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A review on accessing electronic information resources for agricultural education, research and extension

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Abstract
The 21st Century is shaping by sweeping changes in Information & communication technologies. Internet is now widely accepted as an important source of information. The emergence and use of information technology is the century's most significant development affecting scholarly communication. Information is the key component of modern society and almost each and everything is based on the information and depends upon its resources. The tools of Information and Communication Technology (ICT) like Internet and electronic information resources and their use, is the matter of daily concern now. These tools have also made tremendous impact on the academic activities of the faculty members, researchers, students and other professionals which are inseparable part of today's agriculture education, research and extension system in India and Abroad. Developments in telecommunications, computers and internet are revolutionizing agricultural education, research and extension. New information technology has the potential to improve the quality of agricultural education research & extension efficiency of its management and the relevance and timeliness of related results. Scientists, students and other professionals can now access more information than ever before. At the same time, they can disseminate information to users more easily through internet. This paper covers some useful Web-based electronic resources available in the agriculture including: those providing general information, databases and electronic resources and their websites etc.

Keywords: Agriculture, Internet, Computer, Electronic information resources, Web-based resources, Information technology

1. Introduction

Information is the key component of modern society and almost each and everything is based on the information and depends upon its resources. The emergence of national knowledge networks in some countries like India, National Knowledge Network exhibits the importance of information and its sharing among the stakeholders. The tools of Information and Communication Technology (ICT) like Internet and electronic information resources are their use is the matter of daily concern now. These tools have also made tremendous impact on the academic activities of the faculty members, researchers, students and the other health sciences professionals. After the advent of these tools, a significant transition is seen in users' approach and the way they seek information and the methods they use in research and learning activities. In such an academic environment, institutions of higher learning such as Agricultural Universities and colleges are also doing their best to provide their users access to this vast reservoir of information. Due to so many advantages like easy accessibility, availability at any time and at any place basis and searching facility of electronic information resources, most of the libraries of academic institutions like colleges and universities of the present day have added these resources in their convoy and provide access to their respective users.

Since this is the age of electronic era. The nature of information resources is changing rapidly as a result of new information technologies and the advent of internet. Electronic publishing has been revolutionizing the format of the recorded knowledge. Electronic information services are attracting reader's attention in today's networked environment. E-journals and e-databases bring new challenges before the library and information professionals to give full text access to scholarly publications both in print and electronic version to its end users. Now the agricultural scientists, teachers, students, progressive farmers and libraries, have started making maximum use of e-resources.

1.1 Electronic Resources

Electronic resources are resources in which information is stored electronically and which are accessible through electronic systems and networks. E-resources is a very broad term that includes a variety of different publishing models, including CD-ROMs database, online database, e-Journals, e-books, internet, OPACs, digital collections of data and other electronic forms of record. In this context the term means "any electronic product that delivers collection of data be it in text, numerical, graphical, or time based, as a commercially available resource."

According to English Dictionary - With Multi-Lingual Search**,** Electronic Resource can be defined as:

a. Information (usually a file) which can be stored in the form of Electrical Signals usually, but not necessarily on a Computer.
b. Information available on the internet.

Electronic resources include remotely accessible files that are openly available on the internet and those for which the library must pay a licensing fee and negotiate access with the provider.

2. Important Publishers, Portals etc. in Agriculture Research

Some of the important full-text digital collections available on on-line. Networking technology is now available for providing web-based access to electronic resources. The libraries have an option to subscribe to these full-text databases as part of their digital resources. Most of the now offer web-based interfaces and full-text of their journals. Some of the major players in agriculture electronic full-text journal publishing include:

- Elsevier Science Publishers (Science Direct): http://www.sciencedirect.com/
- Academic Press (Ideal Library): http://www.idealibrary.com/
- Springer Verlag (Link Electronic Service): http://link.springer.de/
- Wiley Interscience: http://www.wiley.com/
- Web of Science : http://apps.isiknowledge.com
- SCOPUS : http://www.scopus.com/home.url
- PROQUEST : http://proquest.umi.com/
- CAB International : http://www.cabi.org
- Ovid : http://ovidsp.ovid.com/
- Thomson Reuters : http://thomsonreuters.com/
- SciELO : http://www.scielo.org/php/index.php?lang=en
- LivRe ! : http://portalnuclear.cnen.gov.br/livre/Inicial.asp
- African Journals OnLine (AJOL) : http://www.ajol.info/
- CSIRO : http://www.csiro.au/
- Oxford : www.oxfordjournals.org/
- PubMed : http://www.ncbi.nlm.nih.gov/pubmed/
- INGENTA Gateway Portal: http://www.publishingtechnology.com/
- EBSCO : http://www.ebscoind.com/
- J- Gate : http://j-gate.informindia.co.in/
- Annual Reviews : http://www.annualreviews.org/
- AGORA : http://www.aginternetwork.org/en/
- HighWire : http://highwire.stanford.edu/
- Food and Agriculture Organization : http://www.fao.org/
- Directory of Open Access Journals : www.doaj.org
- AGNIC : http://www.agnic.org/
- CGIAR : http://www.cgiar.org/
- INASP : http://www.inasp.info/

Some free on-line international journals in agricultural science is given below.

