The Essential Electronic Agricultural Library (TEEAL): A Tool for Agricultural Education and Research in Developing Countries (A Case Study)

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One of the most pressing issues for higher education institutions in developing countries is the lack of access to the world’s current scientific literature in any given discipline (Ozowa, 1994; Gathegi, 1990; Mann, 1986). This situation is even more pronounced in the field of agriculture. Most developing country economies are based in rural communities focused on the development of subsistence-level and emerging cash crops, as well as animal production (Eponou, 1996). For instance, in Kenya, approximately 80 percent of the people are involved in some part of the agriculture sector, and 85 percent of this group are engaged only at the small holder level (Suradisastra, 1987). Although Kenya has a basic infrastructure to support these agricultural interests, starting with the Ministry of Agriculture and its research institutes and extension programs, and including non-governmental organization activities, commercial firms, and public universities, often the services available are too few, too limited, and too poorly funded to provide the help needed on current best practices (Ojiambo, 1990; Suradisastra, 1987).

In the case of Egerton University, the public agricultural university in Kenya, until February of 2000 the library system lacked the means to provide the university’s teaching, research, and extension programs with access to worldwide agricultural literature. Up to the present time, the library’s annual budget allowed only for the purchase of a limited number of textbooks, undergraduate support materials, and local newspapers. Books and scientific journals related to graduate studies and research have not been acquired unless through donations or contributions by donor agencies and, as yet, the technological infrastructure is not extensive enough to obtain scientific information through online journals and other electronic publications. Although the Department of Computer Science at Egerton is working to develop a local area network (LAN) to connect all major buildings to the Internet, progress is slow and there were only three public access terminals for general use at the time of this writing.

Based on informal discussions, the author also learned that during the 1990s the University Library acquired a number of bibliographic databases on CD-ROM, including AGRICOLA and CAB Abstracts, through a multi-year grant from the United States Agency for International Development (USAID). However, while searches of these databases provided references to useful information on scientific literature, it was rare for faculty or students to have the means to obtain the full-text versions of the identified documents. This situation has severely limited the faculty’s ability to provide the most up-to-date teaching curriculum, to be competitive for research funds, or to develop research-based field applications.

Recognizing that experiences like Egerton’s are not unique and that institutions throughout the developing world face similar problems of resource and information deprivation, the Rockefeller Foundation teamed up with Cornell University’s Albert R. Mann Library, to develop a product to fill this gap. The Essential Electronic Agriculture Library (TEEAL) has been called a “library-in-a-box” because it is made up of 172 CD-ROMs which include the full-texts of 130 agricultural and life science journals. This impressive product can only be purchased by 115 of the most low per capita income countries, as identified in the World Bank’s 1998-9 World Development Report. The first installment contains journals published from 1993 to 1996 and is comprised of 735,000 pages of text that were scanned and digitized by a contractor supervised by Mann Library staff. Annual installments for subsequent years are in progress and include even more journals. The 1997 edition contains 140 journals and has been available since May 2000. The 1998 edition also includes 140 journals and will be ready for shipping in September 2000. Negotiations are ongoing with publishers to include additional journal titles in future editions (Friedlander, 1999). Mann
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Library is committed to producing TEEAL through 2006, when it is hoped that telecommunications technologies will be more widely available to the developing world, thus providing immediate access to journals online. TEEAL, while underwritten by Rockefeller with a $900,000 grant to Mann Library, is not free. Institutions must pay $10,000 for the first installment and $5,000 for each annual update. However, this is well under the total of the individual subscription costs which would amount to $375,000 for the base set and $75,000 for annual updates. For more than five years, staff at Mann Library negotiated with publishers throughout the world to convince them that distributing the back issues of their journals in this way would not hurt potential sales. Agreements to waive copyright royalties had to be signed before final development of the CD-ROMs could begin. Directly involved in the journal selection process were 600 experts in the field of agriculture from all over the world. Although not all publishers contacted agreed to having their journals included, nearly 70 did accept the idea. These publishers include associations such as the Society for Range Management, government agencies, and commercial publishers such as Elsevier Scientific Publishers (see List of Publishers and Journal Titles below).

