CENTER FOR INTERNATIONAL FORESTRY RESEARCH

OCCASIONAL PAPER NO. 10

ISSN 0854-9818
Mar 1997

Report on

Discussion Forum on Information Services in the Asia-Pacific

and

AGRIS/CARIS in the 21st Century an Asia-Pacific Regional Consultation

Edited by Michael Ibach and Yvonne Byron

CENTER FOR INTERNATIONAL FORESTRY RESEARCH
office address: Jalan CIFOR, Situ Gede, Sindangbarang, Bogor 16680, Indonesia
mailing address: P.O. Box 6596 JKPWB, Jakarta 10065, Indonesia
tel.: +62 (251) 622622 *fax*: +62 (251) 622100
email: cifor@cgnet.com
WWW: http://www.cgiar.org/cifor

The CGIAR System

The Consultative Group on International Agricultural Research (CGIAR) is an informal association of 41 public and private sector donors that supports a network of sixteen international agricultural research institutes, CIFOR being the newest of these. The Group was established in 1971. The CGIAR Centers are part of a global agricultural research system which endeavour to apply international scientific capacity to solution of the problems of the world's disadvantaged people.

CIFOR

CIFOR was established under the CGIAR system in response to global concerns about the social, environmental and economic consequences of loss and degradation of forests. It operates through a series of highly decentralised partnerships with key institutions and/or individuals throughout the developing and industrialised worlds. The nature and duration of these partnerships are determined by the specific research problems being addressed. This research agenda is under constant review and is subject to change as the partners recognise new opportunities and problems.

CONTENTS

LIST OF ACRONYMS

AARD	Agency for Agricultural Research and Development, Indonesia
ABES	Agriculture, Biology and Environmental Sciences
ABOA	Australian Bibliography On Agriculture
ACD	Applied Communication Division
ACIAR	Australian Centre for International Agricultural Research, Australia
AFC-Asia Pacific	Electronic Compendium for Forestry in the Asia-Pacific Region
AFTSC	ASEAN Forest Tree Seed Centre, Thailand
AGLINET	Agricultural Libraries Information Network
AGREP	Agricultural Research Projects in the European Communities, permanent inventory database (CEC), Belgium
AGRICOLA	Agricultural On-Line Abstracts (database compiled by NAL), Bethesda, Maryland, USA
AGRIN	Input preparation program for AGRIS
AGRINDEX	Printed version of AGRIS
AGRIS	Agricultural Research Information Service (FAO)
AGROVOC	Thesaurus for use with AGRIS
AIC	Agricultural Information Centre
AIFM	ASEAN Institute of Forest Management, Kuala Lumpur, Malaysia
AJ&K	Azad, Jammu and Kashmir
ALO	Agricultural Liaison Officers
APAFRI	Asia-Pacific Association of Forestry Research Organisations, Bangkok, Thailand
APAN	Asia Pacific Agroforestry Network, Indonesia
APINMAP	Asian Pacific Information Network on Medicinal and Aromatic Plants
APU	AGRIS processing unit
ARDIN	Agriculture and Rural Development Information Network
ARMIS	Agriculture Research Management Information System
ARRIP	Australian Rural Research In Progress
ARRTIS	Agriculture and Natural Resources Regional Technology Information System
ASDIS	Automated Selective Dissemination of Information Service
ASEAN	Association of Southeast Asian Nations
BARC	Bangladesh Agricultural Research Council
BCSIR	The Bangladesh Council for Scientific and Industrial Research
BFRI	Bangladesh Forest Research Institute
BHD	Diameter at breast height
BIOSIS	Biological Sciences Information System, USA
BNH	The Bangladesh National Herbarium
BBS	Electronic bulletin board system
BSU	Benguet State University, Philippines
BU	Bicol University, Philippines
CABI	Centre for Agriculture and Biosciences International
CALREC	Center for Agricultural Library and Research Communication, Bogor, Indonesia
CARIN	Input preparation program for CARIS
CARIS	Current Agricultural Research Information System
CARPlus	Updated input software program for CARIS
CAS	Current Awareness Services
CD	Compact disks
CD-ROM	Compact Disk - Read Only Memory
CDIS	CD-ROM Based Information Service
CDS/ISIS	Database management software developed by UNESCO.
CGIAR	Consultative Group on International Agricultural Research, Washington DC, USA
CIARL	Compact International Agricultural Research Library
CIESIN	Consortium for International Earth Science Information Network, USA
CIFOR	Center for International Forestry Research, Bogor, Indonesia
CMU	Central Mindanao University, Philippines
CRIS	Current Research Information System
CSIRO	Commonwealth Scientific and Industrial Research Organization, Australia
CSSAC	Camarines Sur State Agricultural College

CSTL	Central Scientific and Technical Library in Hanoi
CTA	Centre Technique de Coopération Agricole et Rurale (Technical Centre for Agricultural and Rural Co-operation
CUFAN	An electronic bulletin board system
Current Contents	Bibliographic of database for agriculture, biology and environment
DENR	Department of Environment and Natural Resources, Philippines
DF	Discussion Forum
DIALOG	On line host (Palo Alto, California, USA)
DMMMSU	Don Mariano Marcos Memorial State University
DOST	Department of Science and Technology
DSI	Directorate of Scientific Information
ERDB	Ecosystems Research and Development Bureau, Philippines
ERIN	Environmental Resources Information Network
ETFRN	European Tropical Forestry Research Network
FAO	Food and Agriculture Organization of the United Nations
FD	Forest Department
FDB	Factual Database
FGRI	Forest Genetics Research Institute
FORNESSA	Forestry Research Network for Sub-Saharan Africa
FORSPA	Forestry Research Support Programme for Asia and the Pacific
FOSTIC	Forest Science and Technique Information Centre
FPRDI	Forest Products Research and Development Institute
FRI	Forestry Research Institute
FRIM	Forest Research Institute Malaysia, Kuala Lumpur, Malaysia
FSIV	Forest Science Institute of Vietnam
FTP	File Transfer Protocol
GAUF	Gregorio Araneta University Foundation, Philippines
GDP	Gross Domestic Product
GIL	Library and Documentation Systems Division, FAO, Rome, Italy
HKUST	Hong Kong University of Science and Technology
HTML	Hyper Text Markup Language
IAEA	International Atomic Energy Agency, Austria
ICFRE	Indian Council of Forestry Research and Education (Ministry of Environment and Forests), Dehra Dun, UP, India
ICRAF	International Centre for Research in Agroforestry, Nairobi, Kenya
IDB	Integrated Database
IDD	The Information and Documentation Division
IDRC	International Development Research Council, Canada
IDRIS	Inter-Agency Development Research Information System, Canada
IMAGE	A database package
INIS	International Nuclear Information System
IP	Internet Protocol
IPA	Data Set Indication/Preparation/Administration
IPSA	The Institute of Postgraduate Studies in Agriculture
IRETA	Institute for Research Extension and Training in Agriculture, University of South Pacific, Western Samoa
ISCA	Isabela State College of Agriculture, Philippines
ISCAF	Ifugao State College of Agriculture and Forestry, Philippines
ISU	Information Service Unit
IT	Information Technology
IUCN	The World Conservation Union (formerly the International Union for Conservation of Nature and Natural Resources), Switzerland
IUFRO	International Union of Forestry Research Organizations
KIET	Korea Institute for Industrial Economics and Trade
KOLAS	Korean Library Automation System
LAN	Local Area Network
LIS	Librarians and Information Services
MAFFIN	Ministry of Agriculture, Forestry and Fisheries Research Network, Japan
METLA	Metsäntutkimuslaitos (Finnish Forest Research Institute), Finland
MISD	Management Information Services Division

MKT	Data Set Marketing
MS ACCESS	Microsoft database package
MSDOS	Microsoft disk operating system
MSU	Mindanao State University
NACESTID	National Centre for Science and Technology Information, Documentation
NARC	National Agricultural Research Centre
NARISP	National Agricultural Information System of Pakistan
NARRDN	The National Agriculture and Resources Research and Development Network
NARS	National Agricultural Research System
NAWG	National Agroforestry Working Group
NFLIC	National Forest Library and Information Centre
NFP	New Forest Project
NGOs	Non-Governmental Organisations
NNs	National Nodes
NVSIT	Nueva Viscaya State Institute of Technology, Philippines
OAS	On-line Alert Service
OFI	Oxford Forestry Institute
PACT	A facilitating organisation for development NGOs
PC	Personal Computer
PCARRD	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development
PG	Post-Graduate
PHY	Data Set Plant Phytochemistry
PLT	Data Set Plant
PRO-CITE	A database package
R&D	Research and Development
RDMIS	Research and Development Management Information System
RETRES	Research Information Storage and Retrieval System
RRDIS	Regional R and D Information Service
RSS	Retrospective Search Services
S&T	Science and Technology
SAARC	South Asian Association for Regional Cooperation
SCAINIP	Standing Committee on Agricultural Information Networking in the Pacific
SCARM	Standing Committee on Agriculture and Resource Management
SCI	Science Citation Index
SDI	Selective Dissemination of Information
SEARCA	South East Asian Ministers of Education Organisation Regional Center for Graduate Study and Research in Agriculture
SFM	Sustainable Forestry Management
SLS	Scientific Literature Services
SOA	School of Agriculture, University of the South Pacific, Apia, Western Samoa
SPAAR	Special Program for African Agricultural Research (World Bank), USA
SPARRSO	The Bangladesh Space Research and Remote Sensing Organisation
SPDC	Special Programme for Developing Countries, Austria
TIAC	Technical Information Access Center
TREE-CD	Compact Disk for database which contents of bibliography data on forestry, agroforestry and forest products
UNCED	United Nations Conference on Environment and Development, Rio de Janeiro, Brazil
UNDP	United Nations Development Programme, New York, USA
UNESCO	United Nations Educational, Scientific and Cultural Organization, France
UPLB	University of Philippines at Los Baños
URL	The Uniform Resource Locator
USAID	United States Agency for International Development, Washington DC, USA
USDA	United States Department of Agriculture, USA
VESTENET	Vietnamese computer network
WAICENT	World Agricultural Information Centre
WAN	Wide Area Network
WCMC	World Conservation Monitoring Centre, UK
WWF	World-Wide Fund for Nature, Gland, Switzerland
WWW	The World Wide Web
ZADI	Zentralstelle für Agrardokumentation und Information, Bonn, Germany

REPORT ON DISCUSSION FORUM ON INFORMATION SERVICES IN THE ASIA-PACIFIC

30 OCTOBER - 1 NOVEMBER 1996
BOGOR, INDONESIA

EXECUTIVE SUMMARY

The information available to researchers in today's world and the technology to access and utilise it is expanding rapidly. The national wealth of industrialised countries is significantly knowledge-based. With the increased emphasis on utilising information to promote sustainable development, as defined by the UNCED World Summit in 1992, access to accurate forestry information is a key element in the decision-making process. This is especially true in the developing world. Unfortunately most forestry and forestry research organisations in the Asia-Pacific region neither have access to nor can utilise effectively the vast amount of existing information. We must create mechanisms to facilitate development and use of this information and information technology.

Many forestry projects in the Asia-Pacific region now encompass information as part of their mandate, including, for example, assistance with publishing, creation of information centres, document delivery and technology development. A number of organisations in the region share common objectives to develop capacity in the forestry research sector. To this end, representatives of the ASEAN Forest Tree Seed Centre (AFTSC) Project, ASEAN Institute of Forest Management (AIFM), Center for International Forestry Research (CIFOR), International Development Research Council (IDRC) and CAB International (CABI), and the Forestry Research Support Programme for Asia and the Pacific (FORSPA) have proposed solutions through collaborative activities.

A proposed regional forum of key people in the Asia-Pacific, to discuss forestry information services needs and opportunities, was preceded by data gathering from specific institutions in the region. A questionnaire surveyed the facilities and support for information services units in forestry institutions throughout the Asian-Pacific region.

This report details the results of that survey and the proceedings of the Discussion Forum on Information Services in the Asia-Pacific held at Bogor, Indonesia, from 30 October to 1 November 1996. The list of perceived needs generated by the survey guided the deliberations of the Forum. Participants identified priority goals, action plans for their achievement and responsible agents/agencies, expected time frames and likely costs. The priority goals agreed upon by the group were:

- To demonstrate the value of information in contributing to a country's development.
- To improve the ability of Information Services Unit (ISU) staff to pro-actively meet user demands.
- To establish a core of well-trained ISU staff and users through an integrated programme of training.
- To improve effectiveness of forestry information services by providing access to e-mail and the Internet, and establishing a list server.

The Forum was assisted in its discussions by keynote papers on the future of scientific information and publishing (F. Ng, CIFOR), IUFRO's role in providing information services (H. Schmutzenhofer, IUFRO) and a comprehensive guide to sources of forestry information (K. Becker, CABI).

The groundwork was laid for a valuable forestry network in the region to be officially launched at the APAFRI/FORSPA meeting in March 1997.

DISCUSSION FORUM ON INFORMATION SERVICES IN THE ASIA-PACIFIC

Becky Skidmore
ASEAN Forest Tree Seed Centre Project, Ottawa, Canada

INTRODUCTION

As we approach the end of the second millennium, there is a general recognition that a new "world order" is being created. Information, and the technology that manages it, have become driving forces in economic growth and in creating that new world order. There is a rapid transition from the industrial economy of the mid-1900s to an information economy where an increasingly large proportion of the labour force is involved in information industries, systems and services. The expanding use of micro-computers and the creation and expansion of networks have had tremendous socio-economic impact on organisational structures and entire nations. Recent statistics show that more than half of total GDP in industrialised economies is knowledge-based (The Economist 1996). Countries with the good fortune to adapt to these developments have been able to use information and information technology to create booming national economies. Japan, South Korea, Taiwan and Singapore are obvious success stories in the Asia-Pacific region.

The continued importance of forestry resources in the national economies of the Asia-Pacific region is undeniable. Similarly, the importance of forest research to support the sustainable development and conservation of the forest resource is recognised. Ten years ago, there were 77 organisations and 1500 scientists involved in forestry research in the region (Kashyap 1995) and that number has most certainly grown. Yet unless concerted efforts are made to acquire and use information and information technology tailored to these national forestry resource capabilities, many nations are in danger of falling behind the development curve. Chapter 40 of Agenda 21 of the UNCED World Summit specifically calls on governments to work towards improving access to and utilisation of information needed to plan for sustainable development. Kashyap makes direct mention of the forest principles of Agenda 21, which state

> The provision of timely, reliable and accurate information on forests and forest ecosystems is essential for public understanding and decision making and should be ensured.

Regrettably, the above statement does not reflect the current state of forestry information in the region. It is an unfortunate reality that most forestry and forestry research organisations and their staff neither have access to nor do they utilise the vast amount of information available for the decision-making process. The literature abounds with references and justifications for the poor use and development of information in both the Asia-Pacific and other developing regions of the world (Agha and Akhtar 1992; Mwinyimbegu 1993). Certainly many of the countries involved face economic difficulties that force governments to focus on the more immediate and basic needs of their populations. Despite the complexity and multiplicity of the factors contributing to this situation, the governments of information-poor countries must also recognise the importance of acquiring and utilising available information and information technology for economic growth. They must create mechanisms to facilitate its development and use. If not, the gap between the information "haves" and "have-nots" will continue to grow.

