Chapter 2

IRRISOFT - A WorldWide Web Database on Irrigation and Hydrology Software [1])

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2.1   Introduction

The "information world" is dramatically changing as electronic means of accessing information are rapidly gaining importance. Not only has the desktop PC revolutionised information processing and handling, but the enormous growth of the Internet has increased the speed of international and intercontinental information exchange.

The Internet, often called the Network of the networks, is growing exponentially. According to Logan (1995), it is estimated to reach 100 million users by the year 1998. The WorldWide Web especially, with its user-friendly interface, forms an important base of information in the Internet. According to Lycos (1996), approximately 18 million unique URLs (URL stands for "Uniform Resource Locator") have been registered and indexed according to their type and context (January 5, 1996 catalogue). Lycos holds the largest Internet catalogue and is claimed to include 91 % of the WorldWide Web sources.
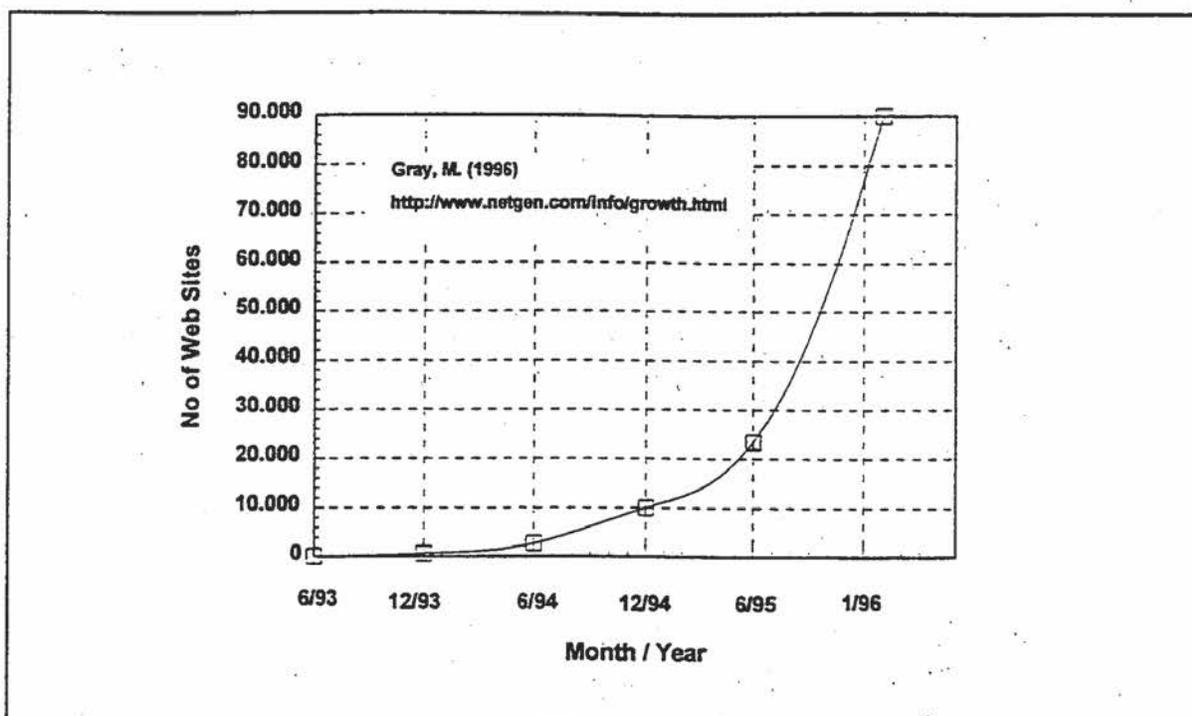

Figure 2.1:   *The worldwide growth of web sites form June 1993 till January 1996. Graph created with data published by Gray (1996)*

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The latest figures published by Gray (1995) demonstrate the exponential growth of the number of web sites in the world. As shown in Figure 2.1, the number of WorldWide Web servers has nearly quadrupled form 23 500 to 90 000 during in seven months.

The Internet and its powerful tools cannot be ignored anymore. Especially during the last two years, the WorldWide Web has established itself as a widely accepted means of information provision. Together with the other Internet services (E-mail, ftp, gopher and telnet), they form an important base for scientific and practical discussions and exchanges.

These modern technologies for bringing information on irrigation and hydrology software to the end-user and their potential as discussion platform are discussed below.