Since TEEAL was announced to the public in July 1999, 35 sets have been shipped to countries such as Zimbabwe, Indonesia, Nepal, and Kenya. Another 6 institutions are arranging for payment. A primary reason for Egerton’s early purchase of TEEAL was the involvement of one of the faculty members in the identification of pertinent journal titles. His promotion of TEEAL, along with the support of many other faculty members, convinced the University’s administration to allocate the funds for the purchase of the first installment as well as the updates for 1997 and 1998. In an institution with so many needs and so few financial resources, this was truly a commitment of major proportions. The purchase and shipment of TEEAL to Egerton was only hampered by a few weeks delay when the set was held by customs officials in Nairobi who maintained that certain duties needed to be paid, although this was not the case. Once this situation was solved, installation of TEEAL and its incorporation into Egerton’s educational program proceeded at a rapid pace.

Coincidently, the arrival of TEEAL occurred at nearly the same time the author was to visit Egerton to provide short-term technical assistance for several campus libraries (funded by the Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance (ACDI/VOCA) Farmer-to-Farmer Program, which is itself supported by the U.S. Department of Agriculture under the Food for Peace program). This effort was requested by the Director of the Crop Management, Research, and Training (CMRT) Project at Egerton, an international training facility at Egerton focused on improving on-farm research and productivity. The primary library targeted for the technical assistance was a special library within CMRT. However, just prior to the author’s visit in March 2000, a re-organization had taken place in honor of TEEAL and in recognition that the University system needed to make changes to ensure widespread use of the service. It was decided by the Egerton Senate Research Committee (the administrative arm of the University dealing with library-related issues) to move the CMRT Library under the umbrella of the University Library and to assign one of the University librarians to manage it who had knowledge of literature searching using CD-ROM technologies. In fact, two Pentium-level computers and all CD-ROM bibliographic databases were transferred to the CMRT Library just prior to the author’s arrival. In addition, it had been agreed by the Senate Research Committee to rename the CMRT Library as the J.D. Rockefeller Research Library.

TEEAL representatives, supported by funds from the Rockefeller Foundation, are conducting training. The International Service for National Agricultural Research (ISNAR) is also providing training assistants. However, at the request of Cornell and Egerton, the author was asked to provide preliminary training exercises during her month-long technical assistance project. Using materials developed by Mann Library, a series of three workshops were held for library personnel, faculty members, and some department heads. In addition, a demonstration of TEEAL was given to all University officials, including the Vice Chancellor and the three Deputy Vice Chancellors, at the opening ceremonies of a “TEEAL Launching” event and the formal christening of the Rockefeller Library.
The training sessions began using a lecture format which provided background on the scholarly communication process and how it relates to using the TEEAL system. This included a discussion of the problem solving nature of applied research and three levels of scholarly communication activities: 1) informal (discussions with colleagues, departmental seminars, and technical reports); 2) formal research publications (journal articles and conference proceedings); and 3) secondary sources (review articles, popular articles, trade publications, books, and Extension publications). It was pointed out that the primary emphasis of TEEAL is the user-friendly delivery of information derived from formal research publications. Following the short lecture, workshop participants were given a practical demonstration of the different browse and search features provided by TEEAL, with opportunities for hands-on exercises at several points.

TEEAL contains two software functions: 1) Folio, which is software to search the index; and 2) Image Viewer, which is software to view the actual pages of the journals. The TEEAL entry screen has two panels, the left one listing the titles of the journals can be clicked on to open a list of editions, followed by article titles (used for browsing); and the right one which provides introductory information and a link to the search capability (Figure 1).

**Figure 1. Initial Screen.**

The “browse mode” allows the user to operate as if in a real library setting. In this mode, the user can open an edition of a journal and essentially leaf through it page by page much the same as reading the actual print copy. A zoom capability provides opportunities for enlarging text and for moving quickly from one section to another. The user can also “Tag” records to mark and save records of articles that are of particular interest.

In the “search mode” a template is pulled up that provides options for basic subject searching of bibliographic records, descriptors, and abstracts (not the full-text version of articles). The user can also search for an author’s name. In both cases, once the user starts to type in a name or subject term, a “word wheel” to the right moves toward that name or term in either the complete list of authors or the list of possible keywords (See Figure 2). This capability assists the user in determining correct spellings and initials for author names or possible variations of keywords. A double click on a term in the word wheel will add it to the search template. As the search statement is being defined, the results of the search (number of hits) is immediately provided in the bottom box of the template. After performing a search, records can be
displayed and the full-text articles viewed using the navigation buttons at the top of the screen. In addition, individual pages or complete articles can be easily printed out for future use.

