just be a top-down communication mechanism from the international bodies only, but by linking existing services more efficiently to create more opportunities for dialogue. This may lead to discussions not just on setting technical exchange standards but also promoting management standards to put the onus on public information providers to link their activities with other related services.

Discussants recognised that it is important to bring these issues to the agenda of international fora. One of the next opportunities to achieve this is the next COAIM meeting.

Action Points

The following action points were suggested in order to enhance coherence in international agriculture information systems, at a policy level:

- **FAO Resource Kit:** The user community that is forming itself around the Resource Kit module on electronic management of documents can very be involved to broaden these processes into including management issues and donor awareness.
- **National forum:** Support to national fora amongst the intended beneficiaries, to clarify and address the demands for agricultural international information systems considering national activities. This could be achieved by Donors supporting an individual country prior to the next COAIM meeting to support the National requirements of the International systems.
- **Donor Dialogue:** Establishment of a donor forum to discuss coherence issues in support to agricultural information systems at an international level.
- **Continued dialogue on agricultural information system coherence.** A start could be made through an e-discussion (Dgroups) possibly in relation with the Agstandards list. This would include discussions on follow-up to the meeting, for example the discussion on quality criteria and marketing.
- **Monitoring:** To follow the change in services and to measure coherence between systems and improved efficiency in exchange of information, a simple monitoring system is required. These monitoring issues can be clarified and a simple measure adopted to see impact of coherence activity. This should be linked to the activities of the LEAP Impact discussion forum.

VIEWS FROM THE SOUTH

Country Profiles

International agriculture information systems are often initiated in order to provide Southern partners with access to relevant information, addressing particular information needs to improve agricultural livelihoods. However, from a development perspective, the impact of agricultural information services has been limited in terms of generating significant improvement in agricultural production. Millennium Development Goals and poverty alleviation often seem far removed from the services provided. What are the primary reasons for this? Agricultural specialists from Ghana, Tanzania and Uganda provide a snapshot of the situation in their country. The detailed profiles are found in the Appendix section.

Ghana

Ghana maintains an extensive network of agricultural information services, coordinated primarily by *GAINS*. The *GAINS* network consists of eighteen libraries and documentation centres among research institutes, the universities and the Ministry of Food and Agriculture. However, a recent stakeholder meeting in Ghana identified that between the resource providers there is a perceived lack of strong partnerships, lack of collaboration among local stakeholders and insufficient commitment to share ownership and responsibilities. Furthermore, partnership with international agricultural information systems and services also raises issues of uniformity of procedures, standards and coherence in accessing or retrieving information from different databases.

Nonetheless, a promising development can be perceived in Ghana. Now that the stakeholders are involved in active dialogue, the major critical issues have been identified and can be addressed both in the national and international arena. The actions set in motion aim at countering the fragmentation, and bundling the products, services, knowledge of actors and modes of dissemination. The *GAINS* network, strengthened with private sector and international stakeholders (such as FAO and KIT), is an important pivotal point in enhancing coherence in agriculture information systems and, most importantly, addressing the needs of the end users to enhance agricultural development.

Tanzania

Until very recently, information management systems were largely based on hardcopies and manually compiled data. Scientists had access to old-fashioned libraries with outdated books and journals and not to the vast information available on the Internet. However, since most upcountry scientists now have their own e-mail addresses, they can request information by e-mail and staff at the head office retrieve the information and forward it to them. This system is cumbersome and not a perfect way of doing it, but it has helped many scientists in acquiring most recent information.

Most research stations are connected to e-mail and some have access to the whole range of Internet services. However, due to high cost of telephone calls, access to e-mail remains out of reach to many individual scientists and institutions. Mobile phone usage is spreading fast.

Despite all the obstacles, in one way or another, many scientists have become acquainted with the World Wide Web, very often on their own initiative and effort. They have created their personal e-mail accounts and use them for communication with colleagues in Tanzania and abroad. Although an increasing number of scientists search the Internet, this has not yet become a habit for most of them.

Uganda

Whilst the academic community seemed sufficiently resourced in references, books or publications, NGOs and consultants expressed lack of information as a major constraint to their work. A general comment is that although information related to agriculture in Uganda is available in the country, it is very difficult to access because it is scattered among various stakeholders including FAO, private sector and various government ministries and parastatal bodies. Additionally, the format in which most of the information is available is most often not the format that is readily usable for especially NGOs, farmer groups and non-technical users. Agricultural information needs of farmer groups and intermediary organisations working directly with rural farmers were somewhat different, in that the actual content needed has to be in a particular format, and must be up to date. Farmer associations needs manuals on livestock and cropping systems, regularly updated databases on weather, market prices, seeds and agricultural inputs, access to credit, etc.¹³ Finally, Internet information systems are considered an important indicator of the output generated by donor initiatives, and provide insight into the needs and interests of their intended beneficiaries.

Conclusions & Recommendations – Southern Perspective

In terms of international agricultural information systems, the anticipated users seem not always to be the recipients of the information. All is not lost however, as a few promising initiatives illustrate. Articulating demand at a grassroots level, and ensuring this demand is transmitted to information providers at an international level, is still quite a challenge. There are a number of indicators by which this can be perceived:

- ❖ *Scattered information*: there is no 'one-stop' centre for agricultural information. This absence of a catalogue or common reference point, guiding the user to find out what information is where, is a serious impediment for many Southern users. Either they do not know whether the information is available, they cannot find it (easily), or it is duplicated. Although financial resources to build such a resource have not (yet) been identified, most information providers expressed willingness to provide their data and collaborate towards a more coherent approach in information provisioning. There was a request for a central one-stop centre, but the same results could be achieved by linking existing services rather than creating a new central site.
- ❖ *Poverty reduction too far off from research*: how does one prevent research from being too abstract? How on the other hand are results from the field translated back into the international domain? This step is neglected in the vast majority of research projects but should be included in the strategies and project documents for information systems. With extension officers acting as 'knowledge brokers', the link can be made, supported by metadata or common vocabulary for databases. There also needs to be a stronger voice for southern stakeholders in setting the research agenda, and more thought given to dissemination of results in a form that facilitates uptake and application in the field.