2.2   The IRRISOFT database

IRRISOFT is a database which provides information on irrigation and hydrology software. In addition, metalinks to servers containing the software packages and further information are included (Stein, 1996). As a WorldWide Web Database, it adds to the traditional sources of information by incorporating other Internet services, so that a broad base for efficient information exchange and discussions is formed.

The objectives of IRRISOFT are to give an overview of irrigation and hydrology programs available and to facilitate the retrieval and distribution of the software. The latter is done by establishing download or E-mail order facilities via the WorldWide Web. Numerous irrigation and hydrology programs have been written by individuals, groups or companies and are available as public domain, shareware or commercial software. However, there is still a lack of easy and efficient information exchange about products and new developments. This situation will be improved by the IRRISOFT system. Beside information and software retrieval, IRRISOFT goes beyond the traditional forms of information exchange and aims at the incorporation of discussion and feedback mechanisms. Besides this maintenance and support service, IRRISOFT allows the inclusion of knowledge and experience of a broad group of practitioners and scientists working in the area of irrigation and hydrology. This may be achieved through E-mail postings on WorldWide Web bulletin boards and discussion lists like IRRIGATION-L.

2.3   The development of IRRISOFT

IRRISOFT was launched on the web in summer 1995. It was announced in the major technical Internet discussion lists like IRRIGATION-L, TRICKLE-L and AGRIC-L. Since then, links have been included in several technically-related servers like AGRIGATOR, DAINet, the Virtual Library IRRIGATION, and other government and commercial servers. Also the information on IRRISOFT is included in several general world Internet catalogues like YAHOO or Lycos.

The IRRISOFT System is located at the University of Kassel and is maintained by the

Department of Rural Engineering and Natural Resource Protection. It started with a few Software Description Pages (SDP). Since then it has been steadily growing, reaching more than 75 software or model descriptions at the end of 1995. The service has been extended to include download facilities by the addition of the IRRISOFT aFTP-server (aFTP). A news section, an irrigation and hydrology software bibliography and a section on other related servers have been created and opened to the public.

IRRISOFT is frequently being accessed, reaching more than 100 different external servers (clients) per day. Every server accessing IRRISOFT generally reads between four and eight pages, which means that the information from approximately 400 to 800 pages is being transferred per day.

2.4   Structure of IRRISOFT

2.4.1 IRRISOFT servers and services

The IRRISOFT system is basically structured into three main servers or services which are shown graphically in Figure 2.2.
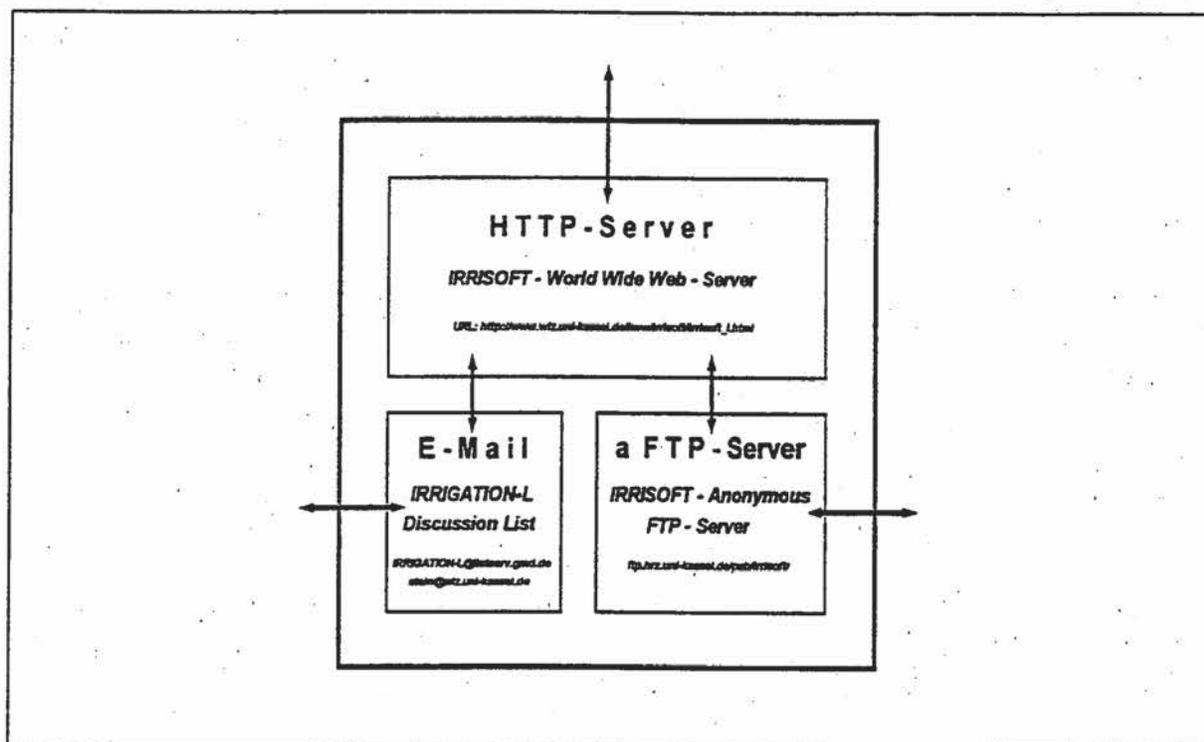