**Figure 2.** Search Results Screen with Word Wheel.

Egerton’s plans for TEEAL include loading the search and browse function on various computers throughout the University so that faculty and students can perform their own searches at convenient locations. However, access to the full-text articles will be necessarily centralized in the J.D. Rockefeller Research Library. Following the “launching” event, demand for searches was so great that the librarian providing the searches moved from a walk-in to an appointment-only schedule. To alleviate strain on the service, consideration is also being given to establishing a vertical file system for maintaining print copies of the most often requested articles. During the first two months of operation, 110 searches were conducted for faculty and students primarily in the areas of crop production, animal science, and agricultural economics. Of this number, lecturers, researchers, and technicians constituted the largest user group totaling 43, with graduate students at 38 and undergraduate search requests numbering 29. More than 500 pages of abstracts and another 500 pages of full-text articles were the results of these searches. At last word, the number of TEEAL search requests continues to increase and the successful operation of the service has led to purchase of an additional printer to help provide printouts as well as a modem and Internet connection for the Library.

For more information on TEEAL, Email: teeal@albert.mannlib.cornell.edu; Website: http://teeal.cornell.edu
List of TEEAL Publishers and Journal Titles

1. Academic Press
   Archives of Biochemistry and Biophysics
   General and Comparative Endocrinology
   Journal of Arid Environments
   Journal of Environmental Management
   Journal of Invertebrate Pathology
   Journal of Molecular Biology
   Pesticide Biochemistry and Physiology
   Physiological and Molecular Plant Pathology
2. African Crop Science Society
   African Crop Science Journal
3. Agricultural Economics Society (UK)
   Journal of Agricultural Economics
4. American Agricultural Economics Association
   American Journal of Agricultural Economics
   Choices
5. American Association of Avian Pathologists
   Avian Diseases
6. American Chemical Society
   Journal of Agricultural & Food Chemistry
7. American Physiological Society
   American Journal of Physiology
8. American Society of Agricultural Engineers
   Applied Engineering in Agriculture
   Transactions of the ASAE
9. Annual Reviews, Inc.
   Annual Review of Ecology and Systematics
   Annual Review of Entomology
   Annual Review of Microbiology
   Annual Review of Phytopathology
   Annual Review of Plant Physiology and Plant Molecular Biology
10. Applied Science
    Aquacultural Engineering
    Food Chemistry
11. British Society for Plant Pathology
    Plant Pathology
12. Bureau for Scientific Publications
    South African Journal of Plant and Soil
13. Bureau of Socioeconomic Research and Training
    Bangladesh Journal of Agricultural Economics
14. CAB International
    Bulletin of Entomological Research
15. Canadian Agricultural Economics Society
    Canadian Journal of Agricultural Economics
16. Canadian Society of Agricultural Engineering
    Canadian Agricultural Engineering
17. Centre de Cooperation Internationale en Recherche Agronomique pour le Développement (CIRAD)
    Agriculture et développement
    Bois et Forêts des tropiques
    Revue d’élevage et de médecine vétérinaire des pays tropicaux
    African Farming and Food Processing
19. Colegio de Postgraduados (Mexico)
    Agrociencia
20. Commonwealth Forestry Association
    Commonwealth Forestry Review
21. CSIRO Publishing
    Australian Journal of Agricultural Research
    Australian Journal of Botany
    Australian Journal of Experimental Agriculture
    Australian Journal of Plant Physiology
    Australian Journal of Soil Research
22. Walter de Gruyter & Co.
    European Review of Agricultural Economics
23. Edagricole (Italy)
    Géno Rurale
24. Elsevier Scientific Publishers
    Agricultural and Forest Meteorology
    Agricultural Systems
    Agricultural Water Management
    Agriculture, Ecosystems and Environment
    Agronomie
    Animal Feed Science and Technology
    Bioresource Technology
    Environmental Pollution
    European Journal of Soil Biology
    Food Policy
    Forest Ecology and Management
    Fruits
    Geoderma
    Journal of Development Economics