¹³ *Needs and Access to Agricultural Information in Uganda, Remigio Achia, 2001*

- ❖ *Format*: relevant formats to address access issues (digital, print, radio) or to reach the target audience are often not provided. The format in which information is presented, is generally adapted to meet the standards of researchers and extension services, rather than 'grassroots' users such as small farmers. This can be perceived in the language used, the website locations (often as a part of academic websites) and the resources provided. Furthermore, full content is often difficult to get (beyond excerpts).
- ❖ *Redistribution problem*: transmission of information between national nodes and international information systems is hindered by the lack of understanding of the mechanisms at present. There is a fear that representation on the policy-making groups for International systems does not take account of the main National user requirements. Similarly the features and opportunities presented by the International systems may not be clear at the National level. International agricultural information systems should primarily plug into national networks, they are there to serve the national concerns (e.g. in CG system whereby national local priorities are addressed and fed into the international research domain);
- ❖ *Local ownership and policy actions*: poor local ownership, currently quite a problem in terms of international information systems, are such that country users are not involved in identifying or addressing information needs. The national government should make sure that international information systems are resourced properly from their country level through the ministry of Agriculture, and should prioritise their support to knowledge brokers (e.g. extension services) to ensure the linkage from a national level is not neglected.
- ❖ *Access*: lack of technology infrastructure restricts access to ICT-enabled information systems. Working through a network, or well-resourced knowledge 'hubs', can in part address this problem, especially now that mobile telephony and email is becoming more widely available, even in rural areas.
- ❖ *International vs. local relevance*: coverage of local issues is generally low; services are often not meeting the needs of local farmers and extension, but are more relevant to the North than South. Funding agencies supporting agriculture information systems should ensure that the priorities of their intended Southern beneficiaries are sufficiently addressed.
- ❖ *Language barriers*: languages issues are poorly addressed, making the information inaccessible through language barriers.
- ❖ *Supply vs. demand*: the services don't always respond to the needs of the users or are unapproachable to articulate demand.

OVERALL CONCLUSIONS

There are opportunities to create collaborative services to provide integrated views on data from different providers in the agricultural field. Exchange standards can help facilitate this process.

Managers and policy-makers in the area of agricultural information services are aware that we can not go on maintaining and creating scattered information services. We should therefore take advantage of the opportunities listed below. In particular there was a feeling we should make more use of the political mechanism available to bring this agenda further; COAIM.

- ❖ *Poverty reduction is too far removed from research:* how does one prevent research from being too abstract? How on the other hand are results from the field translated back into the international domain? This link is neglected in the vast majority of research projects but should be included in the strategies and project documents for information systems. Extension officers acting as 'knowledge brokers' might help link the needs to the services and vice versa, supported by systems using metadata or common vocabulary for databases.
- ❖ *Marketing:* service marketing is a fruitful area for collaboration, as is proven by the abundance of and demand for portals, sharing of links, etc.
- ❖ *Web-services and international standards:* a remarkable number of initiatives are investigating convergence of web services in terms of communications between servers. Furthermore, donor organisations generally have an interest in supporting the exchange of data complying with international standards and quality criteria. Both should be encouraged to enhance coherence.
- ❖ *Baseline studies:* baseline studies on a thematic, cross-country basis could help indicate where duplication is occurring or where more opportunity lies for synergies.
- ❖ *Articulating national information needs:* at a national level, a key debate amongst policymakers addresses how to better meet the demand for information, and articulate this to those responsible for international systems. A national stakeholder forum of intended beneficiaries could help clarify and address the demands for agricultural information systems in terms of national activities. As a result, international information systems will be able to serve these needs better locally, nationally as well as internationally.
- ❖ *Knowledge sharing as a standard:* linking existing services more efficiently creates more opportunities for dialogue, improving the coherence of technical exchange standards whilst at the same time emphasising transparency of governance and knowledge sharing as a standard. This issue will be submitted for discussion at the next COAIM meeting.
- ❖ *Awareness-raising through active communities:* the user community that is forming itself around the FAO Resource Kit module on electronic management of documents can be involved to broaden these processes to include governance issues and donor awareness.
- ❖ *Donor dialogue:* donors are increasingly willing to discuss coherence issues in support of agricultural information systems at an international level. The establishment of a donor forum could help stimulate this dialogue.
- ❖ *Monitoring:* to follow the change in services and to measure coherence between systems and improved efficiency in exchange of information, a simple monitoring system is required to measure the impact of coherence activities. This might be linked to the activities of the LEAP Impact discussion forum.
- ❖ *Scattered information sources:* the absence of a catalogue or common reference point, guiding the user to find out what information is where, is a serious impediment for many Southern users. Either they do not know whether the information is available, they cannot find it (easily), or it is duplicated. A central one-stop centre should be constructed after a comprehensive study and key information needs of different user groups.
- ❖ *Access:* lack of technology infrastructure restricts access to ICT-enabled information systems. Working through a network, or well-resourced knowledge 'hubs', can in part address this

problem, especially now that mobile telephony and email is becoming more widely available, even in rural areas.

- ❖ *International vs. local relevance*: coverage of local issues is generally low; services are often not meeting the needs of local farmers and extension, but are more relevant to the North than South. Funding agencies supporting agriculture information systems should ensure that the priorities of their intended Southern beneficiaries are sufficiently addressed.
- ❖ *Continued dialogue*: the debate illustrate in this report is a promising first step towards agricultural information system coherence. An e-discussion (Dgroups) possibly in relation with the Agstandards list will include discussions on follow-up to the meeting, for example the discussion on quality criteria and marketing.
- ❖ *Link, don't lump*: to implement the next steps in an effective manner, the stakeholders (service providers, southern users and policy makers) should be linked, but not lumped together in discussions and policy formulation processes. Although the stakeholders complement one another, their different needs lead to different prioritisation, and therefore should perhaps be addressed separately.

APPENDICES

Appendix 1: Sites and Services for Study

Contacts and/or Organisational profiles

- WISARD
- EIARD Infosys
- OECD database
- RAIS (ARENA, ECAPAPA)
- World Bank
- ELDIS

Projects and Activities

An increasing number of organisations are participating in AIDA, which is probably the best example of an integrated access service in the field of development. Both the study and the meeting will build on the AIDA experience. The list below contains some of AIDA's constituent datasets.

- FAO/CARIS
- WISARD
- OECD/DAC
- Bellanet (GK-AIMS, NGO community contributions to AIDA)
- EIARD – Infosys

Bibliographic References

- AGRIS
- CABI
- ELAND constituents
- JOLIS

Metadatabase (online resources)

- ELDIS
- EARD Infosysplus (AGRISCOOUT)
- FAO / CGIAR Infofinder
- BIOME
- Development Gateway

Integrated access services

- AIDA
- GFIS
- ELAND
- AGRIS
- EIARD (i.e. the nodexml experience)

News

News in the form of short texts to be communicated to end-users and to be read on the screen