Figure 2.2:   IRRISOFT structure in relation to the server and services provided. Main directions of access and information flow into, out of and inside IRRISOFT.

The http-server or WorldWide Web server forms the base of IRRISOFT holding the main database information and interconnecting the three systems via a single user interface. It also forms the main gateway between IRRISOFT and the external world. The IRRISOFT server may be reached through the following URL:

http://www.wiz.uni-kassel.de/kww/irrisoft/irrisoft_i.html

or also via   http://ilri.nl/irrisoft.html

The IRRISOFT - aFTP - server is used to store software packages and demonstration programs, which have been released to the public by the authors of the programs. Additional information, like documentation, stored in a non-html-format may be grouped with the corresponding software packages. All entries are directly accessible through the main IRRISOFT-WWW server. In addition, the aFTP-server may be reached by regular ftp (file transmission protocol). This is the only way of uploading software. Downloading known programs may be done by ftp or by using a WorldWide Web browser through the IRRISOFT pages. The address of the aFTP-server is: ftp.hrz.uni-kassel.de/pub/irrisoft/

The third IRRISOFT component is the information exchange and discussion component based on E-mail facilities (named "E-Mail" in Figure 2.2). This has been implemented by adding "mailing buttons" to every information source, which allows a user to contact the responsible person or support service of the corresponding software package. Furthermore, direct links are provided to contact the IRRISOFT administration from every page in IRRISOFT. A special bulletin section has been implemented to allow the posting of questions or information on the WorldWide Web page via the IRRISOFT administration. A direct automatic posting in the WorldWide Web, similar to that implemented in "news groups", will be implemented in the future. This will supplement the already existing E-mail discussion list IRRIGATION-L on irrigation and hydrology topics. Links for direct subscription to IRRIGATION-L have already been implemented.

2.4.2   Database structure and information flow

IRRISOFT is a WorldWide Web hypertext and hypermedia-based database, which allows the combination and linking of different types of information (like documents, graphics, demos etc.) from different sources into one document. Since it is permanently linked to the Internet and its different resources, the information provided does not necessarily have to be physically stored on the same server and type of server (http, gopher, ftp, etc.). This has the great advantage of allowing diverse types of information to be accessed; it also allows the major part of the information to be stored where it is produced and maintained. Information can be updated as and when necessary. This ensures a high degree of actuality and minimum time delay in the presentation of new results and updates in the database. The database structure, therefore, is dynamic: it is steadily changing and modifying its sources and appearance according to the actual needs and developments.

The main source of information of IRRISOFT are the Software Description Pages (SDP), which exist for every software package and include INFORMATION and LINKS to the corresponding local or external servers (where available). These SDP have been elaborated to give the maximum information in a concise format, which allows a good overview and

supports purchasing decisions. SDP's are designed to be an open system allowing the inclusion of additional information and links. This extra information may be stored locally on the IRRISOFT servers (www, ftp) and/or externally on other providers' servers (www, gopher, ftp).

Storing information and programs locally on the IRRISOFT Servers as well as on external servers may seem to be a duplicate effort. But experience has shown that it is useful to keep information both stored locally as well as available from external sources. External servers may be down and inaccessible or the information transfer across continents may take a long time during busy hours. Splitting and partly doubling (mirroring) information and software download facilities improve the accessibility of information.