2.1 Free full text E-Journals

- Asian Journal of Plant Science
- Ag Bioforum
- Agricultural Water Management
- Agronomy Research
- International Journal of Sociology of Agriculture and Food
- Journal of Agronomy
- Journal of Central European Agriculture
- Japanese Journal of Crop Science
- Japan Agriculture Research Quarterly
- Pant Biotechnology
- Plant Production Science
- World Journal of Agricultural Science

Besides above free electronic journal, so many other journals is available in electronic format as on free and payment basis in agriculture. Agriculture databases, CAB, AGRICOLA, AGRIS, and other agriculture electronic resources appearance on the web. HighWire press is the largest archive of free full text on the science. Several digital library projects are concerned with providing digital access to materials in agriculture.

3. Agriculture Databases

- AGRICOLA database of bibliographic records created by the National Agricultural Library (NAL) and its cooperators, which contains citations for books, audiovisual materials, and journal articles.
- AGRIS, by Food and Agriculture Organization (FAO) and several other FAO databases covering statistics, nutrition, plants, pests, and early warning systems are available through WAICENT.
- AANRO, Australian Agriculture and Natural Resources Online, an integrated knowledge discovery tool for agriculture and natural resources, funded by Australian Commonwealth and State Governments.
- Aquatic Sciences and Fisheries Abstract (ASFA) Covers the world's literature on the science, technology, management, and conservation of marine, brackish water, and freshwater.
- CAB Direct combines CAB ABSTRACTS and CAB HEALTH into one database accessible via the web for a subscription fee. It is available for a 30-day free trial. CAB ABSTRACTS covers agriculture, including entomology, forestry, mycology, human and animal nutrition, veterinary science; CAB HEALTH covers public health, including tropical diseases. Database guides are provided on the web.
- Current Research Information System (CRIS) is the U.S. Department of Agriculture's (USDA) documentation and reporting system for ongoing and recently completed research projects in agriculture, food and nutrition, and forestry. Projects are conducted or sponsored by USDA research agencies, state agricultural experiment stations, the state land-grant university system, other cooperating state institutions, and participants in USDA's National Research Initiative Competitive Grants Program.
- Food Science and Technology Abstract (FSATA) is covers all areas of food science, food technology and human nutrition, including basic food science, biotechnology, toxicology, packaging and engineering.
- Forest Science Database forms the most comprehensive guide to the international forestry literature.
- Biological Abstracts (BIOSIS) Biological Abstracts is a database produced by Thomson Reuters through its subsidiary BIOSIS. It includes abstracts from peer-reviewed academic journal articles in the fields of biology, biochemistry, biotechnology, botany, pre-clinical and experimental medicine, pharmacology, zoology, agriculture, and veterinary medicine published since1926.
- PubMed the National Library of Medicine's search service that provides access to over 10 million citations in MEDLINE, PreMEDLINE, and other related databases, with links to participating online journals.