- OKN
- EIARD
- ELDIS
- TEC

Appendix 2: Profile of Agricultural Information Services

Name	CABI Compendia Crop Protection Compendium Animal Health and Production Compendium Forestry Compendium	oneFish Community Directory	CAB Abstracts and Global Health (databases) CABDirect (platform)
Content Types	<ul style="list-style-type: none"> - Bibliographic data - Documents - Factsheet, Newsheets etc. - Pictures - Statistics - GIS 	<ul style="list-style-type: none"> - Bibliographic data - Metadata for online resources - Project / Activity descriptions - Documents Contacts (Institutions) - Jobs - News - Events - Polls - Discussions 	<ul style="list-style-type: none"> - Bibliographic data - Documents
Combines data types?	Yes	No	no
Participation collaborative networks	collaborative network in itself	Being pursued: Within FAO – Fisheries information systems (FIGIS, UNAtlas, Etc) and FAO Document Repository. External to FAO – FishPort, GTZ project information, DFID Project Information; AIDA; GFAR	CAB Abstracts is accessible via consortial networks, e.g. BIDS, EDINA, and may be potentially available via other networks, e.g. GFIS
Internal quality procedures	Numerous	Link checking Editor system Dated removal of News and Events; dated archiving of document and project information.	yes (quality assurance procedures, standardization of source citation, validation of field contents)
Content model			
Based on standards?	The products use a 3-tier application model.	<i>Not yet – looking to incorporate AgMes and AIDA IDML and convert legacy data</i> [Note – two other instances of the software have incorporated both the above standards or subsets of them i.e. the Rural Finance Knowledge Management System and the FreshwaterLife Knowledge Exchange System]	no
Public vocabularies/ encoding schemes	We plan to use the CAB Thesaurus as a navigation aid.	Yes – ISO standards for countries and languages	(but CAB Thesaurus is publicly available)
Proprietary vocabularies / encoding schemes	No	No	yes (CAB Thesaurus and CABICodes, but the former is publicly available and the latter can be made available)
Exchange options			
Open standard protocol?	Not yet but are seriously considering use of SOAP or Web services in the future.	Not yet	We are investigating OpenURL. We include DOIs, where available (for resolution via CrossRef).
XML output possible	It will be and yes we have full control over the XML.	XML output possible, control via developers	XML output possible, controls format
Server side script language	ASP. Yes, we handle scripts ourselves.	JSP	C++ (no capacity for scripting)

Multihost systems			
Software used	n.a.	n.a.	n.a.
Proprietary / open source?	n.a.	n.a.	n.a.
Specific DBMS required?	n.a.	n.a.	n.a.
Platforms	n.a.		n.a.

Name	CABI internet resources [i.e. portals]: AgBiotechNet; animalscience.com; ForestScience.info; ICMFocus; leisuretourism.com; nutritiongate.com; organic-research.com	Onesite Europe Contact Database	CARIS – Current Agricultural Research Information System
Content Types	<ul style="list-style-type: none"> - Bibliographic data - Project / Activity descriptions - Documents - Factsheet, Newsheets etc. - Calendar of events - Job advertisements - links to resources, - news, ... 	Contact details and organisation profiles	<ul style="list-style-type: none"> - Project / Activity descriptions - Experts and Institutions
Combines data types?	Yes	No	yes
Participation collaborative networks	No	Not exporting to other initiatives but CIDSE, EUFORIC, EADI OECD development centre, IICD are members of this system.	AIDA
Internal quality procedures	In part, per product	Yes, this is done by all members individually as they maintain their contact databases and by Euforic centrally for the directories of OECD and European Commission.	<i>Formats of data yes, content no.</i>
Content model			
Based on standards?	In part	<i>No, but derived from British Standard postal addressing</i>	CARIS project record structure.
Public vocabularies/ encoding schemes	no (but see CABI abstracts)	Iso codes for countries and languages,	AGROVOC AGRIS/CARIS subject categories ISO codes for countries and languages
Proprietary vocabularies / encoding schemes	no (but see CABI abstracts)	comprises local vocabulary list of EUFORIC keywords with additions from others.	
Exchanges options			
Open standard protocol?	Investigating OpenURL.	No	
XML output possible	not routinely (but some outputs are available in XML, and we control the format of that)	yes (has control)	
Server side script language	asp, jsp – we can handle this in-house	CFM, no local capacity	
Multihost systems			
Software used	n.a.	n.a.	
Proprietary / open source?	n.a.	n.a.	
Specific DBMS required?	n.a.	n.a.	
Platforms	n.a.	n.a.	

Name	AGRIS CARIS FAO online catalogue	Eldis	Open Knowledge Network
<i>Content Types</i>	<ul style="list-style-type: none"> - Bibliographic data - Metadata for online resources - Project / Activity descriptions - Documents 	<ul style="list-style-type: none"> - Bibliographic data - Metadata for online resources: - Project / Activity descriptions: only organisation/service descriptions - Documents - Factsheet, Newsheets etc. - Organisation/service descriptions - People descriptions (via GDNET) - Email newsletter archive (ie full text of other organisation's newsletters) - Announcements/Job postings - Discussion lists (our own: small scale) 	<ul style="list-style-type: none"> - Metadata for online resources metadata will be held for all OKN items - may include, market prices, requests for information, classified adverts, learning resources, images, audio
<i>Combines data types?</i>	Yes	Yes	yes
<i>Participation collaborative networks</i>	AGRIS and CARIS are collaborative networks in themselves	GDNET Other small scale collaboration	no
<i>Internal quality procedures</i>	Depends on the systems	Yes	Decentralized
Content model			
<i>Based on standards?</i>	ISBD, DC, AgMES (Agricultural Metadata Standard), AGLS Metadata standard	Loosely compatible with Dublin core type approaches	Metadata based on Dublin Core, NewsML under consideration
<i>Public vocabularies/ encoding schemes</i>	Subject element: AGROVOC; AGRIS Subject Categories ISO 3166 Country codes ISO 639-1& ISO 639-2 Language codes URI, ISSN, ISBN, IPC, Patent Number (PN) C ISSN	Not strictly	Iso-3 character code for language Date follows W3C-DTF format Format will use Mime Types
<i>Proprietary vocabularies / encoding schemes</i>	No	Yes, but more for controlling specific services such as pre-prepared searches, email bulletins, news feeds etc	Identifier will use OKN item naming system – currently suggested to be of the form Hub.AccessPoint.UID Type – will probably need to extend the Dublin Core type vocabulary to include e.g. Advert, Price etc. – perhaps will need have a sub-type as well Coverage may need to be OKN specific – e.g. to a particular Access Point, or Hub network, or regionally etc. Audience Subject – will look for non-proprietary scheme but may not find one Status – status of item in OKN editorial workflow
Exchange options			
<i>Open standard protocol?</i>	Web services should be possible		Web services highly likely
<i>XML output possible</i>	Yes, has control	Yes (and can control format)	Yes
<i>Server side script language</i>	ASP, JSP	CFM, can handle in house	PHP (using EZpublish library)
Multihost systems			
<i>Software used</i>	A Multihost searching via XML messaging (Open Source) software was prototyped with ZADI.	n.a.	Under design – could be ezPublish/PHP/Apache/SQL database
<i>Proprietary / open source?</i>		n.a.	Open sources
<i>Specific DBMS required?</i>		n.a.	Not yet decided
<i>Platforms</i>		n.a.	Windows / Linux

