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Developing a Digital Library for Teak Museum

[Final Report of Project KFRI RP 708/2014]

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PROJECT DETAILS

a.	Project Number	KFRI RP 708/2015
b.	Title	Developing a Digital Library for the Teak Museum
c.	Funding Agency	KFRI Plan Grants
d.	Duration	Two years (15th June 2015 – 15th May 2017) (Extended up to 15th August 2017)
e.	Objectives	To update the database of the teak bibliography To collect and organize the documents related to teak To build up a digital collection of these documents Link the full text with the citation with necessary metadata Develop a web portal for teak to make it accessible from Teak Museum and the Teaknet website
f.	Investigators	Sarojam, N Sani Lookose
g.	Project Assistant	Hema, E.S
h.	Expected Output	A digital library for teak which can be searched and documents downloaded.

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ABSTRACT

Teak (*Tectona grandis*) is a highly researched tropical timber tree owing to its superior wood quality and high accessibility as a profitable plantation species. In view of the importance of teak, much research has been done on this timber world over. Research results of the work carried out on different aspects of the species have come out in different form and the large amount of information generated are widely scattered.

Teak museum, established by the Kerala Forest Research Institute at Nilambur in 1995 aims to disseminate information on various aspects of teak. Organisation of a library with a collection of all published documents on teak at the museum help to make available any information published on teak. Pooling of information generated on teak at the teak museum facilitate further research and generate more information on teak. As it is kept in its digital form, storage and retrieval is easy. Sharing of information is also possible as it is in electronic form. Documents in electronic form are organised using an open source software.

Research outcomes and descriptions on different aspects available in many forms, were assembled in an easily searchable DVD and made available at the Teak Museum, Nilambur.

Regular updating of the database and the collection of remaining documents is to be continued.

1. INTRODUCTION

Teak (*Tectona grandis* L.f) is one of the most valuable tropical hardwoods of the world and is considered as the queen of timbers. It is used as the standard timber with which the qualities of other tropical hardwoods are compared in assessing their utilization potential. The teak tree which yields internationally reputed high quality timber, is indigenous to the tropics of South and Southeast Asia. Teak grows naturally in India, Myanmar, Thailand, Laos and Indonesia is now widely planted in Bangladesh, China and many countries of Africa, Central and South America and the Caribbean islands. Natural teak forests, in particular old-growth, high-quality stands, are reported declining due to overexploitation of existing stands, deforestation, conversion to other land-uses, and growing competition for environmental services. Teak has attracted the investors' attention on production of high quality timber from both public and private lands.

The need for intensive management of teak plantations is felt as teak supports many wood-based industries and generates employment for thousands of people. Demand for teak timber continues to be on the increase. World's first teak plantation was raised at Nilambur in Kerala, India during 1840's, opening the way to ensure a steady supply of plantation grown teak timber in the face of dwindling supplies of teak from the natural habitat.

In view of the immense value of teak, much research has been done on this timber world over. International Tropical Timber Organization (ITTO), International Union of Forest Research Organizations (IUFRO) and the Food and Agriculture Organization of the United Nations (FAO) over the past decades have been actively involved in research and development work of natural and planted teak forests. Research on various aspects of the species have been carried out in India, Myanmar, Thailand and Indonesia mainly focusing on producing quality wood in a short period. Intensive work has been carried out on different aspects of the species like genetic improvement, provenance trials, selection criteria for superior phenotypes, improved seed strategy, phenology, flowering and pollination processes, seed germination, vegetative propagation and tissue culture, plantation raising and management, properties, treatment and utilization of the timber.

Research results of the work carried out on different aspects of the species have come out in different forms as journal articles, reports, books, theses, conference proceedings, etc. and the large amount of information generated in various aspects of the species are widely scattered. User of the information cannot come across every piece of information he is supposed to make use of unless it is well organized. Its research results are published mainly in leading forestry journals and library with limited budget found it difficult to subscribe all these forestry journals. Researchers on teak has to go through a number of these journals for information.

Secondary sources like abstracting journals directed the researchers to locate the primary literature like books, reports, proceedings and journal articles published on the topic. More and more secondary journals were published and the researchers had to go through all these secondary sources for their topic of interest. It was taking much of their valuable time. Later it is shifted to CD format from print. As it is started to make it available in CD format, a large quantity of information could be stored and download to any format like Dbase, reference manager, procite, scimate, etc. The update of the CD had to purchase. Subscription cost of the CD was also high and all the libraries were not able to afford the cost of these CDs. Subject scattering was that much extent. Then come online services.

Databases on different subjects are now available in online but the subscription cost is very high. Only libraries of research institutions and universities can afford the subscription cost of these databases.
Latest trend is to collect and organize the original documents as such as to make it ready to retrieve as and when it is required. Original document can be provided instead of directing the researchers to the actual resources. It will save much of their time and money and the database can also be regularly updated.