FORESTRY INFORMATION INITIATIVES

In an effort to improve access to and utilisation of forestry information, many forestry projects operating in the region include information exchange as part of their mandate. Initiatives of these projects include such things as assistance in the writing, publishing and dissemination of scientific and technical literature; creation of viable information centres, literature search facilities and document supply services; development of electronic information networks; provision of technical equipment, resources (e.g., journals, CD-ROMs) and training; and CD-ROM production. CABI has been operating a forestry CD-ROM Sponsorship Programme in the region which uses funding from international and bi-lateral development agencies to provide CD-ROM workstations, TREE-CD, training and back-up document delivery to needy organisations. A similar initiative in China for agricultural information included the provision of 34 workstations, 42 sets of agricultural databases on CD-ROM (CABCD, VETCD, FSTA and AGRIS), primary and abstract journals from CABI for 1992-94, computer peripherals

and an extensive local and overseas training programme (Zhang *et al.* 1996).

COLLABORATION

In recognition of their common objectives, representatives from ASEAN Forest Tree Seed Centre (AFTSC) Project, ASEAN Institute of Forest Management (AIFM), Center for International Forestry Research (CIFOR), International Development Research Council (IDRC) and CAB International (CABI), representing both themselves and the Forestry Research Support Programme for Asia and the Pacific (FORSPA), met at AIFM in Kuala Lumpur in March 1995 and June 1996 to discuss common problems of forestry information in South-east Asia and to propose solutions and collaborative activities. Due to the broad geographic focus of most of those agencies present, a decision was made to extend any proposed activities to the entire Asia-Pacific region. It was hoped that the newly formed Asia-Pacific Association of Forestry Research Institutions (APAFRI), with its mandate to promote exchange of scientific and technical expertise and information and to strengthen linkages among national, regional and international research centres and organisations, would both define the geographic scope and legitimise operations.

Representatives at the meetings suggested a regional forum of key people (e.g., senior managers, information providers, information managers/librarians and donors) to discuss forestry information services needs and opportunities and to generate ideas on how to best meet these needs. It was suggested that specific institutions be targeted within each country to respond to a survey questionnaire asking for details on staffing and skill levels, funding, resources, networking capabilities, etc. prior to any collective meeting. The questionnaire would be designed in two parts. Part 1 would address the organisation and management of the agency as a whole and would be completed by the Director General or senior level manager. Part 2 would focus on the information services unit (ISU) within the agency and would be completed by the information manager/librarian. The questionnaire would also ask for an interest in and commitment to participate in the development of a proposed forestry information network. Analysis of the questionnaire was to provide the basis of any resulting Discussion Forum and to select participants. A questionnaire (see Appendix 1) was designed and distributed in early 1996. AFTSC and CIFOR were responsible for analysing the questionnaire and publishing results.

THE SURVEY

The questionnaire was sent to 24 national forestry research institutes, forest research departments, forestry faculties of universities and forestry projects in the Asia-Pacific. Eighteen recipients from 14 countries responded to the questionnaire, giving a 73% response rate. The small sample size and the broad range of responses often made it difficult to extrapolate meaningful statistics, leading to the overall conclusion that the information service units of the region varied considerably in terms of their facilities, resources and management (see Appendix 2 for a discussion of the survey results). Similarly, survey results sometimes were contradictory, as in the case where the data showed a strong management commitment to improved funding of the ISU, but a consistently low level of budget allocation to information services. Many of the respondents also indicated that the lack of literature search capabilities was a constraint to improved quality and quantity of research, yet 18 of the 19 replies indicated they either had access or could get access to relevant published literature.

Despite these difficulties, the responses made it possible to highlight common organisational and operational details and express shared concerns. A list of perceived needs was generated from the survey results, including:

1. Inadequate funding of information services unit
2. Lack of recognition for information professionals
3. Lack of research information management systems within organisations
4. Lack of awareness of and access to current, worldwide literature
5. Lack of training in literature synthesis and scientific writing
6. Lack of training for support staff in information services
7. Considerable variation between libraries in equipment levels
8. Limited exchange of available forestry information within the region
9. Lack of formalised networks of forestry libraries in the region
10. Limited distribution of published forestry information and databases

The organising parties recognised that the list existed purely as a basis for generating further discussion at the proposed Discussion Forum. The Forum itself would focus on refining the list, prioritising needs, exploring solutions and developing specific action plans.

THE DISCUSSION FORUM

The Discussion Forum (DF) on Forestry Information Services in the Asia-Pacific was hosted by CIFOR as a 4-day meeting at the end of October 1996 in Bogor, Indonesia. CABI, AIFM, AFTSC and CIFOR provided

financial support. Twenty-seven people attended the DF and included a diverse group of information professionals, information providers, donors, users and senior management personnel. In all, 16 organisations representing 12 countries, including most ASEAN countries, India, Bangladesh, Myanmar, Vietnam, China, Laos, Korea and Western Samoa, were present (See Appendix 6). Also present were representatives from AFTSC, AIFM, CABI, CIFOR, IUFRO, FORSPA and USAID.

The Discussion Forum had three objectives:

- to analyse the needs and opportunities identified in the survey (Session 1);
- to establish priorities for action among those needs and opportunities (Session 2); and
- to develop and initiate a co-ordinated response to the high priority needs and opportunities (Session 3).

Session 4 was devoted to the presentation of these action plans by working group members. The final session included a keynote paper by CAB International and a demonstration of their proposed forestry compendium.

Despite an initial awkwardness in bringing together such a diverse group of people from a variety of cultures, the working group sessions offered an opportunity for people to interact more directly and express their ideas.

Session 1: Definition of needs and opportunities

Following a thought-provoking address by CIFOR's Francis Ng on the future of scientific publishing and information in the Asia-Pacific (see Appendix 3), working groups discussed the list of needs and opportunities which were developed from the earlier mail survey. Each working group was to comment on, revise or re-word each need as necessary, as well as identify additional needs not included in the list.

A revised and expanded list of needs was developed by the three working groups under the four broad areas of Management, Human Resources, Networking and Physical Resources.

Management

Need for:

1. Adequate funding and efficient management of funds for information units
2. An information strategy at institutional and national levels
3. Integration of all information functions within the organisation, supported by an information management system (e.g., library, publishing, distribution, IT)
4. Information systems for research management within organisations
5. Attention to intellectual property rights (including copyright) with regard to the sharing and use of scientific information
6. Recognition of the value of information and information managers/providers by decision makers, in addition to monetary and policy support
7. Linking incentives with publishing output of researchers

Human resources

Need for:

8. Training of researchers and managers in literature synthesis and scientific writing
9. Training of library/information staff, users, producers (e.g., editors, publishers) in appropriate information skills, providing in-country training where possible
10. Increased awareness of relevant literature (local, grey, international)
11. Development of reading/information habits of educational institutions (based on economic realities and policies of individual countries)
12. Pro-active service orientation (strategies, workplans) of information units
13. Recognition of the dynamic future of information

Networking

Need for:

14. Reliable telecommunication capabilities between institutions and regionally
15. A formalised regional network of forestry and forestry-related libraries (key persons, institutions, databases)
16. Improved access, distribution, utilisation and exchange of available forestry-related information, with appropriate feedback mechanisms on use
17. Inter-disciplinary co-operation in research and information systems

Physical resources

Need for:

18. Compatible exchange mechanisms amongst libraries (information exchange protocols)
19. Effective library equipment, resources and software
20. Access to full-text resources (hard copy/document delivery, full-text databases)

All participants recognised the overlap amongst many of the expressed needs and there was a general

perception that addressing one need may in fact address many of the others. This was particularly true of the needs expressed in the management category where participants constantly stressed the importance of obtaining managerial support at both the institutional and national level to create an efficient and effective information system. With managerial support, necessary funds for equipment, training and resources would logically follow, leading to an improved ability to manage and utilise information. This need for managerial support is echoed throughout the literature. Mwinyimbegu (1993) comments on the "managerial poverty" of developing countries. Similarly, Zhang *et al.* (1996) state that many managerial posts in China are still occupied by individuals with insufficient background in information management, although they are optimistic with an increasing presence of senior scientists or outstanding young scientists in these positions. It is interesting to note, however, in the context of the Discussion Forum, that some participants did feel that sufficient management support already existed in their organisations. The representatives from India and Korea, in particular, felt their information activities were both well-funded and supported by senior management, although there was general uncertainty in all the groups as to what actually constitutes optimum, or even adequate, support.

Central to the managerial issue is the importance of setting in place a national information policy . Such a policy would lead to strategies whereby information activities would exist to contribute to national socio-economic goals. References were made to the Chinese government's policy, "Cha Xin", which requires a compulsory literature search covering the preceding ten years when establishing or evaluating all provincial and national research projects. This policy has led to increased use of information in the research process, reduced duplication of research efforts and has contributed significantly to the heightened appreciation and profile of libraries within organisations (Zhang *et al.* 1996). In the Philippines, where there is no information policy, Broadbent (1992) bluntly states "a national information policy is essential" if future economic growth is to proceed.

The issue of human resources was perceived as being related to management issues, particularly with regard to the need for pro-active service strategies on the part of information managers. Improved marketing of information services, formalised workplans and strategies would ensure information units a viable place within their organisations. Not only do information managers have to convince senior management of the value of information but they must further their marketing efforts to ensure that information services and resources are well utilised by research personnel. Senior managers and policy makers who may themselves acknowledge the importance of information in the research process will not provide continued financial support if information managers do not attract and maintain the appropriate customer base.

Networking was also important to all participants. Many countries represented at the Discussion Forum have under-developed or unreliable telecommunication capabilities, making efficient exchange of information almost impossible. Singapore's excellent telecommunication infrastructure has been instrumental in the country's socio-economic growth and has provided the basis for a national information system connecting computers in homes, schools and offices (Weng and Sabaratnam 1996). An efficient telecommunications infrastructure would enable forestry institutions to develop co-operative networks with other like-minded institutions and organisations. Resources, expertise and services could be shared to the benefit of all. The lack of development of forestry networks thus far can be partially attributed to the unreliable infrastructure, bureaucracies and costs of existing communication systems.

Discussion of physical resources was a natural follow-on from funding and management support. All participants recognised the need for improved information (e.g., monographs, journals, CD-ROMs) and IT (computer hardware and software) resources. Again, with secured financial and political support from senior management, physical resources should improve.

Session 2: Prioritising needs and opportunities

Using the list of needs prepared in session 1, working group participants were asked to rate each need in terms of having the greatest positive impact on the region's information services (i.e., the highest priority). Secondly, they were asked to consider the various inputs (e.g., human and financial resources, management participation, time) required to address each need and rate it according to the likelihood for success in addressing that need. The combination of these two values would lead to identifying those needs which were perceived as having both a high impact and high likelihood for success. Rating was on a scale of 1 to 5, with 5 being the highest value. The needs having the highest combined value would be those for which action plans were to be developed in Session 3. Results for each of the three working groups are shown in Table 1.

As expected, the values expressing priority or importance assigned to a particular need were consistently higher than the values expressing the perceived likelihood for success in addressing that same need. The difference between the two values was particularly evident in the management category. Both the ***need for adequate funds and efficient management of funds*** and the ***need for decision makers to recognise the value of information and information managers/ providers*** scored very high in terms of priority but low in terms of likelihood for success. Large differences

Table 1. Definition of Needs and Priorities

Needs	Allocated Priorities			
	WG1	**WG2***	**WG3**	**Action Plans**
MANAGEMENT				
1. Adequate funds and efficient management of funds for information units	5.7	8.0	7.7	
2. Information strategy at institutional and national levels	7.2	8.5	7.4	Yes
3. Integration of all information functions within the organisation, supported by an information management system (e.g., library,publishing, distribution, IT)	5.4		6.6	
4. Information systems for research management within organisations	6.0		4.5	
5. Attention to intellectual property rights (including copyright) with regard to the sharing and use of scientific information	5.9		4.6	
6. Recognition by decision makers of the value of information and information managers/providers, in addition to monetary and policy support	6.7		6.3	
7. Link incentives with publishing output of researchers	6.1		3.7	
HUMAN RESOURCES				
8. Training of researchers and managers in literature synthesis and scientific writing	6.2		8.0	
9. Training of library/information staff, users, producers (e.g., editors, publishers) in appropriate information skills, providing in-country training where possible	6.7	8.8	9.3	Yes
10. Increased awareness of relevant literature (local, grey, international)	6.1		8.0	
11. Development of reading/information habits of educational institutions (based on economic realities and policies of nation)	5.8		4.4	
12. Pro-active service orientation (strategies, workplans) of information units	7.6	7.6	7.3	Yes
13. Recognition of the dynamic future of information	6.0		5.9	
NETWORKING				
14. Reliable telecommunication capabilities between institutions and regionally	5.6		7.2	
15. Formalised regional network of forestry and forestry-related libraries (key persons, institutions, databases)	6.4	7.6	8.2	Yes
16. Improved access, distribution, utilisation and exchange of available forestry-related information, with appropriate feedback mechanisms	5.7	8.0	8.6	Yes
17. Inter-disciplinary co-operation in research and information systems	6.2		5.8	
PHYSICAL RESOURCES				
18. Compatible exchange mechanisms amongst libraries (information exchange protocols)	5.5		7.4	
19. Effective library equipment, resources and software	5.7	8.7	8.6	Yes
20. Access to full-text resources (hard copy/document delivery, full-text databases)	6.1		7.1	

* WG2 presented only their seven highest-ranked needs

were also evident in the networking category, whereas the differences between the two figures in both the human and physical resources categories were less extreme.

The six needs identified as requiring action plans were:

- Information strategy at institutional and national levels
- Training of library/information staff, users and producers in appropriate information skills
- Pro-active service orientation (strategies, workplans) of information units
- Formalised regional network of forestry and forestry-related libraries/information units
- Improved access, distribution, utilisation and exchange of available forestry-related information
- Effective library equipment, resources and software

Session 3: Development of Action Plans for high-priority Needs and Opportunities

Each working group was asked to work out detailed action plans for addressing two of the six needs identified in Session 2. Outputs were to include a definition of the problem, goals and objectives of an action plan, and a specific action plan outlining persons or agencies responsible, time frame and any associated costs. It was recognised that the various action plans developed and presented by the three working groups would vary considerably from group to group. All groups requested extra time to discuss and develop their proposed plans. The resulting plans, presented in Table 2, provide an excellent starting point for determining actual, achievable plans to which the Discussion Forum participants could agree.