Name	GFIS AFRICA	BIOME / AgriFor	TECA Technology for Agriculture
<i>Content Types</i>	<ul style="list-style-type: none"> - Bibliographic data - Metadata for online resources - Project / Activity descriptions - Documents - Factsheet, Newsheets etc. 	Metadata for online resources	Metadata for online resources
<i>Combines data types?</i>	yes	No	no
<i>Participation collaborative networks</i>	GFIS	RDN	The system is designed as a collaborative network in itself
<i>Internal quality procedures</i>	No	Documented procedures and evaluation guidelines, regular link checking, and periodic reviews of record	Yes
Content model			
<i>Based on standards?</i>	Dublin Core with AgMES AP	Dublin Core	TECA DTD based on DC
<i>Public vocabularies/ encoding schemes</i>	Forest Decimal Code List of descriptors extracted from Agrovoc and CABI thesaurus	CABI thesaurus, DDC	ISO3 for country names
<i>Proprietary vocabularies/ encoding schemes</i>	Data type and format	No	No
Exchanges options			
<i>Open standard protocol?</i>	Z39.50 under study	Z39.50	TECA can exchange data using standard protocol like SOAP (web services)
<i>XML output possible</i>	Yes, returns proprietary format	Not at the moment, but it is planned to by Sept 2003	Yes, using the TECA DTD
<i>Server side script language</i>	PHP (handled centrally)	PERL for sever side scripts, but will have the ability to do JSP by 1 Aug 2003	JSP and ASP; yes we can handle scripts ourselves.
Multihost systems			
<i>Software used</i>	Proprietary PHP solution	n.a.	TECA has been designed in order to be installed locally and exchange data with the central repository using XML
<i>Proprietary / open source?</i>	IUFRO owns code	n.a.	The source is available in ASP and JSP
<i>Specific DBMS required?</i>	MySQL	n.a.	SQL server, MySQL
<i>Platforms</i>	Windows / Linux	n.a.	Windows / Linux

Name	AgNIC Agriculture Network Information System	FAO Information Finder	AiDA: Accessible Information on Development Activities
<i>Content Types</i>	<ul style="list-style-type: none"> - Bibliographic data - Metadata for online resources - Project / Activity descriptions - Documents - Factsheet, Newsheets etc. - Prepared for - Streaming audio and video - Courseware (SCORM compliant) 	Metadata for online resources Photos	Project / Activity descriptions
<i>Combines data types?</i>		The metadata can describe more than one type of content (documents, photos, links, videos, projects, etc.)	no
<i>Participation collaborative networks</i>	Collaborative network in itself	The system has been designed and developed in order to exchange metadata between different content owners, internal and external to FAO. The Consultative Group on International Agricultural Research (CGIAR) has a version of	Project/activity information is shared from the databases of individual organisations to a central aggregating platform (the AiDA database). Information is therefore passed up to the aggregator in a one-way direction, but is not shared between individual organisations

		the Finder (http://infofinder.cgiar.org/) . It contains metadata from the institutions in this network and both the CGIAR and FAO Finder provide the option to search the other.	
<i>Internal quality procedures</i>	Automatic link checking, relies on procedures employed by partners	Content is managed by contributors and approvers that should check data quality	Validation by harvester
Content model			
<i>Based on standards?</i>	Dublin Core, currently ROADS compliant format. New portal OAI compliant	Finder metadata are compliant with the Finder DTD based on international standards (DC) and FAO standard (AGMES)	The AiDA Schema was based on the IDML which was originally based on CEFDA
<i>Public vocabularies/ encoding schemes</i>	Our metadata schema uses the FIPS 10-4 encoding for country and province names.	ISO3 for the country names; AGROVOC thesaurus for the subject element; AGRIS categorization schemes for categories.	1 - Organisation codes: The CIAF (CEFDA Institution Authority File). Since this list is no longer managed, AiDA has been managing this list in a public manner. 2- Country codes: ISO 3166 Alpha 3. 3- Region codes: United Nations Statistics Division Region Codes. 4- Sectors: DAC 5 Codes and CRS Purpose codes. 5- Currencies: ISO 4217. 6- Terms of assistance: From those developed by CEFDA.
<i>Proprietary vocabularies / encoding schemes</i>	Our metadata schema supports the use of the National Agricultural Library Thesaurus as a controlled vocabulary.	No	1- An activity's origin identifier: 2- The rights for particular activities: 3- Status codes: 4-Organisation roles and person involved roles: 5- Activity record relations:
Exchanges options			
<i>Open standard protocol?</i>	With the release of our new Portal in June, we will be syndicating most of our content using RSS 1.0. Where appropriate, we will also make content available with XML-RPC, SOAP, and REST.	Yes, Finder can exchange data using standard protocols like SOAP (web services) based on HTTP	No
<i>XML output possible</i>	Our Portal software platform is Zope/Plone (www.zope.org and www.plone.org), all Open Source software. Thus, we have complete control over the format of the XML we emit.	Yes, using the Finder DTD	N.a.
<i>Server side script language</i>	Zope/Plone supports a number of server-side scripting options though PHP and JSP are not among them.	The system is available in ASP, and some modules also in JSP; we can handle scripts ourselves.	Most participants have the capacity to handle the scripting themselves since their data is already supplied through an online database on their website.
Multihost systems			
<i>Software used</i>	Zope/Plone	ASP and JSP scripts	TCL/TK migrating to Java
<i>Proprietary / open source?</i>	Open source	The source is available	no
<i>Specific DBMS required?</i>	We also employ MySQL as our primary SQL-compliant data store; Zope itself supports a number of SQL back ends including Oracle, PostgreSQL, SAP, Interbase, and Sybase, as well as other data stores such as LDAP and DBI.	Oracle, Microsoft SQL	Oracle DOM parser
<i>Platforms</i>	Linux, Mac OSX, Solaris, and Windows NT/2000/XP	Windows (?)	

Name	WISARD¹⁴	EARD InfosysPlus
Content Types	<ul style="list-style-type: none"> - Project / Activity descriptions - Documents - outputs from projects - Organisations/contacts 	<ul style="list-style-type: none"> - Metadata for online resources - Project / Activity descriptions - Documents - Factsheet, Newsheets etc. - News service - training courses
<i>Combines data types?</i>	Yes	yes
<i>Participation collaborative networks</i>	AIDA	No
<i>Internal quality procedures</i>	Responsibility of focal points.	Checked by National Nodes
Content model		
<i>Based on standards?</i>	yes, control over the format	no
<i>Public vocabularies/ encoding schemes</i>	?	Specific vocabulary based on version AGROVOC
<i>Proprietary vocabularies / encoding schemes</i>	?	?
Exchange options		
<i>Open standard protocol?</i>	?	Presently the system uses NodeXML internally
<i>XML output possible</i>	yes, can control format	Yes, can control format
<i>Server side script language</i>	Can handle CFM, ASP	CFM, ASP
Multihost systems		
<i>Software used</i>	n.a.	NodeXML
<i>Proprietary / open source?</i>	n.a.	Open Source
<i>Specific DBMS required?</i>	n.a.	Various DBMS
<i>Platforms</i>	n.a.	Windows, Linux, platforms that can run PHP

¹⁴ Note: the surveys of WISARD and EARD Infosys were not completed by the service providers but by the authors of this report.