Having "dialled" into IRRISOFT, the user may stay on that server getting all the basic information he needs and he may then switch to the corresponding external server for extra or more detailed information or contacts. Even in the case of an external server failure, IRRISOFT should still hold enough information to allow informed decisions to be made by users and to provide traditional contact information (mail, fax, phone) as well as E-mail addresses and facilities.

Besides the pure information retrieval software, download facilities play a major role in the IRRISOFT concept. Establishing download facilities has the great advantage of supplying irrigation and hydrology software in a convenient, fast and cost-effective way. Not only the time saved by directly downloading software should be taken into account, but also the possible difficulties of transferring software on floppy disks across continents (e.g. to some developing countries). Offering downloadable software may well turn out to be more cost-effective, because packing, copying and handling costs are reduced to a minimum. Time saved may be invested in support and updates.

The IRRISOFT database is generally accessed through the IRRISOFT Main Page which contains all relevant starting information and links to different information and services provided. The general IRRISOFT structure, including the main information sources and directions of information flow, is shown in Figure 2.3. Only the most important sources and links have been listed. The hypertext-based structure of the WorldWide Web server allows numerous external and internal cross-links to any particular document. Less important links and information have been omitted in Figure 2.3 in order to emphasize the main structure.

The Main Page is divided into six sections, according to the type of information stored:
-       The 'General Information' Section
        containing all relevant information on IRRISOFT, its administration, objectives and descriptions of how the information sources have been collected and compiled.

-       The 'Irrigation and Hydrology Software NEWS' Section
        which holds information and links on subject related events like congresses, conferences or workshops or other important news like software updates, new developments, etc.
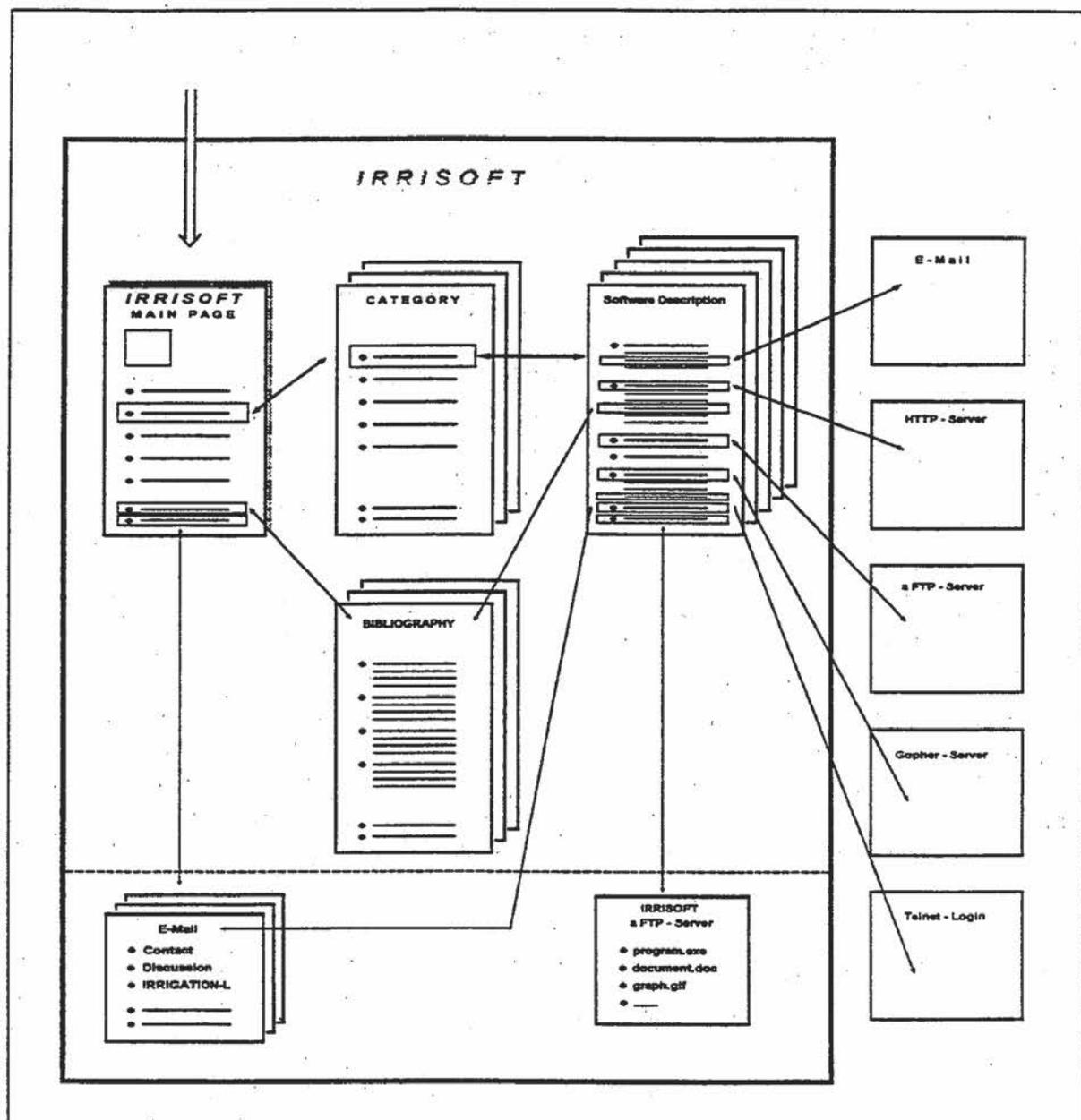
Figure 2.3: IRRISOFT information structure including primary links and interactions to internal and external sources and services.