Table 2. Proposed Action Plans for High-Priority Needs

Definition of Problem or Need	Goals/Objectives	Action(s) Required	Responsibility, Time Frame, Costs
Integrated and focused information policy and strategy	(i) To demonstrate the value of information in contributing to a country's development (ii) To enhance co-operation of organisations and individuals and their capabilities (iii) To enhance the flow of information within and among institutions	Gather case studies where information has contributed to positive economic outcomes Gather information on existing strategies Conduct seminars demonstrating the value of information Create regional working group of policy makers and information providers/ specialists to draft information-related legislation and bills Utilise/develop computerised or electronic information systems Disseminate, through various media, the value of information and information technology	International agencies (e.g., FORSPA, APAFRI, CIFOR) to assume co-ordinating responsibility 2-year time frame Cost: to be determined by implementing agencies
Need to train: Information Services Unit (ISU) staff to improve management, editorial, technical and language skills Users in literature search techniques Editors in information technology and language skills	To create efficient ISU operations in national forestry research and development organisations and establish a core of well-trained ISU staff and users capable of efficient service operations, through an integrated programme of training, by : (i) Improving English language capability amongst ISU and editorial staff	(i) Identify suitable local language training institutions and training staff to provide English language training focused on ISU and natural resources terminology Allocate personnel time and local funds to bring about a sustained effort Follow-up to determine next actions (*optional*: Choose suitable distance learning programmes from international or regional sources)	(i) ISU staff to assume responsibility Time frame: ongoing Costs: to be determined

Table 2. Proposed Action Plans for High-Priority Needs *continued*

Definition of Problem or Need	Goals/Objectives	Action(s) Required	Responsibility, Time or Frame, Costs
	(ii) Improving IT skills of ISU and editorial staff	(ii) Determine IT development needs of ISU staff and users Identify in-country training resources for specific skills (e.g., database management) Allocate time and funding	(ii) ISU staff to assume responsibility Time frame: ongoing Costs: to be determined
	(iii) Improving management skills of appropriate ISU staff Improving technical skills of ISU staff	(iii) Identify managerial and other training requirements of ISU staff at national institutional level Offer 10-day training events for 10-15 participants Offer management training at regional level through resource persons from national and international institutions	(iii) Co-ordinated by a regional (network) agency (local staff to be involved with implementation) Training course costs approx. US$25-30,000 per 10-day training event
		(iv) Determine training development needs of ISU staff in abstracting, indexing and cataloguing Identify in-country training resources Allocate time and funding	(iv) Co-ordinated by ISU staff Time frame: ongoing Costs: to be determined
Need to develop library and information units aligned with institutional priorities in order to increase the effectiveness of their services and resources	To create efficient and effective ISU operations in national forestry research development organisations and improve the ability of ISU units and staff to meet user demands pro-actively, by: (i) Co-operating with users to determine needs (ii) Identifying internal senior management support (iii) Establishing a mechanism for regular communication between users and ISU units	(i) Conduct survey of users' current and future information needs Use survey output to prepare concept framework for ISU development (ii) Select key senior officer to champion concept and be involved with related institutional decision-making (iii) Arrange regular meetings of selected representative users and senior managers to discuss and agree on development of ISU activities	Responsibility and co-ordinating role to be assumed by senior ISU individual Funding from internal sources Time frame: ongoing

Table 2. Proposed Action Plans for High-Priority Needs *continued*

Definition of Problem or Need	Goals/Objectives	Action(s) Required	Responsibility, Time or Frame, Costs
	(iv) Identifying areas for co-operation between national and regional institutions	(iv) Arrange access to other information sources from outside the institution using existing regional networks	
	(v) Facilitating user access to ISU units	(v) Analyse in-house processes and remove obstacles to effective information delivery and, at the same time, reduce costs	
Need for a formalised regional network of forestry and forestry-related libraries	To improve sustainable forest management and conservation in the Asia-Pacific region by improving the effectiveness of forestry information services, by:	(i) Identify people/institutions and resources/services available in network	(i) DF Core Group to take action before end Jan '97 Funding through in-kind contributions
	Developing a co-operative community	(ii) Identify network co-ordinating institution	(ii) FORSPA to assume responsibility of co-ordinating institution immediately
	Providing fast, cheap, reliable and safe information delivery		Costs approx. 1 day per week in time
	Providing access by electronic means	(iii) Develop electronic catalogue/database for institutions/network	(iii) DF Core Group to take action for serials by end July '97; Books by end Dec '97; Grey literature by Dec '98
	Ensuring timely delivery		
	Sharing expertise		
	Communicating with and supporting other networks/ institutions		Funding (approx. US$20,000) through national country institutions
	Improving marketing	(iv) Establish formal agreement between libraries in network	(iv) FORSPA to assume co-ordinating role with draft agreement by Mar '97, final by Dec '97
	Providing e-mail and Internet access; developing list server		
	Filling gaps in serial holdings		Costs approx. 1 day / week in time
	Improving awareness of availability of material		
	Improving ability to exchange information	(v) Hold workshop to review network activities	(v) FORSPA and Working Group members to assume responsibility for developing and participating in follow-up Workshop in Oct/Nov '97
	Establishing linkages/ agreements		

Table 2. Proposed Action Plans for High-Priority Needs *continued*

Definition of Problem or Need	Goals/Objectives	Action(s) Required	Responsibility, Time or Frame, Costs
	Identifying major players		Costs approx. US$30,000
		(vi) Identify co-operating institutions outside network	(vi) Co-operators to come from DF Core Group before end Apr '97 Funding through in-kind contributions
		(vii) Develop home page	(vii) IUFRO Net Task Force to co-ordinate and provide home page before Oct/Nov '97 Funding through in-kind contributions
		(viii) Secure funding	(viii) Funding through donor agencies (short term) and national country institutions (long term) Funding through in-kind contributions
		(ix) Establish e-mail connections	(ix) FORSPA/CIFOR/ AIFM to establish e-mail connections for DF Core Group before June '97 Costs approx. US$20,000
Need for improved access, distribution, utilisation and exchange of available forestry-related information, with appropriate feedback mechanisms	To improve the ability of institutions to produce and circulate forestry material	(i) Provide training and expertise in production of full-text CD-ROMs	(i) CIFOR to assume training responsibility with training to take place by Dec '97 Costs: approx. US$30,000
		(ii) Provide mechanism and framework for wide distribution of published materials to libraries and institutions in the network	(ii) DF Core Group to develop on-going mechanism; review processes at proposed Workshop Funding through in-kind contributions

Table 2. Proposed Action Plans for High-Priority Needs *continued*

Definition of Problem or Need	Goals/Objectives	Action(s) Required	Responsibility, Time or Frame, Costs
Need for suitable and adequate facilities and resources for an effective library operation	To improve library services/ operation by providing suitable and adequate resources and facilities, by: (i) Identifying optimal resource requirements for an efficient library operation (ii) Acquiring appropriate resources (inclusive of facilities) (iii) Managing resources efficiently and effectively (iv) Tapping resources	Study/examine model library and relate to personal requirements Benchmark optimal and functional library Develop proposals and identify potential funders or donors Explore alternative sources of supply (exchange agreements, free sources) Identify income-generating services Identify resources for possible sharing Increase use of electronic media and information technology Train staff on various skills related to management and operation of resources Create mechanism/network for effective sharing of resources (e.g., information directory, union list of periodicals) Promote library services Convince management and funders of value of information (as developed in initial action plan)	FORSPA, APAFRI and CIFOR to assume co-ordination role Time frame within 3-4 years Costs to be developed by implementing agency/agencies

FINAL ACTION PLANS

As emphasised in the table, the need for an integrated and focused information policy and strategy was seen as crucial to the development of an effective forestry information system. All DF participants recognised that such an information system would not be able to develop and flourish without management (i.e., policy) commitment and support at both national and institutional levels. Managers are the resource allocators, but also the policy and decision makers, who "make the powerful linkage between the availability of information and its use, and its impact on their own decision making" (Stone 1993). In order to obtain the necessary management support, library and information managers must be able to convince managers of the value of information and information systems in contributing to the national objectives. In the words of Menou (1991):

> Whatever importance high level decision makers may attach to special information activities, particularly libraries and information services, their main concern is increasingly with the efficiency of organizations and their ability to fulfil their mandate, which is basically to channel the resources geared toward socio-economic development ... A financial benefit is the only rationale decision makers under severe economic pressure could regard seriously.

Discussion Forum participants resolved to use the upcoming APAFRI /FORSPA meeting in March 1997 as an opportunity to demonstrate to national forestry managers instances where information and/or information technology have contributed to national development. Regional representatives from the DF group, India, Vietnam and China (and possibly Forest Research Institute in Malaysia (FRIM)) will collect case studies and information on existing information policies/ strategies which have contributed to socio-economic development. CABI will assist the regional representatives by providing literature search facilities while CIFOR will play a co-ordinating role. The large presence of international agencies in this process seemed appropriate to all members of the Discussion Forum. Agha and Akhtar (1992) refer to the role of aid agencies in national policy development "as catalysts to lend weight to a process that may or may not fail depending on local vigour".

Similarly, the need to improve the ability of ISU units and staff to meet user demands pro-actively and to establish a core of well-trained ISU staff (and users) through an integrated programme of training was also seen as an appropriate topic for discussion at the upcoming APAFRI/FORSPA meeting. If managers could be convinced of the value of information in contributing to national and institutional goals, they would also be sensitised to the training needs of information staff and users in developing effective information systems. DF participants stressed the importance of including all categories of people (i.e., information managers and other ISU staff, producers, editors, users) when considering training needs.

Finally, the importance of establishing a communication network to improve the effectiveness of forestry information services in the Asia-Pacific region, was also recognised by the group. Many members of the DF already had e-mail and internet access. Those who did not were asked to determine the associated cost (e.g., telephone line, modem, service provider) of establishing such a service and report back to CIFOR. CIFOR will investigate possibilities to provide support for e-mail connections, facilitate communication amongst the group and others sharing similar concerns. As a further enhancement, IUFRO would assist in establishing home pages for those institutions possessing the appropriate technology.

As part of the commitment to the future development of forestry networking in the region, all participants at the Discussion Forum agreed to the immediate establishment of a network with themselves as core members. For the time being, this would be an informal network but formal recognition of the network, with name and charter, would be developed at the APAFRI/FORSPA meeting in March 1997. Table 3 presents the actions agreed upon by the group.

KEYNOTE PAPERS

Three keynote papers were presented during the course of the Discussion Forum and added an interesting dimension to the theme of forestry information systems in the region. Francis Ng's paper, "The Future for Scientific Publishing and Information in the Asia-Pacific Region", presents a historical perspective on the development of scientific education, research and publishing in the region and offers suggestions and hope for the future (Appendix 3). He points to the growing dominance of English as the international language of science and the impact this trend has played in developing scientific capacity in the region. In an effort to develop beyond their previous vocational roles, universities in the region, such as the newly established Hong Kong University of Science and Technology, are beginning to play a contributory role to global scientific knowledge. At the same time, developments in information technology offer opportunities for cheaper, more efficient information storage and retrieval, as is evident in CIFOR's own recently produced *Manual of Forest Fruits, Seeds and Seedlings.* In order to use these new tools and the associated technology effectively, CD-ROM producers and information managers such as librarians need to stop considering CD-ROMs as elite products. Declining costs mean these products can be mass-marketed and distributed conveniently to the intended users. The growing availability of desktop publishing and the internet is enabling scientific communities to regain power from commercial publishing houses where copyright concerns have made access to scientific knowledge increasingly restrictive and expensive. AGRIS and its associated CD-ROMs offer an exciting opportunity for non-commercial developers to mass-market agricultural, forestry and fisheries information internationally to scientific users rather than pricing them exclusively for libraries and information centres.

Heinrich Schmutzenhofer of IUFRO spoke on "Information Services at IUFRO and the Latin America Network Experience" (a summary is available at Appendix 4). His presentation discussed the extensive networking experience of IUFRO and its historical development since its founding in 1892. The internet has greatly facilitated the communication role of IUFRO and its home page now provides easy, hypertext access to detailed information about IUFRO, its programmes, divisions and working units, as well as the appropriate contact persons. Where appropriate, a search engine offers keyword and Boolean access. Particularly useful is the opportunity to access, electronically, the extensive publishing output of the organisation. This technology has been instrumental in developing a well-functioning network in the Latin American and Caribbean region to the point requests to IUFRO concerning this network have recently grown

Table 3. Final Action Plans for High-Priority Needs

Goals/Objectives	Action Plans	Responsibility, Time Frame, Costs
To demonstrate the value of information in contributing to country's development	Gather case studies where information has contributed to positive economic outcomes Gather information on existing information policies and strategies Present 1/2 day seminar at APAFRI/FORSPA meeting in Mar '97 on value of information	Regional representatives from India, Vietnam and China, and possibly FRIM CABI to provide literature search facilities and assistance CIFOR to play co-ordinating role To be completed in time for APAFRI/FORSPA meeting Feb '97 Costs - donor support and in-kind contributions, as necessary
To improve the ability of ISU units and staff to meet user demands pro-actively To establish a core of well-trained ISU staff (and users) through an integrated programme of training	Include training concerns as part of agenda at APAFRI/FORSPA meeting to convince higher level policy makers of the importance of improving ISU skill levels	Same as above
To improve effectiveness of forestry information services by providing access to e-mail, Internet; establishing a list server	Countries without e-mail to determine cost of telephone line, modem and service; report back to CIFOR E-mail accounts to be established for organisational level unless cost is appropriate for establishing additional accounts (e.g., ISU units) CIFOR/donor agency and organisation to sign agreement covering funding to setup and maintain connection for 3-year time period Members of DF core group to begin communicating/networking via e-mail IUFRO to assist in establishing home pages for members where appropriate technology exists	FORSPA to be co-ordinator for overall network CIFOR to co-ordinate e-mail accounts; IUFRO to provide home page technical support DF attendees to form core members of network Time - immediately Costs - dependent on infrastructure costs

significantly. The World-Wide Web (WWW) offers a tremendous opportunity for all members of the forestry community and it is not difficult for the appropriate links and home pages to be established for interested organisations already possessing the technology.

CABI's Ken Becker discussed "Sources of Forestry Information" (a summary appears as Appendix 5). He points to the crucial relationship between quality of research and the information that supports that research, and stresses the importance of having access to and knowledge of existing resources. The traditional categories of knowledge are mentioned, including primary publications, of which journals form the most important component, secondary publications such as indexes and abstracts (e.g., AGRIS, AGRICOLA and CAB ABSTRACTS) and tertiary publications, e.g., a subset of abstracts which may include value-added information such as review articles from appropriate subject experts. The presentation provided an excellent, annotated overview of various on-line and CD-ROM databases and the technology that supports them. Internet features and useful WWW forestry and related sites were also reviewed, including electronic publications. Particularly important are emerging knowledge-management systems, such as the proposed Electronic Forestry Compendium, which use subject expertise to manage information in a user-friendly fashion. The continuing developments evident in all aspects of information technology pose interesting challenges to forestry information providers, intermediaries and users, as all shareholders strive to effectively assimilate and use the technology and the information it contains.

The presentations were followed by a demonstration of a prototype of CABI's Electronic Forestry Compendium, a PC-based knowledge management system designed to provide silvicultural information on individual tree species. An 18-month project starting in 1997 will focus on developing a CD-ROM covering 650 tropical and sub-tropical species important for forestry and agroforestry in the Asia-Pacific region. Compendium features include species reviews (with input provided by experts), illustrations, maps, glossary, a multi-lingual glossary, a taxonomic database, bibliographies and abstracts, plus an iterative guide to choice of species for particular sites and uses. The project, formulated after an extensive user needs survey, is to be undertaken by CABI in collaboration with CIFOR and numerous other institutions, and with funding from several donor agencies. The Compendium will be of particular use to developing countries where access to information continues to be a major constraint. The Asia-Pacific module represents an initial step towards the overall goal of a global Electronic Forestry Compendium.