4. Useful Electronic Resources and Websites in Agriculture Research

- **AGLINET (http://www.fao.org/library/library-home/aglinet/en/):** is a voluntary network of agricultural libraries around the world with strong regional/country coverage and other comprehensive or very specialized subject resource collections. If FAO staff need material not available in the David Lubin Memorial Library, AGLINET member libraries are consulted for assistance. AGLINET Centers provide partner libraries with access to the literature originating in the country or region or for a given specialization. This voluntary co-operative library network was founded in 1971 within the framework of the International Association of Agriculture Librarians and Documentalists (IAALD). AGLINET libraries achieve a comprehensive resource coverage and mutual and rational use of library resources, not only for the benefit of members' own constituencies, but also in support of other libraries within their country/region.
- **AgNIC (http://www.agnic.org/):** is a guide to quality agricultural information on the Internet as selected by the National Agricultural Library, Land-Grant Universities and other institutions. It is a site providing access to a network of electronic sources on research and teaching in agriculture, food, renewable natural resources, forestry, physical and social sciences.
- **AGRIS (http://www.fao.org/agris/):** is the international information system for the agricultural sciences and technology. It was created by the Food and Agriculture Organization of the United Nations (FAO) in 1974, to facilitate information exchange and to bring together world literature dealing with all aspects of agriculture. It is a cooperative system in which participating countries input references to the literature produced within their boundaries and, in return, draw on the information provided by the other participants.
- **AGRALIN/Agricultural Literature Information System in the Netherlands (http://www.bib.wau.nl/):** is a gateway to scientific information in the fields of food, agro technology, plant and animal production systems, nature and the environment, based at the Agricultural University of Wageningen.
- **AGRICOLA (http://www.nal.usda.gov/ag98/):** is a bibliographic database covering agriculture and related sciences/activities, produced by the US National Agricultural Library (NAL). It includes some 3 million references to journal articles, books, reports, conference proceedings, patents, audiovisuals, etc.
- **AGORA Access to Global Online Research in Agriculture (http://www.aginternetwork.org/en/):** The AGORA program, set up by the Food and Agriculture Organization of the UN (FAO) together with major publishers, enables developing countries to gain access to an outstanding digital library collection in the fields of food, agriculture, environmental science and related social sciences. AGORA provides a collection of 1900 journals to institutions in 107 countries. AGORA is designed to enhance the scholarship of the many thousands of students, faculty and researchers in agriculture and life sciences in the developing world.
- **AgREN Agricultural Research and Extension Network (http://www.odi.org.uk/work/projects/agren/links):** AgREN was established in the mid-1980s to link policy-makers, practitioners and researchers working in the agriculture sector of developing countries. It has over 1000 members located in more than 100 countries, with around 70 per cent located in developing countries. Members work in a range of organisations, predominantly in university and research organisations, as well as governments, parastatals, non-government organisations and aid agencies.
- **AQUASTAT (www.fao.org/AG/AGL/aglw/aquastat/main/index.stm) :** is FAO's global information system, whose objective is to provide users with comprehensive information on the state of agricultural water management across the world, with emphasis on developing countries and countries in transition.
- **CAB Abstract (www.cabdirect.org) :** The most comprehensive database of its kind, CAB Abstracts gives researchers instant access to over 6.3 million records* from 1973 onwards, with over 300,000 abstracts added each year*. Its coverage of the applied life sciences includes agriculture, environment, veterinary sciences, applied economics, food science and nutrition.
- **CGIAR Consultative Group on International Agricultural Research (http://www.cgiar.org):** The CGIAR is a global partnership that unites organizations engaged in research for sustainable development with the funders of this work. The funders include developing and industrialized country governments, foundations, and international and regional organizations.
- **Consortium for e-Resources in Agriculture (http ://www.icar.org.in):** is a e-Consortium of Agricultural Libraries under the Indian Council of Agricultural Research for NARS.
- **Current Contents - Agriculture, Biology and Environmental Science (http://www.ovid.com/site/catalog/DataBase/930.jsp):** is a rapid alerting service database from the Institute for Scientific Information, now part of Thomson Reuters. Current Contents is a current awareness database that provides easy access to complete tables of contents, bibliographic information and abstracts from the most recently published issues of leading scholarly journals. Cover-to-cover, expert indexing provides accurate access to all the information available in journals, not just articles. Current Contents/Agriculture, Biology & Environmental Sciences provides easy access to complete tables of contents, abstracts, bibliographic information and all other significant items in recently published editions of over 1,040 leading journals
- **Directory of Open Access Journals (www.doaj.org):** This service covers free, full text, quality controlled scientific and scholarly journals. Because open access is a worldwide phenomenon, DOAJ includes publications from around the world in many languages. It is possible to browse through the journals, or search for articles within many of the journals through a web interface. In February 2011, the database contained 6100 journals, of which 2591 were searchable at article level. DOAJ is managed and

partly funded by Lund University Libraries. DOAJ has received or is receiving funding from the Open Society Institute, the National Library of Sweden, SPARC, SPARC Europe, Axiell and EBSCO. The Directory of Open Access Journals participates in the Worldwide Science global science gateway.