Appendix 3: Services Questionnaire

Survey of information systems for the 'Coherence' meeting, 2003-06-2/3 in London

General

- What is the correct name to refer to your information system?
- What type (s) of content does your system deal with? For the study we distinguish between:
 - Bibliographic data
 - Metadata for online resources
 - Project / Activity descriptions
 - Documents¹⁵
 - Factsheet, Newsheets etc.¹⁶
- Are you handling other types of content, not mentioned in the list below?
- Does your system combine more than one type of content?
- Is your information system participating in any collaborative network? If yes, please specify
- Do you have any internal quality procedures to ensure quality, such as link checking or timeliness of information?

Content model

- Is (are) your present data model(s) based on any public standards? If yes, please specify.
- Does your system use public vocabularies or encoding schemes for certain elements? Please specify.
- Does your system use your proprietary vocabularies or encoding schemes for certain elements? Please specify.

Exchange options

- Are you aware if your system can interact with other systems using an open standard protocol (e.g. SOAP, OpenURL, Z39.50, any kind of 'Web services')
- Is your system able to return output in XML? If yes, do you have control over the format of the XML?
- Are you currently using a server-side scripting language (e.g. Php, CFM, ASP, JSP) please specify). If yes, do you have capacity to handle scripts yourself?
-

Multi-host access systems

- If your system is itself a system that gives access to data on more than one host, please specify
 - Software used
 - Is it proprietary or open source?
 - If it is open source
 - Does it require a specific DBMS as a back-end?
 - On which platforms does it run?

¹⁵ Electronic versions of printed documents

¹⁶ Short documents meant to be read online

Appendix 4: Southern Perspectives

Ghana

Joel Sam, Ghana Agricultural Information Network System (GAINS)

John Villars, independent consultant, Ghana

Background

Ghana maintains an extensive network of agricultural information services, coordinated primarily by *GAINS*. The *GAINS* network consists of eighteen libraries and documentation centres among research institutes, the universities and the Ministry of Food and Agriculture.

However, a recent stakeholder meeting in Ghana identified that between the resource providers there is a perceived lack of strong partnerships, lack of collaboration among local stakeholders and insufficient commitment to share ownership and responsibilities. Furthermore, partnership with international agricultural information systems and services also raises issues of uniformity of procedures, standards and coherence in accessing or retrieving information from different databases.

Nonetheless, a promising development can be perceived in Ghana. Now that the stakeholders are involved in active dialogue, the major critical issues have been identified and can be addressed both in the national and international arena. The actions set in motion aim at countering the fragmentation, and bundling the products, services, knowledge of actors and modes of dissemination. The *GAINS* network, strengthened with private sector and international stakeholders (such as *FAO* and *KIT*), is an important pivotal point in enhancing coherence in agriculture information systems and, most importantly, addressing the needs of the end users to enhance agricultural development.

Importance of Internet Services to Ghana Agricultural Environment

The Internet provides agricultural stakeholders with current information and enables them to stay in touch with their colleagues. The Agriculture, Forestry and Fisheries Sector, which has the mandate to coordinate agricultural research in Ghana, has no reliable email or Internet service. Despite these difficulties, Internet services are highly valued in the national agricultural information environment in Ghana.

Nonetheless, there are also a number of difficulties to overcome, for example the lack of the basic infrastructure in most institutions. Despite the awareness of the value of Internet services, and the eagerness to use them, the resulting effect is minimal use in the Ghanaian agricultural information environment. This is particularly within the farmer community who development initiatives often primarily target. Also within the national agricultural research system in Ghana, the use of ICTs is generally weak, again due to lack of access to email and Internet services.

User Needs Assessment

Group	High	Medium	Low
Research		X	
Policy			X
Extension			X
NGOs		X	
Private sector			X
Media			X
Others			X

Table 1 illustrates the use of national agricultural information systems on the Internet, by different groups of users in Ghana. Internet information for research purposes, indicated as 'medium' in use, could be 'high' if facilities were made available and accessible at affordable cost. The extension group is rated 'low' for the simple reason that they operate mostly in rural areas where availability and access to computers is minimal. Policy-makers quote a different reason for marginal use of ICT-enabled information services: they rely on close associates and assistants for their information needs, or use policy documents or guidelines, rather than depend on Internet sources. A large majority of the private sector, with the exception of well-established farmers and traders/exporters of agricultural produce, depend on extension agents to satisfy their information needs, rather than referring to Internet sources.

Most Relevant Types of Content

Type	High	Medium	Low
Information on current projects	X		
Bibliographic information	X		
Information about organisations		X	
Information on online resources ('metadata' / 'portals')		X	
Other			

Table 2

In terms of relevance of content provided, the 'highs' for information on current projects enable users to know who is doing what and to contact such persons ('Invisible Colleges') if necessary. Similarly, bibliographic information provides actual information that may be required and is appreciated especially when abstracts and full-length articles are provided. Information on organisations is rated as being of 'medium' relevance. It only becomes necessary where the required content is unavailable or other researchers are not known; in such a case information on which institution is doing what could be a useful source in locating this content.

Key National Information Providers

The Ghana Agricultural Information Network System (GAINS) is expected to contribute to AGRIS/CARIS. However, due to a few organisational difficulties this has not been done for some time now. It is also one of the sectoral nodal points for the GHASTINET (Ghana National Scientific and Technological Information Network) Project.

The Statistics, Research, Information and Public Relations Directorate of the Ministry of Food and Agriculture (MOFA) contributes to AFAMIN (African Agricultural Market Information Network).

A number of organisations contribute to the Plant Resources of Tropical Africa (PROTA) directory. These are the Plant Genetic Resources Centre (PGRC), Faculty of Agriculture, Kwame Nkrumah University of Science and Technology (KNUST), CSIR-INSTI (GAINS), Water Research Institute (WRI) and Forestry Research Institute of Ghana (FORIG). FORIG also contributes to GFIS (Global Forest Information System).

Issues that are Poorly Addressed by the Existing International Agricultural Information Systems

All in all, coverage of local issues is generally low, and the services prove to have more significance to countries of the North than to developing countries in the South. In this sense, a number of critical local issues to developing countries are not addressed (such as market information, weather conditions, (bio-) pesticides, etc.). The services' relevance for local farmers and extension agents is therefore limited. Although information in local languages is extremely limited, language is generally not a problem in Ghana. Most of the material is in English, which is well understood by most users except illiterate farmers; their needs in turn are catered for by extension agents.

Integration of Sources

Information services are acknowledged to be more useful in addressing Ghana's information needs if they would integrate information from different sources, making them easier and less time-consuming to locate. The respondent suggests the following resources might be integrated:

- *euforic* and *dgroups*: *dgroups* focuses on groups and communities interested in international development, and *euforic* facilitates dialogue between communities involved in Europe's international cooperation. Integration would be appropriate for both as they have identical scope and target similar users.
- WISARD, GFAR and AGRIFOR: the scope of WISARD includes information on experts and output projects, natural resource management and sustainable development; GFAR aims at discussing issues in agricultural research for development (ARD). WISARD's development efforts are impressive, however when connected with GFAR the service would have an even more positive effect on efficient and effective data management. To add the *development gateway* to this union may further boost the depth and variation of information on agriculture and development in the target areas. AGRIFOR added to this would enlarge the scope whilst retaining the relevance of each of these services.
- AGRIS and CARIS: the combination of AGRIS and CARIS would enhance the use of both since they are closely related in coverage and in their current configuration contain a lot of duplications. A linkage would bring together research in progress as well as that already completed.