CONCLUSIONS

In summary, the Discussion Forum on Forestry Information Services in the Asia-Pacific exceeded expectations. The spirit of co-operation evident throughout the forum and the development of three specific and realistic action plans assured participants of the value of networking. The groundwork for a mutually beneficial forestry network in the region has now been laid and participants can use the momentum to further efforts in this direction. Thompson (1993) of IDRC appropriately sums up the collective responsibility required to create a sustainable information system or network:

> [Information specialists] need to work in concert with all prospective users in designing the system; to convince users that the responsibility for designing the system is equally theirs, thereby ensuring that information issues are entrenched in the national research system and forms an integral part of the country's research agenda.

The Discussion Forum, with its diverse mix of information users, providers, managers, policy makers and donors, offers the appropriate combination of skill, knowledge and power to achieve just that.

REFERENCES

Agha, S.S. and S. Akhtar. 1992. The responsibility and the response: sustaining information systems in developing countries. *Journal of Information Science* 18: 283-292.

The Economist. 1996. The World Economy: The Hitchhikers Guide to Cybernomics September 28.

Broadbent, K.P. 1996. Challenges for development in the Asia-Pacific region: the information sector, South Korea and the Philippines. *Journal of Information Science* 18: 193-202.

Kashyap, A. 1995. Briefing Paper for the Discussion Forum on Information Needs in National Forestry Research Institutions.

Menou, M.J. 1991. National information policy in less developed countries: An educational perspective. *International Library Review* 23: 49-64.

Mwinyimbegu, R.W. 1993. Obstacles to information technology transfer to the third world. *Library Review* 42(5): 28-37.

UNCED. 1992. *Report of the United Nations Conference on Environment and Development, AGENDA 21* Documents, The Forest Principles, p. 441.

Stone, M.B. 1993. Assessment indicators and impact of information on development. *Canadian Journal of Information and Library Science* 18(4): 50-64.

Thompson, P.A. 1993. Building sustainability into agricultural information projects in small developing countries. *IAALD Quarterly Bulletin* 38, (2/3): 75-77.

Weng, Chan Fook and J. Sabaratnam. 1996. Library development in Singapore: Country Report. *Libraries in National Development: Papers and Proceedings of the Tenth Congress of Southeast Asian Librarians, Kuala Lumpur, 21 - 25 May 1996* Volume 3, pp. 71-82.

Zhang Qiaoqiao, Miao Zhuoran and Tai Weidong. 1996. Upgrading agricultural information Services in China: the impact of CD-ROM. *Information Development* 12(2): 75-90.

APPENDIX 1

SURVEY QUESTIONNAIRE

Part A - Organisation and Management

1. Name (please underline family name): _____

   Position: _____

2. How many professional staff are employed in your institution?

3. What percentage of your institution's budget is allocated for information related activities?
   a) _____ % ❑ b) no fixed amount ❑ c) do not know ❑

4. In your organisational structure, the library/information services unit (ISU) is located:
   a) under the administration division ❑
   b) under a specific research programme/division ❑
   c) as an independent unit at the same level as research divisions ❑
   d) other (please specify): _____

5. Do you have trained librarians/documentalists/information professionals in your institution?
   a) yes ❑; how many: _____ b) no ❑
   If no, do you have future plans to train staff in these services: _____

6. Given limited budget, how would you prioritise the following (on a scale of 1 to 5; 1 indicates maximum and 5 minimum priority)?

	Priority
a) Upgrading library and documentation centre	_____
b) Purchasing computers/printers for scientists	_____
c) Purchasing laboratory equipment	_____
d) Increasing travel budgets for professional staff	_____
e) Improving office quality	_____

7. In your institution, are literature reviews or problem analyses required in study plans or research proposal?
   a) no ❑ b) yes ❑

8. What do you consider to be the main impediments to completing high quality literature reviews or problem analyses?
   a) Lack of search capabalities ❑ d) Lack of writing skills ❑
   b) Lack of synthesising skills/experience ❑ e) Insufficient time ❑
   c) Language difficulties ❑ f) Other (please specify): _____

9. Is your agency able to compete for international research funds? a) no ❑ b) yes ❑

10. To what do you attribute your success (or failure)?
    a) Lack of contacts ❑ e) Lack of proposal writing skills ❑
    b) Poor research infrastructure ❑ f) Language difficulties ❑
    c) Lack of prior high quality output ❑ g) Lack of guidelines or proposal format ❑
    d) Lack of literature search facilities ❑

11. How do the salaries of personnel in the following categories compare in your institution (on scale 1-4; 1 maximum)?

	Rank
a) Professors/Senior professional staff	____
b) Senior Librarians	____
c) Senior Administrators	____
d) Senior Support Staff	____

12. Are you familiar with CD-ROM technology and other advances in information technology?

a) Yes, I keep abreast with the latest technology ❑
b) No, I would like to but do not have enough time ❑
c) I leave it to my information staff to keep me informed ❑
d) I cannot because we do not have the necessary literature ❑
e) Other reasons (please specify): _____

13. How do researchers/managers in your institution share the research results?

a) Weekly seminars ❑ e) Published reports ❑
b) Monthly seminars ❑ f) Publish in refereed journals ❑
c) Informal discussion ❑ g) On need basis only ❑
d) Informal papers/working papers/newsletter ❑ h) Others (please specify) _____

What are the major constraints? _____

14. In your opinion do researchers/managers in your institution have access to relevant published literature?

a) No scientist has complained, so I presume we do ❑
b) I am sure we have access to the required literature ❑
c) I am sure we do not have access to the needed literature ❑
d) We do not, but we can get it, if required ❑

15. Is lack of adequate information perceived to be a constraint in improving the quality and quantity of research output from the institution?

a) Yes, certainly ❑ b) Partly ❑ c) No ❑ d) I am not sure ❑

16. What are your greatest constraints in improving the research output of the institution (multiple answers are possible)?

a) Lack of financial resources ❑ c) Lack of equipment ❑
b) Lack of trained staff ❑ d) Lack of political support ❑
e) Others (please specify) _____

17. Does your institution have an existing research information management system?

a) We do not have a research information management system ❑
b) Yes, it is a part of the overall management information system ❑
c) It exists on paper, but it is not operational ❑
d) We are planning to set up a system ❑
e) We are managing very well and I do not think there is a need for such a system ❑

18. What, in your opinion, is the foremost reason for researchers/managers not using the existing and available information in your institution (multiple answers are possible)?

a) Not applicable, the researchers are using all available information in their work ❑
b) Lack of suitable incentives ❑
c) Lack of training to use information ❑
d) Lack of motivation ❑
e) Any other (please specify) _____

19. The available information at your institutions is used for (multiple answers possible):

a) Writing research papers ❑
b) Writing subject review papers ❑
c) Preparing teaching materials ❑
d) Writing project proposals ❑
e) Creating in-house databases ❑

20. Which is your preferred format for receiving research related information (multiple answers are possible)?

a) Computer diskettes ❑ b) CD-ROM ❑ c) Transmission over the Internet ❑ d) Printed ❑

21. In the above formats, do you find (multiple answers possible):

a) Databases containing only comprehensive abstracts of published literature to be very helpful and time saving ❑
b) Products under a) are helpful but we have problems in obtaining original documents ❑
c) I would prefer to have full text ❑
d) Either full text or abstracts are fine for use by researchers ❑
e) Cost would be the determining factor ❑

Part B - Information Services

1. Name (please underline family name): _____
   Position: _____

2. Do you have a professional education in library science or related information services?
   a) no ❑ b) yes ❑, in _____ with _____ years experience

3. How many people are employed in your library/Information Services Unit (ISU)? _____

4. Which facilities are available in your ISU (multiple answers possible)?
   a) Personal Computer ❑ d) Photocopier ❑ g) Full access to Internet ❑
   b) Local Area Network ❑ e) E-mail ❑
   c) CD-ROM drive ❑ f) Access to external on-line services ❑

5. What is the estimated number of books/monographs in your library?
   a) < 500 ❑ c) 3,001 - 5,000 ❑ e) 10,001 - 15,000 ❑
   b) 500 - 3,000 ❑ d) 5,001 - 10,000 ❑ f) > 15,000 ❑

6. To how many journals (excluding newsletters) does your library currently subscribe?
   a) < 5 ❑ c) 11 - 20 ❑ e) 31 - 40 ❑ g) >50 ❑
   b) 5 - 10 ❑ d) 21 - 30 ❑ f) 41 - 50 ❑
   Does this include any eletronically published journals? no ❑ yes ❑, how many? _____

7. Do you subscribe to abstracting and indexing services (e.g. AGRIS, Current Contents)?
   a) no ❑ b) yes ❑, to _____

8. Do you maintain statistics about the number of visitors or loans in your library?
   a) no ❑ b) yes ❑ (please specify type and results): _____
   _____

9. Who decides the purchase of new books/journals for use in the institution (multiple answers possible)?
   a) Director General and Director of Research ❑ d) Library committee ❑
   b) Requests from Researchers/Scientists/Managers ❑ e) No fixed criterion ❑
   c) Librarian suggests purchases ❑ f) Other (please specify):_____

10. Do you provide a document delivery/photocopy service for documents available in your library?
    no ❑ yes ❑ if yes, do you charge for it? no ❑ yes ❑

11. Do you subscribe to an external document delivery service (e.g. British Library)?
    no ❑ yes ❑ please specify: _____

12. Do you have arrangements for inter-library loans ? no ❑ yes ❑, please specify policies and procedures :
    _____
    _____

13. Are you member of a network of partner organisations in the area of information services (e.g. CARIS, AGRIS, IILP, etc.)? no ❑ yes ❑, please specify : _____
    _____

14. Are there existing or planned networks you would like to subscribe to? no ❑ yes ❑, please specify
    _____
    _____

15. Would you be interested in getting actively involved in new networks? no ❑ yes ❑, please specify details of your interest: _____
    _____

16. Does your organisation have regular publications?
    a) no ❑ b) yes ❑, please specify (titles, formats, etc.): _____
    _____

17. Do you have access to external databases? no ❑ yes ❑, please specify:_____
    _____

18. Please describe databases developed and maintained in the ISU.

Name	Approx. No. of records	Language	Updating Period (months) <1	1-6	6-12	>12	Available in electronic format
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	

19. Please describe databases maintained in other research programmes in your institute:

Name	Approx. No. of records	Language	Updating Period (months) <1	1-6	6-12	>12	Available in electronic format
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	
			❑	❑	❑	❑	

20. What database management/library management software do you use, if any?

_____

21. Please list five strengths of your institution as related to information access, information processing and information dissemination:

a) _____ d) _____

b) _____ e) _____

c) _____

22. Please list five constraints in achieving your objectives in the above areas.

a) _____ d) _____

b) _____ e) _____

c) _____

23. Would you be interested in a discussion forum on information services?

a) no ❑ b) yes ❑, please specify (multiple answers possible):

Type:

a) conference ❑
b) workshop/seminar ❑
c) informal meeting(s) ❑
d) electronic discussion group ❑

Geographic focus:

a) national ❑
b) regional ❑
c) global ❑

Involvement:

a) present a paper ❑
b) participate in forum organisation ❑
c) attend forum ❑
d) be an active member ❑

Costs for participation:

a) participate at own cost ❑
b) can meet part of the cost ❑
c) depend fully on external funding ❑

APPENDIX 2

FORESTRY INFORMATION SERVICES IN THE ASIA-PACIFIC REGION

Analysis and interpretation of a questionnaire survey conducted in preparation for a Discussion Forum on Information Services in the Asia-Pacific

Jim Coles[1] and Michael Ibach[2]

INTRODUCTION

The rapid development of information technology brings tremendous changes at organisational levels as well as national levels. Studies predict the impact of information technology to be similar to the industrial revolution which turned agrarian economies into industrial economies at the turn of the last century (Nolan and Croson 1995). Already, more than half of total GDP in industrialised economies is knowledge-based, including sectors such as telecommunications, computers, software, education and research (The Economist 1996).

As economies expand rapidly, the Asia-Pacific region is facing a period of increasing environmental pressure. With growing populations and the drive towards development, there is more competition in land-use, the oceans appear to be less able to support a viable fishing industry and the atmosphere and waterways are becoming increasingly polluted. The Asia-Pacific needs a cadre of well-trained and well-informed scientists and managers to assist with the development of solutions to problems and with the formation of policies and strategies for protection and sustainable use in such areas as agriculture, the environment, fisheries and forestry. Access to current scientific information is necessary if scientists and managers are to be well informed and respond to the needs of their countries.

In the forestry sector, information is growing at a rapid pace. Under the International Union of Forestry Research Organizations (IUFRO), more than 700 member organisations in a network of over 15,000 scientists generate probably more information than is ever accessed by the majority of scientists working in this area (Kashyap 1995). In his paper, Kashyap refers to 581 institutions in 104 countries that were engaged in forestry and forest products in 1986. In 1995, FAO has registered 764 forestry research organisations in 112 countries (FAO 1995), with over 9,000 forestry graduated scientists in Asian countries alone. But scientific strength appears to be very unbalanced. Ten years ago, five institutions out of a total of 23 accounted for 50% of the total research capacity (Kashyap 1995). This information "explosion" shows no signs of abating. Indeed, the ability to access and utilise information has become intrinsically linked with a country's economic development (Broadbent 1992). The unfortunate reality in Asia and the Pacific is that most forestry and forestry research organisations and their staff neither have access to nor do they utilise the vast amount of information necessary in the decision-making process.

Many forestry projects in the Asia-Pacific region have a mandate to improve information exchange among scientists and managers. Information exchange encompasses a wide range of services including electronic information networks; writing, printing and distributing a variety of scientific and technical publications; and maintenance of a living library with a well-organised, pertinent collection of books and journals, literature search capabilities and document supply services, all functioning in an increasingly electronic environment under the leadership of well-trained and committed staff.

[1] ASEAN Forest Tree Seed Centre Project, Thailand
[2] Center for International Forestry Research, Indonesia

Information exchange is a common mandate of the ASEAN Forest Tree Seed Centre Project (AFTSC), the ASEAN Institute of Forest Management (AIFM) and the Center for International Forestry Research (CIFOR). Collectively these agencies have perceived that the quality of the information services available in the Asia-Pacific region is variable and often weak. As such, an attempt is being made to identify the problems, prioritise them, find solutions and co-ordinate efforts to overcome the manageable problems. The initiative is in three parts: (1) the distribution of a questionnaire and the analysis of the returns which will identify current issues; (2) a discussion forum involving information specialists which should prioritise problems, recommend solutions and develop an action plan; and (3) a co-ordinating role to implement action plans in co-operation with other agencies such as the Asia-Pacific Association of Forestry Research Institutes (APAFRI), Forestry Research Support Programme for Asia and the Pacific (FORSPA), CAB International, International Union of Forestry Research Organizations (IUFRO) and the Food and Agriculture Organisation of the United Nations (FAO).

The questionnaire (see Appendix 1) was sent to 24 national forestry research institutes, government forest research departments, forestry faculties of universities and projects in the Asia-Pacific. The questionnaire addressed two main functional areas: (1) organisation and management of the agency as a whole, completed by the Director or senior management; and (2) the information services unit within the agency, completed by information specialists. In the following, the results of the questionnaire survey from eighteen responding organisations are presented and some emerging issues are highlighted.