Information systems for a species or group of species are rare, one such system on bamboo has been in existence at the Kerala Forest Research Institute. The IUCN plant information system is a system designed for updating data on endangered plants and the review of their status. The present information system is for storage and dissemination of information on teak.

Systematic classification and integration of the research outputs in the field of teak is becoming highly essential to know the gaps in the field and to carry out further research. There is a great deal of research in progress about various aspects of teak. Great strides in the development of techniques for assembling bibliographic references, linking them with full text and distributing them digitally through internet make constructing an information system feasible. Efforts to collect and organize existing and emerging literature on teak under one roof and facilitation of easy access by means of appropriate documentation and digitization are taken. Need for such an information system that can provide information at the fingertips is a priority item for planning and executing teak research as well as environmental activities.

Teak Museum, established by the Kerala Forest Research Institute with the support of Kerala Forest Department at its Nilambur Sub centre campus in 1995 aims to disseminate information on various aspects of teak- history, cultivation, management, ecology, utilisation and socio- economics. It is with the purpose a full fledged library was also proposed to organize at the museum. Organisation of a library with a collection of all published documents on teak at the museum is the ultimate aim of this project. A copy of any information published in any corner of the world is to be collected and documented in the library.

KFRI has a resourceful library in forestry and the resources of the library include books, journals, proceedings, reports, theses, dissertations, reprints, paper clippings, videos, CD/DVD, photographs, manuscripts, rare books, maps, pamphlets, popular articles, etc. Various collections have been brought into electronic form at different times and organised the digital collections in such a way to make it readily available when it is required. In the beginning much importance was given to the digital archiving of KFRI publications like research reports, scientific papers, extension materials, annual reports, newsletters, information bulletins, seminar papers, monographs, handbooks, proceedings, training manuals, theses and dissertations.

The objectives of the project are

1. To update the 2004 database of the teak bibliography
2. To collect and organize the documents on teak
3. To build up a digital collection of these documents
4. Link the full text with the citation with necessary metadata
5. Develop a web portal for teak to make it accessible from the Teak museum and Teaknet website

2. MATERIALS AND METHODS

2.1 Collection of Documents

Annotated bibliography compiled and published in 2005 cover citations of documents published on teak upto 2004. It was compiled as a continuation of the work done by Mathur (1973), FAO (1973) and Krishna Murthy (1974). A searchable CD was also published in 2005. The database of this was made available in the website of teaknet. A total of 4781 records had been covered which include references date back to the year 1856. The database is updated as part of this project by incorporating the citations of documents published on teak during 2004 to 2016. All the available databases like CAB Abstracts, Chemical Abstracts, Biological Abstracts, AGRIS database, Current Contents, etc. were searched for teak references as part of compilation of the bibliography.

Journals subscribed in the library including its back issues were a good source of collecting full text. Databases developed at various times at KFRI library on Books, Research Reports, Scientific papers, theses, Newsletters, Indian Forest Records, etc. were also a good source of information on teak. Journals available in UGC and ICAR journal consortium were also searched for articles on teak. Many of the recent publications on teak were collected from internet. Journal articles are collected and stored journal wise. Documents collected from various sources are linked to the database on teak. As the bibliographical database was already developed and as type of documents were categorised into books, theses, reports, etc., linking of full text was easy.Documents not collected are marked to collect it later.

The bibliographic management software CDS/ISIS was used for developing the database as this had facility for storing multiple authors and keywords as repeated fields. Title, author, year, source, keywords, abstract and publication type were the fields created for the database.

Databases developed in CDS/ISIS wasrought to Comma Separated Values (CSV) format and then to Access database to check for duplication and other corrections. Final database was converted to MS Excel format to facilitate compatibility with the overall system.

As far as possible documents were collected in electronic form. Documents not available in electronic form are collected in printed form. KFRI library

had a very good collection of documents such as books, reprints, theses, reports, proceedings, Indian Forest Records, etc.

Documents collected in print form are digitized. Scanners like flatbed scanner, planetary scanner and photocopier are used for imaging the pages of documents. Hard copy is scanned in 300 dpi in 24 bit colour mode in Acrobat professional and saved as pdf file. Pages are cropped, cleaned, aligned and book marked. File name include the name of journal, its volume, issue, year and page number of the journal from which the article is taken. By following this method we could avoid duplicating documents. Large documents are book marked to facilitate internal navigation. The digitized files brought to pdf format are linked to the database developed.

2.2 Design of Information System

The database developed in CDS/ISIS used in the initial stages of data compilation is transferred to CSV (Comma Separated Values) format to implement in website. Free and open server technology of APACHE-PHP is used for website development. The main components of WAMP are Windows, Apache, Mysql and PHP. WAMP refers to a set of free (open source) applications, combined with Microsoft Windows, which are commonly used in Web server environments. All these are open source packages except Windows. A local server has been installed for institutional users. In the case of LAMP Linex is used instead of Windows. Information system could be constructed in standalone DVD. For development, and for use in removable media, pre configured package of WAMP such as Server2go (https: //server2go. en.softonic.com) is used.