- <u>The 'Software Index' Section</u>
  contains a thematic index of the main data sources stored in IRRISOFT. The index presently leads to eleven different pages which contain alphabetical lists of programs stored under their respective categories. Every software name is included with a brief description to allow a better pre-selection. The main categories of IRRISOFT are:

    −   Irrigation Systems Programs
    −   Surface Irrigation Programs
    −   Sprinkler Irrigation Programs
    −   Drip / Trickle Irrigation Programs
    −   Canals and Canal Network Programs
    −   Pipes, Pipe Network and Pumping Programs
    −   Hydraulic Structure Programs
    −   Irrigation Management Programs
    −   Drainage Programs
    −   Other Irrigation Programs
    −   Hydrology Programs

These categories are dynamic as they may be supplemented and modified in response to future developments and needs.

- The 'Additional Software Information' Section
  leads to information and links related to the database development. It allows a user to read lists of programs under development and to get information on submission of new programs to IRRISOFT. Furthermore, it leads to a locally stored Irrigation and Hydrology Software Bibliography.

- The 'Other Servers with related information' Section
  allows users to contact other servers holding thematic information or to access the IRRISOFT aFTP server.

- The 'Discussion' Section
  forms the IRRISOFT discussion platform allowing the direct exchange of information between users. Questions, problems and experiences related to irrigation and hydrology software may be posted and discussed on the IRRISOFT pages or through linked mail discussion services. This section has been partly implemented already, allowing the subscription to the discussion list IRRIGATION-L and the posting of messages on the web through E-mail directed to the IRRISOFT administration.

2.4.3 Software categories

The software has been classified according to its purpose into eleven categories, listed above. Taking into account the structure of the WorldWide Web and expected user preferences, the categories have not been implemented strictly hierarchically. A "flatter" structure has been favoured by putting categories on the same level rather than adding deep-structured trees. Additional sub-classifications have thus been omitted deliberately, thereby preventing the users from getting lost in the links, back-links and cross-links of a WorldWide Web server. This allows a reduced number of pages to be loaded before reaching the final Software Description Page.

Different structural systems may have to be implemented with growing numbers of software packages listed. Reference is made to Benz and Voight (1995a, 1995b), who have shown effective ways of indexing file systems for the implementation of search interfaces on WorldWide Web databases.

2.4.4 Structure of the Software Description Pages (SDP)

The IRRISOFT software information is based on Software Description Pages (SDP) which have been compiled for every listed program. They have been designed to give the maximum information in the concise form of one page. Besides traditional types of printable information, additional meta-information like links to local and external server, mailing "buttons", download facilities have been included. A graphical overview of possible and implemented links is shown in Figure 2.2.

The structure of the Software Description Pages has been undergoing gradual modification in order to improve the presentation of information. The information structure allows the supply of large amounts of information, while still making local and external extensions possible. The chosen structure with a short description of every topic is shown in Table 1 below.

2.5   Conclusions and outlook

There is a considerable interest all over the world in sharing information on irrigation and hydrology software through the WorldWide Web. IRRISOFT has shown the potential of offering this service by combining traditional types of information with web-specific meta-information. It may, therefore, become a gateway for information and software exchange by bringing together software providers and end-users in an expected time- and cost-efficient way.