ORGANISATIONAL ENVIRONMENT OF FORESTRY INFORMATION SERVICES

The Information Services Unit in the organisational context

The Information Services Units (ISUs) in more than half the agencies were independent functional units reporting directly to the administration division. In five agencies, the ISUs were part of the research division. The agencies varied greatly in size from a small professional staff of 15 to a very large staff of 500. Most had between 50 and 150 professionals. In 11 of the agencies, the ISUs had just 1 or 2 trained librarians or information professionals, while three ISUs had 3 or 4. The ratio of professional librarians/information specialists to professional staff varied from 1:10 to over 1:100 with an average of 1:42. Virtually all agencies indicated that the lack of financial resources was the chief constraint to improving the quality and quantity of research. Others suggested that lack of well-trained staff and equipment and political support were also cause for concern.

Nine of the agencies allocated no fixed percentage of total agency budget to information services. Four agencies allocated 1 or 2% and three agencies between 10 and 30%. Given additional funds, ten of the agencies said their first priority would be to upgrade the library and documentation facilities. This strong desire to improve information services, however, somewhat contradicts the survey findings which show the consistently low level of support in budgetary terms which libraries receive in most of the institutions. The Discussion Forum might focus on the reasons why libraries receive so little funding and explore possible solutions.

ISSUE No. 1: Inadequate funding of Information Services Unit

The salaries of senior librarians and information specialists were well below those of both senior professional staff and administrators and just above those of senior support staff. The salaries do not reflect the fact that most librarians must have a Masters level education to acquire the necessary technical and managerial skills to perform in their job. In a region where salary is often seen as a measure of a person's worth and importance, this lack of financial recognition clearly indicates the minimal regard and importance attached to those who work in information services. This low level of recognition for information professionals was further amplified by the fact that the information section of the questionnaire was completed, in five cases, by an agency Director or senior administrator. This was in spite of the fact that all five agencies indicated professional information staff were available.

ISSUE No. 2: Lack of recognition for information professionals

Research information management systems

The management of research information among scientists and managers within agencies and to external user groups is extremely important to ensure continued support for research, effective research and application of research results. Seven of the agencies reported they had no information management system while six others reported they were planning one or had one that was not operational. Virtually all of the agencies said the means of keeping research staff informed was through distribution of results in informal publications, reports, newslet-

ters and refereed journals. Ten agencies reported that informal discussions were also a means of exchanging information.

ISSUE No. 3: Lack of research information management systems within organisations

Information access and use

In virtually all agencies questioned, literature reviews or problem analyses were required as part of all study plans or research proposals. Over half of the respondents indicated that the lack of literature search capabilities impeded the completion of high-quality literature reviews. Other respondents quoted the lack of synthesising and writing skills and language difficulties as impediments. Others reported the lack of time although it is the responsibility of every researcher to make time to keep current and write literature reviews for papers and proposals. When asked if researchers at the respective institutions had access to relevant published literature, 12 respondents replied in the affirmative while 5 others suggested they did not have access but could get the literature. This is in contrast to the replies when asked if having access to adequate information was perceived as a constraint to improving the quality and quantity of research. These replies indicate that 12 agencies thought lack of information was certainly or partly a problem. Although not clear from the questionnaire, it may be that lack of access to current literature is a problem in many research institutes in the Asia-Pacific region. Certainly, the authors' experiences at many ASEAN libraries confirm this view. It is also the authors' experiences that in hierarchically conscious bureaucracies, information is often collected and its distribution suppressed. Similarly, recent acquisitions of library equipment such as PCs and CD-ROMs have often been kept under lock and key, rather than being used as they were intended. Such actions are sometimes the result of staff inability to use the equipment, or worse, because of a wish for personal aggrandisement on the part of the individuals responsible for it (Mwinyimbegu 1993). Managers and senior staff need to be convinced that the free flow of information to all staff will contribute to the needs of the whole organisation.

ISSUE No. 4: Lack of awareness of and access to current, world-wide literature

Often, even though access to current literature is available, researchers/managers do not utilise the resource. More than half the respondents identified the lack of training in the use of information as the principal reason for this weakness. Others cited lack of incentives and motivation. This corroborates an earlier reply that suggested lack of synthesising and writing skills were an impediment to good research.

ISSUE No. 5: Lack of training in literature synthesising and scientific writing

The Information Services Unit

Resources

Human

All information professionals who completed the information services portion of the questionnaire had a professional library education and many years of experience. The Directors who completed the section did not have information training but indicated that their librarians were trained in library science. The information professionals replied that on average, more than three support staff were employed for each trained librarian. Thus, availability of support staff does not appear to be a problem. Many of these support staff no doubt have considerable experience and enthusiasm and, with training, could become competent para-professional information staff. There appears to be a need to develop necessary skills and permanent professional education in order to keep up-to-date with the developments in the information technology sector.

ISSUE No. 6: Lack of training for support staff in information services

Physical

All but one of the 17 libraries responding had personal computers and CD-ROM drives. Only 3 did not have photocopiers. Less than half had local area networks and access to e-mail, online services or the Internet. There is obviously a great deal of variation in the equipment available in the libraries in the Asia-Pacific region. If these ISUs are to be brought together with others in the area in an information exchange network, some minimum level of equipment will be required.

ISSUE No. 7: Considerable variation between libraries in equipment levels

There are some major forestry libraries in the region. Seven of the libraries reported having over 15,000 books or monographs and receiving over 50 journals. Similarly, there are a number of mid-sized forestry libraries having roughly 5,000 books or monographs (7) and receiving approximately 20 to 30 journals (8). Very few libraries received an electronically published journal. Twelve of the 17 libraries subscribed to abstracting/indexing services, with CAB ABSTRACTS, Current Contents and TREE-CD being the most popular. However, the questionnaire does not fully address the quality of the collection with regard to its currency and accessibility, and these aspects should be explored at the Discussion Forum. Similarly, the availability of abstracting services on CD-ROM and diskette (e.g., TREE-CD, AGRIS or Current Contents) was noted for several of the libraries but the various responses referring to the availability of or access to relevant literature and inter-library loan services question the value of these resources if there is no timely and affordable document back-up.

ISSUE No. 8: Limited exchange of available forestry information within the region

Use of information services

Virtually all libraries record number of visitors and number of loans. However, few indicated whether they felt the library was well used or under-utilised. Those who did reply stated that the predominant users were staff and, in the case of universities, students. The libraries are used for a wide variety of endeavours – research and review papers, proposals, teaching material and, to a lesser extent, in-house database collation. No one use predominates. Most users preferred to receive the information on diskette, CD-ROM or in printed form but few were set-up to receive electronic transfer through the Internet. There seemed to be a slight preference for receiving information as an abstract although most replied that either abstract or full-text form was acceptable. Most respondents stated that cost was the determining factor. Six of the respondents suggested that they had difficulty getting the full text original document after reading the abstract. This comment confirms the problem identified above – i.e., limited exchange of forestry information which is available in the region.

Management of the Information Services Unit

The decision to purchase new books or journals seems to be a two-step process. In most libraries a combination of scientists, managers and librarians recommended appropriate purchases with the final decision being made by the Director in 8 institutions and by a library committee in 7 institutions. All institutions with photocopiers (14) provided a photocopying and document delivery service to their staff and to other libraries. Ten of the libraries which provided this service charged an amount sufficient to cover costs. In many cases, this charge applied to only those requests from outside the agency. Twelve of the ISUs questioned did not subscribe to an external document delivery service. Ten, however, said they had arrangements for inter-library loans. Most of these inter-library loan arrangements were with other libraries in the same institution or with nearby institutions. Seven ISUs stated they had no arrangement for inter-library loans and two librarians said is was desperately needed. The lack of viable forestry networks was repeatedly emphasised. Roughly half the respondents indicated they were not part of any network while seven responded that they belong to networks, with CARIS, AGRIS and IILP being the most common. Twelve said they would like to subscribe to existing or planned networks, with Internet and any forestry network being the most common mentioned. All 17 respondents indicated they would actively participate in any new networks with ten agencies stating the dire need for a forestry information network. Also mentioned was the need for an information service management network. One respondent suggested that any new network should be electronically operated. The replies to the questions on inter-library loans and on networks point to a major shortcoming in forestry information services in the Asia-Pacific region – the lack of exchange of existing information. There is obviously a great need for a network of forestry libraries, perhaps connected electronically, who would share their resources and capabilities. The opportunities for co-operation are endless – table of contents exchanges, literature search services, inter-library loans, professional and support staff training and exchanges, and consultancies.

ISSUE No. 9: Lack of formalised networks of forestry libraries in the region

There is a tremendous amount of forestry information published by the respondents. All but one of the ISUs produces regular publications. Most produce newsletters with various foci and technical papers, the national agencies produce national journals of forestry or forest science and most produce internal reports.

All the ISUs reported they had database software to manage their library although one ISU said they had the software but not the computer to run it. By far the most common software was CDS/ISIS; others mentioned were PRO-CITE and IMAGE (a New Zealand program) along with a range of database packages. Ten of the ISUs said they had no access to external databases while the other seven had access to a few, mostly local databases. One ISU reported they subscribed to DIALOG which provided access to over 500 external databases. Virtually all

agencies reported that they developed and maintained databases with their ISU for their internal consumption. These databases covered a wide range of topics from books, theses, periodicals, resources, researchers, completed research projects, on-going forestry projects, to more specific topics like growth and yield plots, and biodiversity plots. A few ISUs reported they had access to other databases within the same institution. Most of these databases were peripheral to forestry such as maps and environmental management databases.

Unfortunately the questionnaire did not cover the dissemination of the locally produced newsletters, technical publications and journals to other agencies in the region or the access of the internal forestry information databases to other agencies. From the authors' experiences, distribution and access of internally produced information (grey literature) appears to be variable and generally limited.

ISSUE No. 10: Limited distribution of published forestry information and databases

CONCLUSION

From the responses to questionnaire it is clear that the Information Services Units in the Asia-Pacific region are variable with respect to their facilities, resources and management. Of the eighteen agencies responding, there were four who considered that they had sufficient professional and support staff, well stocked libraries in terms of books, periodicals and databases, adequate computer hardware and software, and good access to networks of other libraries for loans. Only two ISUs considered themselves well funded however. The constraints to achieving the objective of providing good information services, as listed by the other ISUs were long and varied. Twelve of the ISUs listed inadequate funding; six reported a lack of trained professional and support staff; six listed lack of computer hardware and software; four specified inadequate and poor quality space; three listed language problems; two reported lack of time for new initiatives, lack of networking opportunities, lack of training opportunities for support staff and one stated there were no young people on staff.

The issues below, which were identified by the respondents to the questionnaire, cover many of the above constraints.

ISSUE No. 1:	Inadequate funding of information services unit
ISSUE No. 2:	Lack of recognition for information professionals
ISSUE No. 3:	Lack of research information management systems within organisations
ISSUE No. 4:	Lack of awareness of and access to current, world-wide literature
ISSUE No. 5:	Lack of training in literature synthesising and scientific writing
ISSUE No. 6:	Lack of training for support staff in information services
ISSUE No. 7:	Considerable variation between libraries in equipment levels
ISSUE No. 8:	Limited exchange of available forestry information within the region
ISSUE No. 9:	Lack of formalised networks of forestry libraries in the region
ISSUE No. 10:	Limited distribution of published forestry information and databases

All respondents indicated a willingness to actively participate in a discussion forum as it is considered to provide support to reaffirm the above identified issues, prioritise them, seek solutions to tractable problems, and devise action plans to ameliorate those problems.

REFERENCES:

Broadbent, K.P. 1992. Challenges for development in the Asia-Pacific region: the information sector, South Korea and the Philippines. *Journal of Information Science* 18: 193-202.

The Economist. 1996. The World Economy: The Hitchhikers Guide to Cybernomics; September 28.

FAO. 1995. *Directory of Forestry Research Organizations 1995*. Food and Agriculture Organization of the United Nations, Rome.

Kashyap, A. 1995. Briefing Paper for the Discussion Forum on Information Needs in National Forestry Research Institutions.

Mwinyimbegu, R.W. 1993. Obstacles to information technology transfer to the Third World. *Library Review* 42(5): 28-37.

Nolan, R.L. and D.C. Croson. 1995. *Creative Destruction: A Six-Stage Process for Transforming the Organization*. Harvard Business School Press, Boston.

APPENDIX 3

THE FUTURE FOR SCIENTIFIC PUBLISHING AND INFORMATION IN THE ASIA-PACIFIC REGION

Francis S.P. Ng
Center for International Forestry Research, Bogor, Indonesia

Summary

The growing acceptance of English as the language for scientific communication throughout the region is enabling national scientific communities to emerge from ghetto-science. At the same time, research universities are beginning to emerge from the obsolete paradigm of vocational universities. Simultaneously, the electronic revolution is overturning traditional concepts of publishing, archiving and database management. Desk-top publishing technology has drastically reduced the expense and labour of publishing on paper, while Internet publishing offers a powerful alternative. Both these developments enable scientific communities to take back publishing power from the commercial publishing houses. Cost and copyright barriers will hopefully come down. The nature of scholarship is changing as computer-readable archives replace paper archives. Libraries, and database services like AGRIS, need to re-focus their activities in order to remain useful to the scientific community.

SCIENTIFIC SCHOLARSHIP AND THE LANGUAGES OF SCIENCE

The most important characteristic of science is that it is universal and unified. There is no such thing as American molecular biology separate from Russian molecular biology, nor Chinese physics separate from Japanese physics. All scientists share and contribute to the same universal pool of scientific knowledge, at least in principle. In practice, this pool is divided by language into various sub-pools, with the practical consequence that access to the scientific literature is determined by language.

Before World War II, every colonial power promoted its own language as a language of science. German and French were strong contenders against English, but after the war, German lost its position due to the emigration of many German scientists to the US. This gave English a clear lead, and this lead has grown steadily, because of the obvious advantages of having a single language for scientific communication. It is estimated that about 80% of the world's scientific literature is now published in English. As a result scientists who do not use English are locked out of the bulk of the world's scientific literature.

In the Asia-Pacific region after the war, nationalistic sentiments have played an important role in the development of science and technology. All governments have recognised the value of science and technology in the building up of national economic assets (knowledge, products, processes, skills) but, at the same time, nationalist sentiments in countries like Japan, China, Indonesia and Malaysia have made it politically difficult for scientists to address the problem of scientific communication in an objective way. The desire of such countries to make their languages "scientific languages" in the old European pre-war style, has held back the development of science by hindering the development of scientific scholarship. Scientists who have been locked into small language ghettos have been unable to acquire the confidence that comes from familiarity with the larger pool of knowledge outside, and have been unable to place their own contributions into the larger pool, to benefit from international review, and to earn international recognition. In China, the political decision to promote Russian as the second language of scientists, rather than English, proved to be a blunder which slowed down the development of Chinese science for 30 years. It has taken the Asian countries some 50 years to learn that ghetto science is detrimental to national development, and that scientists serve their own communities better if they act as bridges to the world of science at large.

The decision by ASEAN to use English as its regional working language, has been a decisive factor in the growing acceptance of English as the language for communication in commerce and science throughout the Asia-Pacific region. The economic and technological advantages of using a common language have become so evident that this trend is unlikely to be reversed. The way has thus been cleared for the Asian scientific communities to put the emotive language issue behind them and to concentrate on the development of scientific capacity.