Tanzania

Barnabas Kapange, Ministry of Agriculture and Food Security

Background

Tanzania shows a fair number of agricultural institutes, including Sokoine University of Agriculture, the Tropical Pesticides Research Institute, the Commission for Science and Technology, the Tanzania Food and Nutrition Centre, the University of Dar es Salaam, the National Environment Management Council (NEMC), the Centre for Agricultural Mechanization & Rural Technology, Department of Livestock Research and Training (DLRT) of the Ministry of Water and Livestock Development, the Tanzania Forestry Research Institute (TAFORI) and Tanzania Fisheries Research Institute (TAFIRI). The Department of Research and Development (DRD) of the Ministry of Agriculture and Food Security (MFAS) is the lead national agricultural research institution in Tanzania and therefore the main player in the planning and execution of agricultural information and documentation services.

Most of the information and documentation centres under these agricultural-related institutions in Tanzania are not able to provide the required information support (acquisition, processing and organizing, storage and dissemination) to users due to limited physical, human and financial resources. Besides, there are no formal networks or strong linkages among the bodies involved in agricultural information services in Tanzania; thus access to the few existing information resources is limited. However, the DRD has initiated the Tanzania Agricultural Research Project Phase II (TARP II), to address these shortcomings. The project aims to improve acquisition, processing and dissemination of agricultural information through the development of networking system firstly within the DRD, and later on between the DRD system and the national agricultural information community as a whole.

The Information and Documentation Unit at the DRD head office coordinate the information and documentation services between 22 major and minor stations in seven agro-ecological zones, which in turn are linked to zonal research centres and stations. The DRD is currently engaged in strengthening the scientific and management information systems both at the zonal and headquarter levels.

Importance of Internet Services to Tanzania Agricultural Environment

The Department of Research and Development (DRD) of the Ministry of Agriculture and Food Security wishes to consolidate ICT developments and to create a wide area network that will allow the stations to effectively and efficiently share local resources through a local area network, to link with other research stations and the headquarters; and ultimately to link to the Internet. The DRD intends to connect all major institutes to the Internet before the end of 2003. So far, DRD has connected 6 institutes to full Internet access, 4 of which are zonal head offices.

Until very recently, information management systems were largely based on hardcopies and manually compiled data. Scientists had access to old-fashioned libraries with outdated books and journals and not to the vast information available on the Internet. However, since most upcountry scientists now have their own e-mail addresses, they can request information by e-mail and staff at the head office retrieve the information and forward it to them. This system is cumbersome and not a perfect way of doing it, but it has helped many scientists in acquiring most recent information.

Most research stations are connected to e-mail and some have access to the whole range of Internet services. However, due to high cost of telephone calls, access to e-mail remains out of reach to many individual scientists and institutions. Mobile phone usage is spreading fast.

Despite all the obstacles, in one way or another, many scientists have become acquainted with the World Wide Web, very often on their own initiative and effort. They have created their personal e-mail accounts and use them for communication with colleagues in Tanzania and abroad. Although an increasing number of scientists search the Internet, this has not yet become a habit for most of them.

User Needs Assessment & Relevance of Content

Group	High	Medium	Low
Research	X		
Policy			X
Extension			X
NGOs		X	
Private sector	X		
Media		X	
Others			X

Type	High	Medium	Low
Information on current projects	X		
Bibliographic information	X		
Information about organisations		X	
Information on online resources ('metadata' / 'portals')	X		
Other		X	

The primary users of agricultural information services are the private sector and scientists. The private sector uses Internet information predominantly for online resources in production processes and marketing. Scientists use ICTs to access up-to-date information beyond the walls of the institute in an efficient and effective manner, consulting handbooks and scientific journals; they need reliable statistical data, and information from resource persons within professional networks and on the Internet.

Key National Information Providers

Tanzania participates in numerous collaborative agricultural research initiatives, and through such liaisons exchanges experiences with other local, national, regional and international organisations. The DRD is part of the regional and global information networks and the focal point for information exchange with the CGIAR International Agricultural Research Centres (IARCs) and other organisations, including FAO (CARIS database), CABI, DFID and CTA. As such, the DRD gains access to the technologies required from regional collaborative programs and allows them to be adapted in order to meet the needs of its farming community.

DRD is also member of regional information networks such as Regional Agricultural Information Network (RAIN) of Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Southern African Agricultural Regional Information Network (SAAINET) of SACCAR and many others. These networks enhance the access to information and may lead to regional collaboration.

Besides the international databases, there are nationally managed databases that are of importance. These include: CARIS, SPAAR InfoSys, TARD, FAO statistical database, MUSADOC, Management of Agricultural Research by ISNAR and others. All (DRD) zones participate in updating CARIS information, which is eventually sent to FAO for incorporation in the global database. NEMC, TAFORI and TAFIRI contribute in national updates to the global databases in their respective fields.

The DRD, both nationally and internationally an important information provider and network partner in its own right, has a website (<http://www.drd.mafs.go.tz/>) containing research results, policy documents and news. The statistical unit of MAFS prepares a wide range of information, including production areas and yields of food and cash crops, climate and rainfall, irrigation, agricultural inputs, plant health services, and agro-processing. The information is also accessible at the MAFS website (<http://www.kilimo.go.tz>).

The Tanzania Global Development and Learning Centre (www.tgdln.go.tz), housed at the Institute of Finance Management, facilitates sharing of research findings and successful development related experiments through video, electronic classrooms, satellite communications and the Internet. The Tanzania Development Gateway (<http://www.tanzaniagateway.org>) provides a rich platform of information, particularly relevant local content and interactive exchange of expertise and experience between scientists and other stakeholders. Tanzania Online (<http://www.tzonline.org>) is a gateway to information on development issues in Tanzania. It makes a reliable source to outsiders for information on Tanzania.

Issues that are Poorly Addressed by the Existing International Agricultural Information Systems

International, regional, and national agencies that support information activities influence the technologies, projects, and approaches that are used in a developing-country research organisation. International centres, as well as agencies such as IICD, CABI, CTA, FAO, ISNAR, and IDRC can all be made more responsive to the clarified requirements and objectives of their clients.

It is worth noting that every information unit has increased demands for ICTs but is limited with resources to acquire them, and capacity to use them. Capacity development and enhanced integration might increase the usability and transparency of services, bringing the supply and demand closer together.

Integration of Resources

ICTs have remarkable potential to help tackle problems ranging from poverty to economic stagnation, and from good governance to environmental degradation. In the information society, the information-poor are also the resource-poor, while countries with the highest incomes are also the most information-rich and ICT-developed.