Looking at possible future developments, IRRISOFT will surely undergo structural, management and information changes brought about by the rapid changes on the Internet scene. This probably means that IRRISOFT will have to adopt other retrieval systems based on searchable indices. Generally speaking, the work-load will increase with the growing acceptance of the new database. Other management and co-operation strategies will have to be introduced.

From the software developers' point of view, changes will be necessary in the way products are marketed and distributed. The software development industry has to adapt to new methods of software distribution and management, which are already quite common in other parts of the software scene. This may be done, e.g., by implementing software keys, which allow a free distribution of "locked" software packages over the net. After free testing of restricted versions, users can register with the software producer and the program may be unlocked to its full functionality by purchasing its key.

Table 2.1: Structure of the Software Description Page for programs listed in IRRISOFT

	Topic	Topic Description
1	Name	SOFTWARE NAME
2	Keywords	Keywords describing the software package like: *Irrigation, design, management, etc.*
3	Categories	Main- and Sub-Categories *for the classification of the software packages. This section is mainly for future developments in the implementation of searchable indices.*
4	Contact	Contact Person: *Name, Mail Address, Telephone, Facsimile, Telex, E-Mail and URL.*
5	Abstract	Abstract: *A clear and precise description of the software functions and abilities. This section may contain further information by incorporating linked pages for explanatory notes.* Author of the Abstract: *Name, Institute or Company, E-mail*
6	On-line Information, Purchase, Download	All additional available on-line information including internal and external links: *Features, Functions, Screen shots.* *Software price list* *Software purchase.* *Software download facilities.*
7	Model Description	A model description verification.
8	Application Criteria	Target Group: *For whom this program is designed.* User Application Level / Knowledge: *Background information needed to run this program.* Program / Application Limitations: *This program is not meant to be used for / by ...*
9	System Requirements	Software Hardware
10	Source-code	Source code used: *Programming language used.* *Availability of source code.*
11	Price	Price and Maintenance
12	Other	Other types of information: *Time scale.* *Software use.* *Software environment.* *Unit system.* *Date of current version.* *Working language.* *The program contains...* *On-line help and functions.*
13	Documentation/ Literature	Documentation accompanying the program and references describing the software package or its model sources.

References

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Benz, J. and Voigt, K., 1995a: Indexing File Systems for the Set-up of Metadatabases in Environmental Science on the Internet.- 19th International On-line Information Meeting, Proceedings 1995, London, UK, 5-7 December 1995, pp. 455 - 465.

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Logan, E., 1995: The Internet Challenge, in: Williams, M.E. (Ed.), 16th National Online Meeting, Proceedings 1995, New York, 2-4 May 1995, Learned Information Inc., Medford, NJ, pp. 285-290

- *Internet Sources*

AGRIC-L: E-mail discussion list on agricultural topics. agric-l at listserv@uga.cc.uga.edu

AGRIGATOR: Agricultural and Related Information. University of Florida.
URL: http://gnv.ifas.ufl.edu/www/agator/htm/ag.htm

DAINet: German Agricultural Information Network at the Centre for Agricultural Documentation and Information (ZADI) Bonn-Bad Godesberg, Germany.
URL: http://www.dainet.de/

Gray, M., 1996: Measuring the Growth of the Web - June 1993 to June 1995 - net. Genensis Cooperation, Cambridge, Massachusetts.
URL: http://www.netgen.com/info/growth.html

IRRIGATION-L: E-mail discussion list on irrigation in theory and practice.
irrigation-l at listserv@listserv.gmd.de

Lycos, 1996: The Lycos(TM) "Catalog of the Internet". - Lycos Incorporated, 293 Boston, Post Road West, Marlboro, MA 01752. URL: http://www.lycos.com or http://www.lycos.com/info/index.html.

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URL: http://www.wiz.uni-kassel.de/kww/irrisoft/irrisoft_i.html.
URL: http://www.ilri.nl/irrisoft.html

TRICKLE-L: E-mail discussion list on trickle irrigation. trickle-l at listserv@unl.edu

WorldWide Web Virtual Library IRRIGATION: Metadatabase on Irrigation and Hydrology Sources. University of Kassel.
URL: http://fserv.wiz.uni-kassel.de/kww/projekte/irrig/irrig_i.html