The alternative, if each country pursues a nationalist language policy in science, would be the division of the world's scientific literature into one major pool: English, and several minor pools: Russian, Japanese, Chinese, German and French, according to the numbers of scientists belonging to each linguistic group (Table 1).

The resolution of the language issue has already enabled Asian countries to play an increasing role in international scientific communication. The trend has become evident in the rise in scientific papers tracked by the Science Citation Index. Between 1989 and 1994, Taiwan, Singapore and Hong Kong have more than doubled their annual output, while China has increased its annual output by about 50% (Nature, 1996). Other countries that have begun to make their mark are South Korea, Thailand and Malaysia. These countries have been increasing their publication rate faster than the average for all countries in the world.

Table 1. Scientists and engineers engaged in research and development

Country	Number	Source
USA	2,500,000	Time Magazine, 24 Jan 1994
Former USSR	1,004,000	UNESCO, 1992
Japan	637,000	UNESCO, 1992
Mainland China	500,000	Rubinstein, 1995
Germany	293,000	UNESCO, 1992
UK	203,000	*
India	119,000	UNESCO, 1992
France	115,000	UNESCO, 1992
Canada	61,000	UNESCO, 1992
Australia	39,000	UNESCO, 1992

** The US National Science Foundation 1991 estimates the number of UK scientists and engineers in government and industrial R&D at 101,400. I have doubled the number to include the universities.*

SCIENTIFIC SCHOLARSHIP AND THE ROLE OF UNIVERSITIES

Scientific scholarship is heavily dependent on the way in which scientists are trained at universities. With few exceptions, the developing countries of the Asia-Pacific region only began to build universities after independence. Most universities in the region are less than 50 years old, and nearly all were founded on the idea that universities should concentrate on vocational training. Research has played a very minor role. Laboratory and library facilities have been poorly developed, and staff have had little or no incentive to do research. Efforts to track down published sources for reference have been futile because of the poor state of libraries. Consequently, the habit of scientific scholarship, which involves the ability to survey, evaluate and summarise the scientific literature could not be promoted. Students interested in research have found it preferable to take their research degrees overseas.

Scientific scholarship is a habit that has to be instilled. CIFOR found this when it distributed pre-paid vouchers to 17 forestry institutes and universities in developing countries (Argentina, Brazil, China, Chile, Colombia, India, Indonesia, Peru, Senegal, Sri Lanka, Tanzania, Uganda and Venezuela), to enable them to order copies of papers from CAB International. The receiving organisations had previously been supplied with the TREE-CD database which contains Forestry Abstracts, Forest Products Abstracts and Agroforestry Abstracts (Soeripto, 1996). No organisation was able to use up its 50 vouchers in one year. We found that the demand does not exist even when the means are made available, because the habit has not yet been instilled.

UNESCO statistics (1993) show that the numbers of students from developing countries studying in the developed countries rose from 518,195 in 1980 to 666,445 in 1990. The favourite destinations were the USA, France, Germany, UK, the former USSR, Canada, Belgium, Australia and Japan. The financial consequences of this movement of students have been immense. Foreign students in the USA alone spend $7 billion a year on tuition and living expenses, and provide vital support for many graduate programmes in science and engineering (Koretz, 1995).

In contrast, the universities in developing countries that have concentrated on their vocational roles, have become stunted in their scientific development. When I was Chief of the Forest Research, Training and Education Branch in the FAO in 1991 - 1994, I was puzzled by requests from forestry faculties and colleges in developing

countries for FAO assistance to upgrade their teaching curricula. Why were they not able to upgrade their curricula themselves? It turned out that these faculties and colleges had been set up under developmental aid programmes implemented by the FAO in the 1960s to 1980s. Their teaching staffs had been trained to teach forestry as a fixed package of knowledge. By the 1990s, this package had become obsolete. Retraining was not the solution, for the staff would only have become obsolete again. The only way they could have kept themselves up to date was to do research, and to train post-graduate students through research.

Developing countries are beginning to discover the hard way that an undergraduate programme cannot be sustained without a postgraduate programme. The post-colonial vocational university model only resulted in pseudo-universities, not real ones. Kelly (1990), commenting on his experience in a university in Nigeria, says that the students knew their mentors only as teachers of science and not as creators of science. Science was something that was created elsewhere. In a survey of scientists in developing countries, Gaillard (1991) has noted, "All too many university professors in developing countries have lost contact with ongoing science and merely chant scientific facts of the past instead of teaching students that science is an active method used to state and solve problems".

During a visit to Iran, I found that the first postgraduate programmes were only implemented in the early 1990s. This large country of 50 million people needed to train hundreds of PhDs, but post-graduate students had always been sent abroad for training. It was only the desperate state of the national economy in the 1990s that forced the government to think about local training for PhD candidates, but it was an idea that the academic staff were themselves unhappy with. They felt they were not ready for it.

Through the delay in establishing their postgraduate programmes, the ability of developing-country universities to keep their undergraduate courses up-to-date was undermined, but something else was undermined too: the early emergence of a culture of science in their countries. Thirty years after the establishment of universities, the local academic communities should have already produced respected professors, whose students should be having an influential effect on society. Instead, most universities have been anaemic and scientists, including those trained expensively abroad, have been tempted to emigrate.

Interestingly, at the end of its colonial period, Hong Kong has set up the Hong Kong University of Science and Technology (HKUST), with post-graduate training and research on top of its agenda. As one of Asia's most ambitious educational projects, HKUST aims to be a first-rank science academy, with a faculty recruited from prestigious research organisations around the world (Lindorff and Engardio, 1992). Reform has also been spreading through other university systems, in Singapore and Malaysia, while India has passed a bill in parliament to allow for the establishment of private universities, in recognition of the fact that the government-established universities was producing graduates "poorly equipped for high-tech occupations" (Bagla 1995). In 1996, thirteen universities in Asia (Japan, China, Korea, Taiwan and Hong Kong) formed the Association of East Asian Research Universities to promote academic co-operation between them (Normile 1996). This is a clear sign that universities in Asia are beginning to see themselves as part of a larger scientific and academic community, with the leading ones taking action to lift themselves above the pack by emphasising research.

THE EFFECT OF THE ELECTRONIC REVOLUTION ON SCHOLARSHIP

For centuries, paper has served as the universal medium for publishing and archiving. About 30 years ago, the beginning of the so-called information explosion forced a distinction to be made between publishing and archiving. As the numbers of books, journals and magazines kept increasing, libraries were forced to specialise and to cull their collections continuously, because of lack of physical space. Libraries also began to convert their paper collections to microfiches for archiving. For a while, it looked as if microfiche films would replace paper as the universal medium for archiving. However, microfiches were clumsy to handle. Also, as the amount of published information increased, information searches became more and more difficult, and it was more difficult to search through microfiches than to search through paper. Hence microfiches never became popular.

Now, computer-readable storage in compact disks (CDs) provides a powerful medium for the archiving of published information, not only because of the immense volume of information that a CD can hold, but also because of the rapid way in which its contents can be searched and analysed. The nearly 30 volumes of the Encyclopaedia Brittanica, now available in a single CD, provides an excellent example how much information a CD can hold, while the Index Kewensis CD demonstrates clearly the power of computer search. The paper version of the Index, containing all the published names of plants, was a pain to use, because the information was scattered over so many volumes. With the CD version, information search and retrieval is so much more efficient that the printed versions became obsolete as soon as the CD became available. Recently, we in CIFOR put my two-volume 3.8 kg *Manual of Forest Fruits, Seeds and Seedlings* into one CD containing over 1000 illustrations. In the beginning we had some doubts over whether all the pictures, including hundreds in full colour, would fit into the CD. In the end, we had room to spare on the CD. Future CD-ROMs will have many times the storage capacity of current ones, and capacity will continue to grow.

As more publications are digitised and archived in computer-readable format, the nature of scholarship, which used to mean the ability to search manually through books and papers for information, will change. Much of the tedium of scholarship will be reduced by computer-assisted search mechanisms, freeing researchers for more creative activities. As an example of what is already happening, there was a PhD student who, in 1987, finished four years of labour searching the Greek classics for the classical sources of 2000 anonymous fragments of mediaeval text. Then, just as she began to write her doctoral dissertation, all that effort was eclipsed. In a few dozen hours working with the new *Thesaurus Linguae Grecae* on CD, she found every one of her 600 hard-won sources again, and 300 more that she had missed! (The Economist, 1994).

Whole libraries can now be scanned into the digital domain, which will allow their contents to be analysed exhaustively. It has been estimated that the entire Library of Congress can be stored in a roomful of CDs. The massive job of conversion from paper copy to computer-readable copy would have to be done first, but the cost of doing this is coming down as scanning technology improves and document-formatting software becomes easier to use. One can set up a CD production unit (scanners, character-recognition software, document-formatting software, and CD writer) for a few thousand dollars. Replicating a disc is cheap. If mass-replicated, the cost comes down to about $4 a disc. At the same time, home computers with CD readers have become standard items already, thanks to children's computer games which now come in CD format. To computer-literate children, getting information and entertainment by slipping a CD into a computer is the easiest thing to do.

This opens the possibility for private individuals to have an entire Library of Congress installed in their own homes if they wish, or to have tailor-made but very comprehensive selections. Music-lovers have been able, for years already, to put together their own selections, by copying from tape to tape. In principle, this can be done with CDs. Service providers can scan documents into diskettes and customers can then have the information reformatted any way they like, and eventually transferred to a CD for permanent storage.

How are libraries and CD producers adapting to the electronic revolution? Inadequately, I think. CD producers are still marketing their products as if they are high-tech expensive products for the exclusive few. Consequently libraries are treating CDs in the same way. The way of the future is to treat CDs like paperback books. This is because

- CD technology is not expensive to acquire.
- Scientists do not have large blocks of time to spend in libraries.
- Information products that are not designed for customer convenience will lose customers.

Libraries should stock multiple copies of each CD edition, so that users can borrow CDs to use wherever they wish – at home, in the office, or on a laptop during travels. The most-used CDs should find a permanent place in home libraries. Technically, a library with a collection of digitised works, could produce tailor-made combinations of such works according to the needs of individual readers. For forestry, I think making the 40 most-used books and 20 most-used journals available in computer-readable form, will meet the reference needs of most foresters.

INTELLECTUAL PROPERTY AS A BARRIER TO SCIENTIFIC SCHOLARSHIP

A big and relatively new barrier to the development of a world-wide community of scientists sharing information resources is intellectual property rights. The main interest of scientists in journal publication is to have their papers distributed as freely as possible. The practice of giving out free reprints of one's published papers, at one's own expense, was a well-established scientific courtesy until photocopiers became easily available. The invention of photocopy machines was a boon to the spread of scientific information. Then in the 1970s and 1980s more and more scientific journals in the west turned commercial, and their publishers began to lobby for laws making it a crime to make unauthorised photocopies.

Copyright statements like this:

> "The contents of this journal may be reproduced provided that the authors and journal are acknowledged"

began to be replaced by statements like this:

> "The publication you are reading is protected by copyright law. This means that the publisher can take you or your employer to court and claim heavy legal damages if you make unauthorised photocopies from these pages."

What the publishers are doing goes against the traditions of science, whereas a scientist who makes copies of journal articles for personal or class room use or to share with other scientists, is keeping well within the traditions of science.

The surrender of copyright to the commercial publishing houses in the developed countries was due to the withdrawal of scientific organisations from publishing, as a cost-cutting measure. This forced scientists to submit to the demands of the publishing houses in order to get published. We now have the situation in the publication of scientific research, that intellectual property has passed out the hands of the scientists who do the intellectual work, and out of the hands of their employers, into the hands of their publishers. One can understand the need of the publishing houses to make a profit, but the way it is done should be fair to all. Otherwise, scientists are forced to look for other alternatives in publishing.

During the past five years, the labour involved in type-setting and formatting has been drastically reduced by the development of desktop publishing software. It is now possible for the scientific community to regain control of the publication of scientific journals, at relatively low cost.

At the same time, Internet publishing provides a powerful alternative. It is interesting to see how scientists who have lost control of paper publishing, have taken to Internet publishing, using their creative energies to present information in attractive and competitive formats on well-designed Internet pages. Designing paper pages using advanced desktop publishing software is not more difficult than designing Internet pages. The advantage of publishing on the Internet is that it saves the cost of using and mailing paper. However, an Internet page is more ephemeral than a printed page, although for the purpose of archiving information, information designed for Internet pages, just like information on printed pages, can be easily transferred to CDs.

ABSTRACTING SERVICES: AGRIS

The service provided by AGRIS to the international scientific community, in agriculture, forestry and fisheries, was an excellent idea, at a time when the information explosion was just starting. However, with the explosive growth of published information, the system may be on the verge of breaking down. Having begun with resources provided by international donors, AGRIS has not faced up squarely to the problem of how to sustain itself without donor funding. It has also not recognised the need to capture the imagination and support of the scientific community, nor that of editors and publishers. In the field of forestry, most forestry research institutions and their editors do not feel any affinity to AGRIS. I also doubt if publishing houses have any affinity for AGRIS. This is a major weakness of the system.

We need to think about incentives for participation. Editors, publishers and authors need to be convinced that being in AGRIS would elevate their status. To get onto the Science Citation Index, a journal has to pay $10,000, and over 3000 journals pay to get on (Gibbs 1995) because they see obvious benefits in getting cited in the SCI. Why is there little interest in being cited in AGRIS?

The AGRIS database on CD ROM represents the climax of a big international co-operative effort. It could be a great promotional product. Every researcher in agriculture, forestry and fisheries should be made aware of it and be encouraged to own a personal set. However, at over $1000 for the initial set of 6 disks, the AGRIS CDs are unmarketable to individuals. AGRIS needs to reconsider the market for its products. The idea of libraries as the market for archival CDs may prove to be a fatal mistake, because instead of going to a library, more and more scientists expect the library to come to them through their personal computers.

ACKNOWLEDGEMENTS

I am grateful to Mikael Hirsch, Jerry Vanclay and Neil Byron for reviewing the manuscript.

REFERENCES

Bagla, P. 1995. India proposes private universities. *Science* 270 (3 November): 730.
Gaillard, J. 1991. *Scientists in the Third World*. University Press of Kentucky.
Gibbs, W.W. 1995. Lost science in the Third World. *Scientific American*, August issue: 76 - 83.
Kelly, M. 1990. Creating the right atmosphere. *New Scientist* (7 April): 17-18
Koretz, G. 1995. Colleges are looking abroad. *Business Week* (27 November): 14.
Lindorff, D. and P. Engardio. 1992. Is 'The MIT of Asia' growing in Hong Kong? *Business Week* (30 November): 77.
Nature. 1996. Chinese scientists drawn back to Asia. 5 September (383): 11.
Normile, D. 1996. 13 universities seek common ground. *Science* 273 (20 September): 1661-1662.
The Economist. 1994. The lays of ancient ROM. August 27. 65 - 66.
UNESCO. 1992. *Statistics on science and technology*.
UNESCO, 1993. *Foreign students in higher education*. STE-11.
Rubinstein, E. 1995. Editorial: Winds of Change. *Science* 270 (17 November): 1099
Soeripto, Y. 1996. TREE-CD database and literature requests. *CIFOR News* No. 12: 2.