- **EIARD-InfoSys the european information system on agricultural research for development (http://www.eiard-infosys.org/):** aims to increase the transparency of, and access to, European web resources on agriculture, environment, fisheries, forestry, socio-economics, rural transformation and other development topics. It also aims to create an information and communication platform as a service for a multitude of institutions and parties all over Europe involved in scientific development cooperation.
- **FAO Food and Agriculture Organization (http://www.fao.org/):** is a specialized agency of the United Nations that leads international efforts to defeat hunger. FAO is a source of knowledge and information, and helps developing countries and countries in transition modernize and improve agriculture, forestry and fisheries practices, ensuring good nutrition and food security for all.
- **HINARI Health Inter Network Access to Research Initiative (http://extranet.who.int/hinari/en/journals.php):** The Health InterNetwork Access to Research Initiative (HINARI) is a new initiative, led by the World Health Organization (WHO), to provide free or nearly free access to the major journals in biomedical and related social sciences, to public institutions in developing countries. Starting in January 2002 with over 2000 journals from the world's leading biomedical publishers, HINARI is part of the Health InterNetwork, which was introduced by the United Nations' Secretary General Kofi Annan at the UN Millennium Summit in the year 2000.
- **IAMSLIC International Association of Aquatic and Marine Science Libraries and Information Centers (http://www.iamslic.org/):** is an association of individuals and organizations interested in library and information science, especially as these are applied to the recording, retrieval and dissemination of knowledge and information in all aspects of aquatic and marine sciences and their allied disciplines. The association provides a forum for exchange and exploration of ideas and issues of mutual concern.
- **ICAR Indian Council of Agriculture Research (http://www.icar.org.in):** The Indian Council of Agricultural Research (ICAR) is an autonomous organisation under the Department of Agricultural Research and Education, Ministry of Agriculture, Government of India. The ICAR has its headquarters at New Delhi. The Council is the apex body for coordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country. With over 97 ICAR institutes and 45 agricultural universities spread across the country this is one of the largest national agricultural systems in the world. The ICAR has played a pioneering role in ushering Green Revolution and subsequent developments in agriculture in India through its research and technology development. It has played a major role in promoting excellence in higher education in agriculture. It is engaged in cutting edge areas of science and technology development and its scientists are internationally acknowledged in their fields.
- **SIDALC Agricultural Information and Documentation Service of the Americas (http://orton.catie.ac.cr**/): is an international agricultural, livestock, forestry and environmental information service in which institutions in 22 countries of the Americas share information and services on line. Created in 1999, today it is one of the most important sources of knowledge and information in LAC. SIDALC is the result of earlier initiatives aimed at management of knowledge and information, all promoted by IICA, such as the Orton Commemorative Library (founded in 1943); the Scientific Exchange Service (SIC), created in 1958; the Inter-American Association of Agricultural Librarians, Document lists and Information Specialists (AIBDA), founded in 1965; and the Inter-American Agricultural Information System (AGRINTER), created in 1972.
- **TEEAL (http://www.teeal.org/):** is a digital collection of research journals for agriculture and related sciences. Researchers, students, faculty and librarians can discover and access thousands of full-text PDF articles without the use of the internet. TEEAL is available to institutions in income-eligible countries. TEEAL is produced by a cooperative effort between Cornell University's Albert R. Mann Library and leading science publishers, with the ongoing support of the Rockefeller Foundation and other agencies.
- **WAICENT Information Finder (http://www.fao.org/waicent/search/def.asaultp?lang=en):** allows users to search in two ways: Free Text Search of the entire FAO website for web pages and documents; and Directory Search of important sites and information within FAO.

5. Some Useful Web Sites in Agriculture for Accessing E-Resources

There is unlimited web site in agriculture for accessing the agriculture resources. Few important web site given bellows for accessing electron information resources on the web:

- http://www.cgiar.org
- www://www.fao.org
- http://www.nal.usda.gov
- http://www.agnic.org/
- http://www.agricultureinformation.com/
- http://www.agriculturallink.com/
- http://www.kisan.net/
- http://www.krishiworld.com/
- http://www.indiaagronet.com/
- http://www.agrisurf.com/
- http://www.web-agri.
- http://www.agriwatch.com/
- http://www.isapindia.org/
- http://www.indiaagristat.com
- http://www.agriculture.gov.au
- http://www.icar.org.in

- http://agrifor.ac.uk/search/
- http://agmarknet.nic.in/
- http://www.agview.com/
- http://www.aginternetwork.org/en/

6. Conclusion

The present era of 21st century is the days of electronic. Information is moving in the air around us. We have to catch it and available to our users. It can only by the internet. The electronic evolution, especially internet is narrowing the information gap. Most of organization, institutes and publishers are publishing their publication in electronic mode. Vast e-resources are available on internet in agriculture, which we can access in library, information centers and provide the information to library users. In the agricultural research some of the important electronic resources like electronic journals, databases, abstracts, books, reports, catalogues, directories, home pages of the institutes, organizations etc. are available. In this articles few important web-based electronic resources are complied, which are very useful and frequently use by agriculture research workers and libraries e. g. CAB Abstracts, AGRICOLA, AGRIS, FSATA, CRIS, AGNIC, FAO, CGIAR, ICAR, AGORA, Agrigate, HINARI, AROW, DOAJ, AGLINET, AGRALIN, TEAL, WAICENET, etc. This paper provides way to get access the electronic resources in agriculture. The scientists, students, concern persons of agriculture sciences will be benefited for use of above electronic resources.

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13. http://www.icar.org
14. http://www.wikipedia.org/