    Livestock Production Science
    Meat Science
    Soil & Tillage Research
25. Farm Machinery Industrial Research Corporation
    AMA: Agricultural Mechanization in Asia, Africa and Latin America
26. Federation of European Biochemical Societies
    FEBS Letters
27. Food and Agriculture Organization
    FAO Quarterly Bulletin of Statistics
    FAO Agricultural Development Paper
    FAO Agricultural Services Bulletin
    FAO Agriculture Series
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|-------------------|-----------------------------|
| FAO Animal Production and Health Paper (or Series) | Plant and Soil: International Journal on Plant-Soil Relationships |
| FAO Economic and Social Development Series | Vegetatio |
| FAO Food and Nutrition Paper (or Series) | Water, Air and Soil Pollution |
| FAO Forestry Paper | Vereniging/Royal Society for Agricultural Sciences |
| FAO Irrigation and Drainage Paper | Netherlands Journal of Agricultural Sciences |
| FAO Pasture and Fodder Crop Studies | 44. Koninklijke Landbouwkundige |
| FAO Plant Production and Protection Paper (or Series) | Malaysian Forester |
| FAO Research and Technology Paper | 46. Miller Publishing Company |
| FAO Soils Bulletin | Feedstuffs |
| FAO Training Series | 47. National Research Council of Canada |
| Nutrition in Agriculture | Canadian Journal of Botany |
| Unasylva | Canadian Journal of Forest Research |
| World Animal Review | Canadian Journal of Microbiology |
| Genetics | Botanical Review |
| 29. Indian Society of Agricultural Economics | Economic Botany |
| Indian Journal of Agricultural Economics | 49. North Holland |
| 30. Indian Society of Soil Science | European Economic Review |
| 31. Indian Veterinary Association | Journal of Hydrology |
| Indian Veterinary Journal | 50. Pakistan Institute of Development Economics |
| 32. Institut Agronomique de Tunisie | Pakistan Development Review |
| 33. Institute of Developing Economies (Japan) | Journal of Rural Studies |
| The Developing Economies | Journal of Stored Products Research |
| 34. Institute of Development Studies | Phytochemistry |
| IDS Bulletin | Soil Biology and Biochemistry |
| 35. Institute of Foresters of Australia | World Development |
| Australian Forestry | 52. Population Council, Inc. |
| 36. Institution of Agricultural Engineers (UK) | Population and Development Review |
| Landwards | 53. Potato Association of America |
| 37. Instituto Agronômico (Brazil) | American Potato Journal |
| Bragantia | 54. Research School of Pacific and Asian Studies (Australian National University) |
| 38. International Association of Milk, Food and Environmental Sanitarians | Bulletin of Indonesian Economic Studies |
| Journal of Food Protection | 55. Rural Sociological Society |
| 39. International Rice Research Institute | Rural Sociology |
| International Rice Research Notes | 56. Scottish Academic Press |
| 40. Istituto Sperimentale Per La Cerealcoltura/Experimental Institute for Cereal Research (Italy) | Tropical Animal Health and Production |
| Journal of Genetics and Breeding | 57. Society for Range Management |
| Rural and Environmental Engineering | 58. Society for the Study of Fertility |
| 42. Kenya Agricultural Research Institute | Journal of Reproduction and Fertility |
| Agroforestry Systems | Journal of Nematology |
| Entomologia, Experimentalis et Applicata | 60. Soil and Water Conservation Society |
| Euphytica | Journal of Soil and Water Conservation |
| Irrigation and Drainage Systems | 61. South African Society of Animal Science |
South African Journal of Animal Science
62. Springer International
Irrigation Science
Mycorrhiza
Oecologia
Planta; Archiv für Wissenschaftliche Botanik
Theoretical and Applied Genetics
Zeitschrift für Lebensmittel-Utersuchung und Forschung
63. Tri-Societies (American Society of Agronomy/Crop Science Society of America/Soil Science Society of America)
Agronomy Journal
Crop Science
Journal of Environmental Quality
Soil Science Society of America Journal
Tropical Grassland Society of Australia
Tropical Grasslands
64. University of Chicago Press
Economic Development and Cultural Change
65. University of Wisconsin Press
Land Economics
66. Weed Science Society of America
Weed Science
67. John Wiley & Sons, Inc.
Agribusiness
68. World’s Poultry Science Association
World’s Poultry Science Journal
69. World Bank
World Bank Economic Review

References