APPENDIX 4

INFORMATION SERVICES AT IUFRO[1]

Heinrich Schmutzenhofer
IUFRO Secretariat, Vienna, Austria

IUFRO: INTRODUCTION AND BACKGROUND

The International Union of Forest Research Organizations (IUFRO) was founded in 1892; its main objective at that time was to establish guidelines and standards for comparability in research for research establishments first in Europe and then in the temperate climate zone of the northern hemisphere. IUFRO was a forum of directors of research institutes. One of the first IUFRO recommendations was the BHD (diameter at breast height) 1.3 m. In 1903, guidelines for thinnings and incremental fellings were introduced.

In its second phase, 1929 to 1948, IUFRO started to extend into the tropics (Dehra Dun) and the southern hemisphere. The universities took a more dynamic part in the activities. Classification and terminology projects became imperative.

In the third phase starting 1948, the main emphasis of the Union shifted from the member organisation to the individual researcher. The establishment of personal contacts between the researchers of the different institutions and different countries became more important and the exchange of experiences and results were important goals. IUFRO's structure still functions on a voluntary basis.

The IUFRO structure in its present form was introduced in 1971 and amended in 1990 and 1995. Its objectives are now to promote international co-operation in forestry. There are 270 specialised Working Units in 8 technical divisions. These divisions are:

1. Silviculture
2. Physiology and Genetics
3. Forest operations and Techniques
4. Inventory, Growth, Yield, Quantitative and Management Sciences
5. Forest Products
6. Social, Economic, Information and Policy Sciences
7. Forest Health
8. Forest Environment

IUFRO's fourth phase started in the nineties when nearly all major forest research institutions world-wide were already members and electronic communication enabled a new form of networking. IUFRO on the Internet acts as an information resource and as a network.

IUFRO'S INFORMATION SERVICES

IUFRO began as a network of and for forest scientists based in forest research establishments. For that purpose a structure network was established, containing IUFRO Working Parties, Subject and Project Groups, now called uniformly, working units. Together with the Executive Board and the Secretariat special publications are edited and conferences organised. Results are mostly published in proceedings, representing a valuable source of grey literature. The following publications are available:

- *IUFRO News*: published quarterly, sent to members and officeholders, providing information in the fields of actual research activities, publications and proceedings published, calendar of meetings, directories of

[1] This paper has been compiled from the overhead presentation by Heinrich Schmutzenhofer at the Discussion Forum.

officers. Since the late eighties, a Spanish version is published three times a year, first started in Mexico and then continued in Spain.

- *Annual Reports*: published in the four IUFRO languages, referring to the scientific work of the working units and providing news from the nine IUFRO regions.
- *Congress Proceedings*: full paper versions of invited papers are published and distributed to member organisations. They are distributed to conference participants and on request to others interested.
- *IUFRO World Series*: 5 Volumes since 1990, for sale.
- *IUFRO Occasional Papers*: five publications since 1994, distributed free on request.
  Apart from the publications, IUFRO structure-based mailing lists, newsletters and circulars are issued and contribute greatly to communication among forest scientists participating in IUFRO.
- *IUFRO World Congresses*: currently at five-yearly intervals. These Congresses are the most important platform for forest scientists to present their research results and meet to discuss research work. Attendance has increased from 2000 to 3000 in the course of the last three IUFRO World Congresses at Ljubljana (former Yugoslavia), Montreal (Canada) and Tampere (Finland).
- *INTERNET*: IUFRO provides freely accessible information via Internet about its structure, office holders, calendar of meetings and conferences, special publications, like the ones mentioned above, Special Programme for Developing Countries (SPDC); the terminology project, and electronic networking have been started recently.

IUFRO homepage on Internet (http://IUFRO.BOKU.ac.at)

The IUFRO Homepage provides an overview of the Organization and the Network, with details of all services, including the IUFRO FTP service, meetings, conferences, publications and SPDC. Other forestry-related websites can be accessed from the IUFRO homepage.

SylvaVoc terminology project

Sylvavoc is an acronym from *sylva = forest* and *voc = vocabulary.* The project emphasises the importance of the correct usage of technical terms in forestry and is IUFRO's clearing house for multi-lingual forest terminology. It can be accessed through IUFRO's homepage. Sylvavoc has created enormous interest, 84 requests or more than half a percent of all requests were observed in the first month of presentation.

Special Programme for Developing Countries (SPDC)

SPDC was established in 1983 to strengthen the capacity for forestry research in developing and economically disadvantaged countries. It works to link forestry research institutes with donor agencies. Activities include training, information services, scientist assistance, organisation of meetings and workshops, inter-institute collaboration and international co-operation.

IUFRO Development Fund

The IUFRO Development Fund, set up in 1993, provides a vehicle for direct financial assistance to researchers in forestry and related disciplines from developing and disadvantaged countries, in order to upgrade the level of scientific research in these countries. In addition to travel grants, future objectives include supporting international meetings in target countries, promoting the active participation of scientists in national, regional and global research networks, and supporting target-country researchers to pursue post-graduate study.

Task Forces of IUFRO

The aim of the Task Forces is to strengthen IUFRO activities in specific areas and contribute to on-going international processes and activities. Task Forces are currently operating in the areas of environmental change, forests in mountain development, international relations, international resources, and sustainable forest management.

THE LATIN AMERICA NETWORK

The Latin America and Caribbean Information Systems Network supports forestry research in Latin America and the Caribbean by collecting and supplying documents and information. Access is available via the homepage of Division 6 and provides information on the network, activities and events, publications and references, newsletters and other information resources. The network was one of the major fields of interest for searches on the Internet homepages; the requests in the last observation period of less than one month totalled 135, which is nearly one percent of all requests of the entire IUFRO offering.

APPENDIX 5

SOURCES OF FORESTRY INFORMATION[1]

Ken Becker and Stephen Rudgard
CAB International, Wallingford, United Kingdom

INTRODUCTION

Well-organised, comprehensive and up-to-date information is essential for creating a knowledge base suitable for planning and implementing effective forestry research programmes. The purpose of this paper is to briefly discuss the role of scientific information in the management of forestry research and then to document established and newer sources and services that are available for use by researchers.

"Information" (which can also be termed "objects of knowledge") is contained in numerous forms and various structures, ranging from persons to practical skills and values, written text, etc. In the field of tropical forestry, the 700 or so member institutions of the International Union of Forestry Research Organizations (IUFRO), located in 110 countries and with a network of over 15,000 scientists, collectively generate a vast amount of information. This body of information, recorded in a wide range of publications in many different languages, is being supplemented daily. It is essential that forestry research institutions in developing countries are aware of what is available and have the resources that will allow access to information facilities.

In 1986, FAO listed 581 institutions in 104 countries engaged in forestry and forest products research. The number has grown since then. There are at least 77 organisations and 1500 scientists involved in forestry research in Asia. However, scientific strength is concentrated in only a few institutions. In a 1986 survey, five institutions out of a total of 23 accounted for 50% of the total research capacity. The state of forestry research in the Asia-Pacific region in general, and also when compared with agriculture, is poor in terms of funding, leadership, skilled staff, salaries, training and scientific facilities. These factors have produced a poor research environment and, in conjunction with the lack of information resources, they severely constrain innovation and progress by forestry research institutions in the region.

In order to encourage innovation and overall progress, it is imperative that developing countries invest in forestry research. The knowledge generated must be shared between the scientific and technological communities, policy makers and the general public. Improved communication and co-operation between researchers and decision makers will facilitate greater use of scientific and technical information and knowledge in policy formulation and programme implementation, helping to achieve the objective of more sustainable management of forests.

ESTABLISHED SOURCES OF FORESTRY INFORMATION

It is essential for forestry research institutions to have ready access either to what is already known or to the information resources necessary to find out what is known in all fields related to forestry. In the absence of such access, resources may be wasted by duplicating research, opportunities to learn from other's experiences may be lost, and decisions may be taken without studying their proper environmental and social consequences. The established sources of forestry information are discussed under three categories below.

Forestry literature (Primary publications)

Forestry literature in the form of primary publications represents an important medium for the transfer of knowledge and is available in many formats, including serials (journals and bulletins), books, reports, conference proceed-

[1] Based in part on a manuscript prepared for FORSPA by Arun Kashyap and Timothy Green (CAB INTERNATIONAL), with assistance from Andrew Speedy (Oxford Forestry Institute).

ings, monographs, dissertations[2], standards, patents, maps, laws and non-conventional (or grey) literature. There are some major forestry libraries in developing countries, but the state of collections in most is discouraging. The main reason lies in the limited financial resources of these institutions, thus ruling out the possibility of maintaining large numbers and ranges of primary documents independently.

The Core Literature in Agricultural Sciences Project initiated by the Mann Library, Cornell University, USA, to identify the core agricultural literature for both the developed and developing worlds will be of considerable assistance in managing several areas of library and literature collection.[3] The resulting studies will provide evaluation tools and title compilations for agricultural literature[4] for the developing world as a portion of the entire study. The final product will be the storage, page by page, of the core literature on compact discs.

Secondary publications

Compilations of abstracts from multiple sources constitute secondary publications. The abstracts assist users in their search for information in a cost- and time-efficient manner, by helping researchers to decide immediately whether to read the paper itself or whether there is enough information in the abstract to meet their needs. It is difficult to identify one particular database as the best source of forestry information, as they tend to complement each other.

The three most valuable sources of secondary information for forestry researchers are: (1) AGRICOLA, the indexing database of the US National Agricultural Library; (2) AGRIS, the bibliographic database of the Food and Agriculture Organization of the United Nations (FAO); and (3) CAB ABSTRACTS, the bibliographic database compiled by CAB INTERNATIONAL. Besides the regular printed versions, databases may be available on floppy disks, on-line and on CD-ROM. The databases which constitute the major sources of secondary information in forestry are listed later in this paper.

Tertiary publications

At this level we are dealing with reviews of the state of knowledge on specific subjects, often created with input from subject experts. The content of tertiary publications can consist of sub-sets and/or selections of abstracts, with review articles and other features. At the tertiary publications level we are moving from information provision towards knowledge management, a process discussed later.

THE ROLE OF ESTABLISHED COMPUTER-BASED SYSTEMS

Two computer-based modes of information transfer which have become established in the past 10 to 20 years are online availability of databases and CD-ROM technology.

Online

Online searching is the process of directly interrogating computer systems to resolve particular requests for information (Hartley *et al*. 1990). Online document retrieval allows remote access and searching of document reference collections via computer terminals connected to telecommunication lines. The search is usually conducted by means of a keyboard and screen, which communicate through a computer system and a modem to access files of data, possibly at a remote location.

The search process is dynamic and interactive, allowing the searcher to refine the original request and continue the process until the best possible results are obtained. Online access is more cost- and time-effective than the print medium. Access may be through a host and by subscription or through the World Wide Web.

---

[2] Forestry dissertations have a greater influence in developing countries' research literature. It has also been observed that forestry dissertations in these countries relate more to the biological sciences than to economics, engineering or forest management and policy (McDonald 1996).

[3] For further information, please contact W.C. Olsen., Core Literature Project, Albert R Mann Library, Cornell University, Ithaca, New York 14853-4301, USA. Fax: (607) 255-0318.

[4] The areas of the agricultural sciences designated for concentrated study include: *Agricultural Economics and Rural Sociology*, *Agricultural Engineering, Animal Science and Diseases, Soil Science, Food Science and Human Nutrition, Plant Protection and Improvement, and Forestry and Silviculture*.

CD-ROM

Online access to remote databases by means of computers and modems is dependent on the existence of an adequate and reliable telecommunications infrastructure. In many developing countries such a network scarcely exists. In cases where it does, the high cost of acquiring online information can make the process prohibitively expensive. Charges vary according to online host, size of file, "heavy use" discount, changes in royalty, etc.

CD-ROM (Compact Disc-Read Only Memory) technology overcomes these constraints and provides a cost-effective way of accessing data irrespective of the size or duration of the searches, using only a personal computer, a CD-ROM player and a printer. CD-ROM technology has been revolutionary mainly because of its exceptional storage capacity. CD-ROM technology enables entire collections of books to be put on a single CD-ROM – approximately 240,000 A4 pages of text (or 1500 floppy disks), or 7500 pictures in digitised format, or about 74 minutes of sound alone, can be put on a CD-ROM 120 mm in diameter and 1 mm thick.

Data access and retrieval using CD-ROM is much faster than referring to printed indexes. As a result, many of the databases that are important for forestry researchers are also available in CD-ROM format.

BIBLIOGRAPHIC AND RESEARCH DATABASES RELEVANT TO FORESTRY

Bibliographic databases

The three main bibliographic databases relevant to forestry are:

- AGRICOLA, produced by US Department of Agriculture National Agricultural Library.
  Available as: printed - *Bibliography of Agriculture*
  CD-ROM - AGRICOLA on Silver Platter
  Online - AGRICOLA
- AGRIS (International Information System for the Agricultural Sciences and Technology), produced by FAO AGRIS Processing Unit
  Available as: printed - *AGRINDEX*
  CD-ROM - AGRIS
  Magnetic Tape - AGRIS; on lease from FAO
  Online - AGRIS
- CAB Abstracts, produced by CAB INTERNATIONAL (CABI)
  Available as: printed - *Forestry Abstracts*, *Forest Products Abstracts*, *Agroforestry Abstracts*
  CD-ROM - CABCD; TREE-CD is a specialised CD-ROM on international forestry literature.
  Magnetic Tape - CAB; On lease from CABI
  Online - CAB ABSTRACTS

Other bibliographic databases with forestry coverage

- CAB ACCESS (CAB INTERNATIONAL) – floppy disks and Internet access through subscription
- Biological Abstracts (Biological Abstracts, Inc. [BIOSIS]) – printed, CD-ROM, magnetic tape, online.
- Biological Abstracts/RRM (Reports, Reviews, Meetings) (BIOSIS) – printed, CD-ROM, online
- BIOSIS Previews (BIOSIS) – online, magnetic tape
- University of Minnesota Forestry Library Databases (University of Minnesota Forestry Library) – printed, online (Internet),
- SCISEARCH[5] (Institute for Scientific Information) – printed, CD-ROM, magnetic tape, online
- Current Contents Search (Institute for Scientific Information) – printed, magnetic tape, online
- TROPAG (The Royal Tropical Institute [KIT]) – printed, CD-ROM, online

[5] An earlier study had found that of the four principal databases (AGRICOLA, BIOSIS, CAB ABSTRACTS and SciSEARCH) that are available, AGRICOLA usually was the first choice because of it being the least expensive of the four. However, CAB ABSTRACTS is often chosen because abstracts are available. SciSearch is often the last database to be searched in a multi-database database search and BIOSIS searches are usually the most relevant in ecologically oriented requests (Brooks 1980).