2.3 Search Engine

The entry point of this system is index.php. This displays title and its menu. The menu is connected to a .PHP or .htm file, which will open the database and display its contents. Apache, the public domain webserver program, installed in a local server along with the database such as MySql and PHP compiler. When the user clicks on search button, a box for entering the search term will appear. The search string will be collected and parsed by the programme search.php. The keyword will be passed to each of the databases sequentially. Hit records will be displayed on the screen.

Library portal is a window through which all scientists and researchers can access the the database and digital resources from all locations of KFRI.

The Digital Library Software-DSpace was later used to build the KFRI in-house repository of digital resources and to link it with the existing digital library. DSpace is selected, as it is an open source software for digital library and is designed for digital preservation of documents. It is capable of searching and retrieving items by using basic or advanced search options. It is also possible to browse items by title, author, subject, etc. It provides tools for management of digital assets, and is commonly used for building institutional repositories. It helps to create, index and retrieve various types of digital contents and helps to organize photographs, films, audio/videos, presentations and other forms of contents. The collection in DSpace is organised into communities, collections and items. An item is a deposited object of any type: a published article, an image, audio, or video file, etc. Related items are grouped into collections and related collections are grouped into communities. DSpace supports descriptive metadata fields such as Author, Title, Year, Publisher, Citation, Series/Report No., Subject Keywords, and Abstract etc. It has facility to acquire material from network through the DSpace users. The system supports importing of bulk metadata/contents of digital objects, weed out and to delete items from the collection.

A searchable DVD is an output of this project.

3. RESULTS AND DISCUSSION

There is a continuous increase of publications on teak from 1870s. Brandis, Bourdilon and Beddome are appearing during this period.

Maximum number of publications is of FAO (50) followed by Brascamp (32) and FRI, Dehra Dun (31). Two authors have 22 publications each. Thirteen authors have publications in the range of 10 to 20. These include well known scientists, Champion, H.G; Bhat, K.M and Stebbing, E.P. Forty authors have publications in the range of 5 to 10. There are more than 500 authors with publications in the range of 2 to 5. About 4000 publications are of single authorship.

An analysis of the database shows that out of 6345 records 2941 records are journal articles. There are 30 books, 118 research reports, 27 Ph D Theses, 26 book chapters, 250 seminar papers, etc. References include date back to the year 1852.

The journal Indian Forester is the leading journal with 821 articles on teak. Next is the Indian Journal of Forestry with 126 articles. Journals with more than 10 articles on teak are listed below.

Journals	No. of Articles
Indian Forester	821
Indian Journal of Forestry	126
Teaknet Newsletter	105
Journal of Tropical Forest Science	77
Indian Forest Records	66
Bois et Forêts des Tropiques	57
Forest Ecology and Management	56
Current Science	43
Duta Rimba	38
Holz als Roh-und Werkstoff	37
Indian Forest Bulletin	28
Karnataka Journal of Agricultural Sciences	26
Environment and Ecology	24
New Forests	19

Journals	No. of Articles
Indian Journal of Tropical Biodiversity	18
Journal of Forestry Research	18
Cerne	17
Entomon	15
Holzforschung und Holzverwertung	15
Insect Environment	15
Revista Árvore	15
Commonwealth Forestry Review	13
Journal of Tropical Forestry	13
Pesquisa Florestal Brasileira	13
Scientia Forestalis	13
Unasylva	13
Annals of Forest Science	12
Floresta e Ambiente	12
Ceylon Today	11
Empire Forestry Journal	11
Holzforschung	11
Indian Journal of Agricultural Sciences	11
Evergreen	10
Forest Products Industries	10
IAWA journal	10
Journal of Sustainable Forestry	10
Revista Forestal Venezolana	10

Work of updating the bibliographical database is in progress. Collected full text is linked to the database by creating a separate field for the file name. File name include the name of journal, its volume, issue and pages to avoid duplication. Documents are collected both in electronic and printed forms. Journal articles in printed forms are arranged journal wise in separate box-files in its chronological order. Theses are arranged in the name of scholars and reports in its numbers.

4. CONCLUSIONS

Annotated bibliography brought out by Sarojam in 2005 is updated as part of this project. The number of references have gone up to 6345 from 4781. A compilation of the bibliographical details of literature published upto 2016 on teak includes books, reports, theses, conference proceedings and journal articles. Major portion of the literature is journal articles. Out of the journals, Indian Forester is leading with 821 articles on teak. Indian Journal of Forestry is in the second position. Literature collected as part of this project is maintained in the teak museum library. Digital collection of these documents is organized to search and retrieve information. It is possible to download and share it among researchers. New documents can also be added to the collection.

Database of teak literature published in 2005 was updated till date. A searchable DVD is prepared which includes the updated bibliography and the full text. This can be copied into the hard disc. This will be useful to researchers and all those working on teak to acquaint themselves with published literature for their research work.