Integration of information from different sources should be the target by all nations or organisations working with agricultural information systems. Researchers, extension workers and farmers are facing the increasing challenge of accessing and interpreting the new information within the context of the existing recommendations. Internet tools can facilitate the organisation, storage and selective extraction of information. Integration can help improve the effectiveness of management, use of agricultural information and allocation of financial resources, providing the users of agricultural information services with a viable way to deal with information overload.

Uganda

Remigio Acchia, FAO/NAADS Uganda

Background

In terms of governance, Uganda implemented a nationwide decentralisation policy a number of years ago. This means that governance is addressed at a national, district and sub-county level. Because of this, decentralisation, and liberalisation, of services was an important move for Uganda. This includes agricultural information services, traditionally addressed by public national extension services.

The National Agricultural and Advisory Services (NAADS) is a semi-autonomous body formed with the overall aim to reform the delivery of advisory services to farmers in Uganda. NAADS is one component of the overall Government Plan for Modernisation of Agriculture in the country. The fundamental aim of the organisation is to develop a demand-driven, client-oriented and farmer-led agricultural services delivery system in the country with a strong focus on targeting the poor, women, youths and people with disabilities. The programme is being implemented with the overall mission of realising “Increased farmer access to information, knowledge and technology through effective, efficient, sustainable and decentralised extension with increasing private sector involvement in line with government policy.”

Institutionally, NAADS is grounded on farmer groups at sub-county level. The groups are integrated, through representation at farmers' for a, with a hierarchy that has its base in the parish and ascends through the sub-county, district and ultimately the national level. The fora approve the plans and service contracts.

The upside of the decentralisation of Uganda's government is that it will, ideally, lead to a highly demand-driven system. The downside however is the risk of scattered information needs and feeds. Effective coordination, making sure information supply and demand meet, is a big challenge for NAADS as the programme is implemented.

Importance of Internet Services to Uganda's Agricultural Environment

Internet services are seen as very strategic to the National Agricultural and Advisory Services (NAADS) in the context of improvement in the management of information within the Organisation as well as access to agricultural information and knowledge in other sources.

A number of initiatives pertaining to agriculture are currently ongoing; ICTs could play a particularly pertinent role in processing the results and disseminating them to a broader audience. It is unclear at this point to what degree this is indeed happening. For instance, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) until recently regularly collected relevant information, aggregated at a national level to give a broad outlook of land use, crop plantings, production of crops, etc. Following structural reform, past data is now being used to produce annual estimates of agricultural data in the country (although the Uganda Bureau of Statistics, in a WorldBank project, now collects agricultural statistics). If restructured, ICTs could play an enormous role in such data collection and processing.

The National Agricultural Research Organisation (NARO) produces technologies on agriculture appropriate to the country, and is charged with the task to disseminate tested research

technologies and knowledge to rural farmers. They do this through the NARO Agricultural Research Information System (ARIS), which targets primarily Ugandan agriculture stakeholders. ARIS was established with support from FAO and receives and disperses information in various formats, including CD-roms, print and video.

The Department of Meteorology is the main source of agro-meteorological information and is aired on most FM radios around the country. Radio has a far higher permeation in terms of the rural community and is therefore a preferred form of technology to Internet.

Electronic document sharing is however increasingly overtaking hard copy distribution amongst most organisations consulted. Research bodies, private consultants and NGOs are heavy users of electronic mail for delivery of information compared to government institutions in general. Almost all organisations working with national agricultural information have their own email accounts or access to a computer with such facilities. However, only few have web pages (e.g. Ministry of Finance, NARO, FoodNet, Makerere University, ACODE).

Group	High	Medium	Low
Research	X		
Policy		X	
Extension			X
NGOs		X	
Private sector	X		
Media- Newspapers	X		
Media - Radio		X	
Consultants	X		
Students/Youth	X		
Farmers			X
Donors	X		

Type	High	Medium	Low
Information on current projects		X	
Bibliographic information	X		
Information about organisations		X	
Information on online resources ('metadata' / 'portals')	X		
Full text	X		
Funding sources	X		

User Needs Assessment & Relevance of Content

In general, various organisations produce a variety of reports for in-house and public use, including booklets with background information, activity and evaluation reports, and research results. Information needs vary between organisations surveyed.

Whilst the academic community seemed sufficiently resourced in references, books or publications, NGOs and consultants expressed lack of information as a major constraint to their work. A general comment is that although information related to agriculture in Uganda is available in the country, it is very difficult to access because it is scattered among various stakeholders including FAO, private sector and various government ministries and parastatal bodies. Additionally, the format in which most of the information is available is most often not the format that is readily usable for especially NGOs, farmer groups and non-technical users.

Agricultural information needs of farmer groups and intermediary organisations working directly with rural farmers were somewhat different, in that the actual content needed has to be in a

particular format, and must be up to date. Farmer associations needs manuals on livestock and cropping systems, regularly updated databases on weather, market prices, seeds and agricultural inputs, access to credit, etc.¹⁷ Finally, Internet information systems are considered an important indicator of the output generated by donor initiatives, and provide insight into the needs and interests of their intended beneficiaries.

Key National Information Providers

Uganda has quite a number of agencies and departments providing agriculture information. These include:

- Uganda Bureau of Statistics (Agricultural statistics department, Uganda National Household Survey Project, Uganda Demographic and Health Surveys Project) or UBOS is the national body mandated to collect, analyse and disseminate various types of information in the country.
- The National Agricultural Research organisation, by nature of its mandate (generation and dissemination of appropriate agricultural knowledge and technology) is a key producer of improved agricultural knowledge and technologies.
- The Agricultural Policy Secretariat, Bank of Uganda and the Economic Policy and Research Centre are key sources for macroeconomic information, analysis of agricultural policies in the country, poverty trends, etc.
- The Uganda Revenue Authority is a major source of import statistics of agricultural related goods.
- The Ministry of Tourism, Trade and Industry: collects agricultural farm gate commodity and food price information from various markets across the country. Currently collaborating with the IITA/Foodnet project to collect, analyse and disseminate, over radio (103 FM), agricultural market information of about 27 major commodities across the 11 agro-ecological zones of the country.
- Ministry of Agriculture, Animal Industry and Fisheries: collates information from various sources and collaborates closely with UBOS to produce official releases of agricultural information for transmission to various international organisations such as the World Bank, UCTAD, FAO, UNDP, UNICEF, etc.

Issues that are Poorly Addressed by the Existing International Agricultural Information Systems

There is a number of problems in accessing relevant content, including:

- Data quality and comparability (tools used, samples, etc)
- There is no 'one-stop' centre or reference point for agricultural information; many producers of similar information but no coordination and collation of information
- The information is often presented in formats not usable by envisioned beneficiaries
- Poor access: it is difficult to access much of the information: the majority is presented in hard copies, is not available locally and/or published internationally
- Country users are not involved by providers in understanding of nature, types and formats of information that they require; hence divergence or mismatch between user-producer supply-demand
- Full content often difficult to get.

¹⁷ *Needs and Access to Agricultural Information in Uganda, Remigio Achia, 2001*

Integration of Resources

Integration of information sources in the context of providing a one-stop centre or reference point would go a long way in improving access to and usage of agricultural information in the country. Integration in terms of collating information into one source may not be practical as it might lead to difficulties in terms of ownership of information, updating, quality control, etc. However, a single point of reference would be a step in the right direction.

National agricultural information systems (producers and users) need to be supported to address not only the immediate issues of quality and data comparability but also other issues related to development of standard tools and methods for data collection.

There is also a need to support user-producer multi-stakeholder forums where differentiated groups of users can interact and negotiate with various producers as to the types, nature and formats of information that they need.

Appendix 5: Proposal for a Clearinghouse for Information Exchange Standards in the Field of Agriculture and Natural Resources

DRAFT
Version 2003-07-29

Rationale

This proposal has been written in response to the recommendations of the workshop from the workshop “Coherence in International Agricultural Information Systems”, organised by DFID, London, June 2 – 3, 2003. Representatives from different information services recognised that a number of activities to develop exchange standards are under way, and formulated proposals for further actions. However, these standards and activities to develop them need a “home”. This proposal aims at creating a structure to provide such a “home”. It will be discussed with interested parties and be developed further at the basis of their comments.

Role of the clearinghouse

We can distinguish a number of roles:

- **Custody.** The community¹⁸ needs a repository of information exchange standards. The custody of this repository is probably a more active role in information systems these days than it is for older standards like the meter or the kilogram. It may very well involve the maintenance of an interoperable ‘Webservice’ that can be integrated in an online application
- **Decision structure.** There is a need for a structure to take the decision that a certain draft can evolve into a version of a standard. The clearinghouse sees to it that comments are invited and possibly incorporated, and at a certain stage it may be necessary to vote.
- **Meeting place.** The clearinghouse should offer members of the community who want to cooperate to develop a new standard.
- **Initiator.** It is probably not enough to wait till a group within the community establishes itself; the clearinghouse may perceive the need to initiate certain activities. This will be done on the basis of a vision of possible new developments

The custody role – maintenance of a repository of standards – is an activity for which it will be difficult to attract external funding. There it is desirable that this role is taken on by an international public organisation with relatively secure funding. (FAO/WAICENT seems to be in the best position to take this role on.)

The decision structure needs neither is an activity for which it is easy to attract external funding. It is not desirable that such a structure will be maintained by a single organisation. Stakeholder organisations should contribute staff time as a contribution in kind to a professional organisation.

The meeting place role is a relatively easy to play if the clearinghouse manages to organise a lively e-discussion around its activities. For the moderation of such a list stakeholder organisations should contribute staff time as a contribution in kind to a professional organisation.

The initiator role provides stakeholder organisations with an opportunity to raise external funds for collaborative projects and the organisation of conferences.

¹⁸ The ‘community’ meant here is the community of practitioners and those responsible for the quality management of information services in the field of agriculture and natural resources.

Organisation of the clearinghouse

Information services rather than their parent organisation should participate as stakeholders as they are the true interested parties for the development of exchange standards. These services should (of course with clearance from their parent organisation) express their interest to participate in the clearinghouse. They should commit themselves to contribute staff time to clearinghouse activities. They can express their interest in a letter of agreement with the clearinghouse. For this purpose the clearinghouse can be represented by FAO. The stakeholders nominate and elect members for a working group. This working group will

- Develop a work plan to initiate activities for the development of exchange standards
- Propose a decision making structure for such standards
- Organise a launch meeting to discuss these proposals

Appendix 6: Participants

Policy group:

Anton Mangstl	FAO
Barnabas Kapange	Tanzania Min. Agriculture & Food Security
Chris Addison	Communiq.org
Colm Foy	OECD
David Woolnough	DFID
Dylan Winder	DFID
Edith Hesse de Polanco	CGIAR
Geoff Barnard	Eldis
Jean-François Giovanetti	FAO – EGFAR
John Chelsom	Independent Consultant
John Villars	Ghana Inst. for Scientific & Tech. Information
Julie Ferguson	IICD
Koen Beelen	WISARD
Lucy Ambridge	DFID
Michael Kleine	GFIS
Peter Armstrong	OKN
Peter Ballantyne	INASP
Remigio Achia	FAO/NAADS Uganda
Sue Smith	CABI
Virginia Yee (by video conference)	World Bank (AIDA)
Yvonne Thomas	DFID

Services group:

Henry Mwandemere	FAO (TECA)
Hugo Besemer	Besemer.org
Ian Pettman	FAO (OneFish)
James Brooks	CABI - Thesaurus
Johannes Keiser	FAO (Agris)
Julia Brunt	CABI - Compendium
Joost Lieshout	InfoBridge
Ken Kitson	OneWorld International
Marc Bernard	EIARD
Michael Roberts	Bellanet (ICA)
(by video conference)	AgNic
Peter Ferguson	Eldis
Remigio Achia	FAO Uganda (Reviewer/NAADS)
Roger Mills	BIOME
Sarah Kerr	Bellanet
Steve Katz	FAO (InfoFinder)

IICD

The International Institute for Communication and Development (IICD) assists developing countries to realise locally owned sustainable development by harnessing the potential of Information and Communication Technologies (ICTs). IICD realises its mission through two strategic approaches. First, Country Programmes bring local organisations together and help them to formulate and execute ICT-supported development policies and projects. The approach aims to strengthen local institutional capacities to develop and manage Country Programmes, which are currently being implemented in Bolivia, Burkina Faso, Ecuador, Ghana, Jamaica, Mali, Tanzania, Uganda and Zambia. Second, Thematic Networking links country and international partners working in similar areas, connecting local knowledge with global knowledge and promoting South-South and South-North exchanges. Thematic Networking focuses on sectors like education, health, governance, environment, livelihood opportunities - especially agriculture - and overarching issues such as training and evaluation. These efforts are supported by various information and communication activities provided by IICD or its partners. IICD is an independent non-profit foundation, established by the Netherlands Ministry for Development Cooperation in 1997. Its core funders include the Dutch Directorate-General for Development Cooperation (DGIS), the UK Department for International Development (DFID) and the Swiss Agency for Development and Cooperation (SDC).

Communiq.org

Communiq.org is a platform offering consultancy support and services to organisations and networks working in Sustainable development and International Cooperation. It focuses on short term consultancies for building, developing, managing and evaluating Internet based services. Chris Addison trading as Communiq.org has been working on Internet Use in the Development Sector since 1994 and has focussed on supporting networks and networking organisations in their use of the Internet. His background is in working with European networks and organisations in Development research, Policy and practitioner environments.

<http://www.communiq.org>

Hugo Besemer

Hugo Besemer has been involved in this research activity as a private consultant but he has been working in different capacities on similar issues for Wageningen University and Research Center since 20 years.

DFID

The Department for International Development (DFID) was established in 1997, as the successor to the Overseas Development Administration, previously part of the Foreign & Commonwealth Office (FCO). DFID's overall aim is to reduce global poverty and promote sustainable development, in particular through achieving the Millennium Development Goals (MDGs).

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