- ELFIS (Ernährungs, Land- und Forstwirtschaftliches Information System) (Centre for Agriculture and Documentation - Zentralstelle für Agrardokumentation und Information [ZADI]) – online. In German
- FOREST Information Retrieval System (Forest Products Research Society) – printed, online
- PAPERCHEM (Institute of Paper Science and Technology) – printed, online
- PAPERTECH (Papiertechnische Stiftung [PTS]) – online. German with titles in original language
- GEOBASE (Elsevier/Geo Abstracts) - printed, online
- PHYTOMED (Biologische Bundesanstalt für Land- und Forstwirtschaft [BBA]) – printed, online.
- System for Information on Grey Literature in Europe (SIGLE) (European Association for Grey Literature Exploitation [EAGLE]) – printed, CD-ROM, online
- Compact International Agricultural Research Library (CIARL) (Consultative Group on International Agricultural Research) – CD-ROM
- Biological & Agricultural Index (H.W. Wilson Company) – printed, CD-ROM, magnetic tape, online
- UnCover – online (Internet)
- VELLEDA (Ecole Nationale du Génie Rural) – online
- CARIS (FAO) - database of projects compiled by national centres

Research databases

Major databases documenting current research activities in forestry are:

- IDRIS (Inter-Agency Development Research Information System) (IDRC, Canada) – printed, diskette/magnetic tapes, online
- Agrar Forschungsvorhaben (Zentralstelle für Agrardokumentation und Information [ZADI]) – printed, online. In German
- AGRISEARCH (Canadian Agricultural Research Council [CARC]) – CD-ROM
- CRIS (Current Research Information System) (US Department of Agriculture, Cooperative State Research Service [CSRS]) – CD-ROM, online
- AGREP (Permanent Inventory of Agricultural Research Projects in the European Community) (Commission of the European Communities [CEC]) – printed, magnetic tape, CD-ROM, online
- Longman/Microinfo World Research Database (Longman Group UK Ltd) – CD-ROM
- ETFRN Directory (see under section on "Important forestry lists and sites on the WWW")

THE INTERNET

The Internet is the world-wide network of networks connected to each other using the IP protocol suite. The Internet has revolutionised the supply side of information, creating a new online world that is becoming increasingly attractive to researchers, scientists, businesses and professionals at every level and in every discipline. In May 1969, four computers were linked to the Internet. By January 1996, the number of host computers reached 10,000,000.[6] An October 1996 estimate of the number of Internet users was 40-50 million.[7] The volume of information available on the Internet is increasing rapidly: at present, hundreds of new Internet sites appear every day. Clearly, the Internet should now be considered as providing an appropriate mechanism for communication between forestry researchers in all countries.

Connecting a computer to the Internet is similar to connecting a telephone to the phone system. All that is needed to connect to the Internet is a computer, a modem and an account with an Internet service provider. Internet connection can range from a full connection via a local area network (LAN) to limited dial up connections using

[6] from "Ask Dr Internet, Oct 96" (lis-iis).

[7] *The Economist*, October 19th 1996, p. 28.

a terminal emulation package. Burk (1995) provides a good summary of Internet basics and of how to connect to the Internet.

The World Wide Web, Telnet, File Transfer Protocol (FTP), Gopher and electronic mail (or e-mail) are some of the facets of the Internet, each with their associated specialist software that allows one computer to communicate with another computer. Any permanently connected computer can be an information site on the Internet and is recognised by a unique number (IP or Internet Protocol Number such as 129.1.67.1) or an address (e.g., vax.oxford.ac.uk). There is an international numbering and addressing system based on country codes and organisation type codes. The Uniform Resource Locator (URL) is an address that specifies the location of a file on the Internet. Personal e-mail addresses are often in the format: user name@host name.organisation.country.

A survey made in late 1995 by the Forest Products Society (Vlosky and Gazo 1996) on use of the Internet by members of the Society found that the most commonly used Internet functions were e-mail (used by 58% of respondents) and the World Wide Web (used by 46% of respondents). Many university forestry schools, forestry libraries, forestry agencies, forestry extension services, forestry companies and forestry consultancies are developing Web sites. It is clear that there has been a rapid uptake of Internet facilities, and Web sites for forestry organisations and businesses based in South-east Asia are appearing. The trend towards world-wide uptake of Internet facilities is sure to continue during the late 1990s at an accelerating rate.

The World Wide Web

The World Wide Web (WWW, W3, "the Web") is a popular application that enables users to find and view the information on the Internet. The basic concept behind the WWW is "hypertext", whereby one resource can be linked to any other information on the Web. There is no formal organisation of the WWW and anyone can set up and maintain a WWW site. One of the common criticisms of the Internet is that it is difficult to find particular information owing to the huge amount of information available and the lack of a formal organisation of this information. However, there are some effective and efficient ways of "navigating" the WWW which can make it easier to find relevant information.[8] Various resources to help users are located on the Web itself. Green and Sommer (1995) provide a useful summary of World Wide Web basics for forestry.

A "Web Browser" is software which enables the WWW user to find, read, download and print Web pages. These exist for all major operating systems, including MSDOS (DOSLYNX), Microsoft Windows (Netscape, Microsoft Internet Explorer), Mac System 7 (Netscape), 0S/2 (Web Explorer) and Unix systems. The software operates using the Internet protocol (TCP/IP) to "talk" to the remote computer. Web pages, written in HyperText Markup Language (HTML), can consist of text and graphics, and contain hypertext links which are usually operated by clicking with a mouse to jump to a new location. This may be on the same computer or at a completely different site in another country. Once a page is loaded, it may be "saved" to disk or printed. The browser software will also access Gopher and FTP sites, and Newsgroups. The following descriptions refer to the commonly used browser, Netscape for Windows.[9]

Information on the Internet can be accessed by (1) typing an address, (2) re-accessing pages using "Bookmarks", and (3) searching using "Search engines".

Direct access

To access a site directly, the address may be typed into the Location box. Addresses may vary based on the type of software used. Once the site has been accessed, further sites may be accessed by clicking on the highlighted hypertext links. Many heavily used sites have identical mirror sites located on different computers at different locations. If there is a choice of identical sites, it is usually quicker and cheaper to look at the nearest site.

Bookmarks

Once a useful site has been located, a personal or local index can be kept which allows repeated access. This is managed by use of the "Bookmarks" facility. A menu appears at the top of the screen with the commands "add bookmark" and "view" (or "go to") "bookmarks". The current URL is then added to Bookmarks. Click on the bookmark and you will go to the requested page.

---

[8] For fuller descriptions and accounts, see one of the numerous popular publications about the Internet, for example: Krol (1996).

[9] See the discussion on the current "battle" between Netscape Navigator 3.0 and Microsoft Explorer 3.0 in *.net* magazine, Issue 25, November 1996, pp. 44-62. (http://www.futurenet.co.uk)

Search engines

To locate information when the address is not known, use a "search engine". Search engines are databases located on remote computers with forms for inputting requests and output screens containing the references as hypertext links. Information providers may "submit" their addresses to the major indexes or the database systems may search the web automatically to find new information ("spider-based" search engines such as the World Wide Web Worm or WebCrawler). Netscape maintains its own search engine and some others, which can be accessed through hypertext links in Netscape.

In addition, specific geographical and subject-oriented lists are maintained at a number of sites. These provide hypertext links to a large number of sites. Several lists cover all subjects, including forestry, and are indexed. There is also the WWW Virtual Library which contains the Forestry Virtual Library which is discussed below.

Some of these engines process huge amounts of information. Rapid advances are being made in Web search facilities, which will help improve both the comprehensiveness and the specificity of information retrieved from the Internet. There are several sites acting as guides to the use of search engines or as collections of search engines.

Forestry information on the Internet[10]

[Note: Sources of information on the Internet are changing rapidly. Some mail addresses and URLs may have changed since this paper was prepared.]

Mailing lists

Electronic mailing lists are lists of groups of people sharing similar interests who exchange their views on various topics within the particular interest area using e-mail by way of a central list address. These lists are often run automatically from a list server (which serves e-mail messages to a list of addresses) and anyone wishing to subscribe to the list can do so by sending a SUBSCRIBE command to the subscription address. Any messages sent to the group list address are then automatically forwarded to all members of the list. Many lists also maintain archives of messages.

Some mailing lists of relevance to forestry are:

forest@listserve.funet.fi
fmdss-l@pnfi.forestry.ca
Sylvanet@ncsu.edu
itrdbfor@listserv.arizona.edu
ecolog-l@UMDD.umd.edu
agric-l@uga.cc.uga.edu
micronet@vm.uoguelph.ca
iopi@iopi.csu.edu.au
firenet@life.anu.edu.au
plant-taxonomy@mailbase.ac.uk
Rainforest@UMIAMI.IR.MIAMI.EDU
dendrome@s27w007.pswfs.gov

Newsgroups on Usenet

Usenet News (netnews) is a decentralised discussion system that allows the world-wide transmission of electronic messages in a standard format using an inter-connected network of computers. The messages, grouped in categories called newsgroups, contain information about the sender and the newsgroup to which it is posted in the header lines. The newsgroups may be distributed locally, regionally or internationally.

Two important newsgroups dealing directly with forestry-related subject matter are:

sci.bio.ecology Linked to mailing list ecolog-1@umdd.umd.edu; and
bionet.agroforestry Archive at: http://www.bio.net/hypermail/AGROFORESTRY/

[10] This discussion has been largely taken from J. Saarikko. Forestry Information Resources on the Internet; URL:http://www.metla.fi/~saarikko/doc/forestry-resources.html.

Many files that appear periodically in the newsgroups can be obtained by e-mail from mail-server@rtfm.mit.edu. Instructions can be obtained by transmitting a message with the subject: HELP.

Bulletin boards

Electronic bulletin board systems (BBSs) are computer services for which connection has to be made to a specific computer, normally by Telnet (a program that allows login to other computers on the Internet) or by a packet switching system. BBSs are also called "computer conferences" or "electronic notice-boards". They are usually on small computers run by local interest groups that interested parties can connect to using their computer and a modem. Although many bulletin boards are free, some of them are accessible only with a password and require a fee for their use. BBSs may also provide a personal mailbox, access to databases, bibliographies, etc. Agricultural bulletin boards may also contain information relevant to forestry researchers.

Some BBSs relevant to forestry are: FedWorld, CUFAN, UNEPNET-LAC, EcoNet, Greennet, LTERnet. BBS sites can also be located by entering the BBS name into a search engine.

Electronic publications

An increasing number of forestry-related publications are becoming available on the Web. Various forestry journals are making some of their information content available on the Web. The full text of many research and conference papers, government regulations, international guidelines (such as the International Tropical Timber Agreement), bibliographies, lists of publications, etc. is available on the Web. Documents which must be updated frequently are especially appropriate to publish electronically. Electronic publications with full online functionality (e.g., access to abstract, full text and graphics; sophisticated search facilities; comprehensive archives; automatic search profiles; and links to related information) currently comprise only a tiny fraction of the available print versions. No available titles in forestry can be cited at present.

Three forestry-related electronic Newsletters are:

CEDAR Newsletter: Access: gopher://pan.cedar.univie.ac.at

Sylvanet: Access: gopher://dewey.lib.ncsu.edu/11/library/stacks/sylvanet or by e-mail subscription from: listserv@ncsu.edu.

ERINYES Newsletter of the Environmental Resources Information Network (ERIN), Australia. Access: gopher://kaos.erin.gov.au/11/info/news

Important forestry and related sites on the WWW

Some of the important forestry sites available in October 1996 include:

WWW Virtual Library: Forestry: http://www.metla.fi/info/vlib/Forestry.html

Forest Research Institute of Malaysia (FRIM): http://frim.gov.my

Consultative Group on International Agricultural Research (CGIAR): http://www.cgiar.org

Center for International Forestry Research (CIFOR): http://www.cgiar.org/cifor/

Yahoo Index: Forestry http://www.yahoo.com/Science/Agriculture/Forestry

METLA: The Finnish Forestry Research Institute: http://www.metla.fi

International Union of Forestry Research Organisations (IUFRO): http://iufro.boku.ac.at

Oxford Forestry Institute (OFI): http://ifs.plants.ox.ac.uk/

Australian Environment Network (ERIN): http://www.kaos.gov.au

European Tropical Forestry Research Network (ETFRN): http://www.zadi.de/etfrn/

World Conservation Monitoring Centre (WCMC): http://www.wcmc.org.uk

FAO Forestry: http://www.fao.org/waicent/forestry.htm

University of Minnesota Forestry Databases: gopher://minerva.forestry.umn.edu/11/

IDRIS [now INDIX] Research Database: telnet://indix.idrc.ca or gopher://indix.idrc.ca

USDA Forest Service: http://www.fs.fed.us/

Swedish Forest Industries Association: http://www.forestindustries.se

CSIRO Tropical Forest Research Centre: http://tfrc.csiro.au/

Arboriculture On-Line: http://www.ag.uiuc.edu/~isa/

ICRAF Update: http://www.cgiar.org:80/icraf/

LEUCNET NEWS: http://ifs.plants.ox.ac.uk/ofi/leucaena.htm

New Forests Project (NFP): http://www.igc.apc.org/nfp/index.html

World Neighbors: http://www.halcyon.com/fkroger/wn.html

Ecology Action Centre Index to Environmental Resources on the Internet: www.cfn.cs.dal.ca/Environment/EAC/eac-internet-resources.html

International Center for Tropical Ecology, University of Missouri: ecology.umsl.edu/

Pactok: http://www.peg.apc.org/~pactok/#Pactok

Forestnet: http://www.forestnet.com/

CAB INTERNATIONAL: http://www.cabi.org

FROM INFORMATION TO KNOWLEDGE MANAGEMENT

As we have seen above in the discussion on the Internet, modern technology can provide easy access to huge masses of information. However, being given information is merely to become informed. Being able to assign meaning to the information received is to become knowledgeable (Tecglen 1992). Knowledge management systems provide not just access to stored information but also access to the meaning of that information. An appropriately designed knowledge management system uses expert knowledge (i.e., expertise) on a subject to guide decision making. The advantage of such a system is that it enables the expertise it has captured to be widely disseminated in a user-friendly form that answers questions in its subject area easily and rapidly. Information technology can be used to organise wide-ranging knowledge (encyclopaedia systems) and/or to apply a subset of knowledge to answer specific questions (advisory systems).

The problem of access to knowledge has been seen as particularly relevant to tropical and sub-tropical forestry in the less-developed countries. As an example, CAB INTERNATIONAL (CABI), in collaboration with the Oxford Forestry Institute, has identified a strongly expressed user need for a knowledge management system on the characteristics of tree species important for forestry in the Asia-Pacific region. In response to this need, CABI, in collaboration with CIFOR and in consultation with many other institutions involved in Asia-Pacific forestry, has formulated plans to develop an Electronic Compendium for Forestry in the Asia-Pacific Region (EFC-Asia Pacific). The Electronic Compendium concept, initially developed by CABI for crop protection, is in fact a tertiary level publication as defined earlier in this paper. The EFC-Asia Pacific will be a comprehensive resource on species characteristics relevant to the conservation, management and use of economically important forest trees of the Asia-Pacific. A key feature will be reviews, prepared by experts, of the knowledge base on each of these species, expressed in terms of the application of this knowledge to forestry practice. The EFC-Asia Pacific will contain species reviews, bibliographies, abstracts, illustrations, maps, and taxonomic and multi-lingual terminological databases, all linked by user-friendly search software. In addition to the encyclopaedia system, the EFC-Asia Pacific will also include an advisory system in the form of an interactive guide to species selection. The Compendium will be presented on CD-ROM for use on personal computers, with appropriate links to the Internet for access and updating. The eventual overall goal is development of a Global Forestry Compendium.

CONCLUSION

The discussion above about the Internet may give the impression that the everyone across the world will soon be using computer networks with access to powerful (and increasingly intelligent) search engines that will extract information from tens of millions of sites on the World Wide Web in seconds. The pace of change is indeed exciting, rapid and accelerating in the North, and has certainly not left the South untouched, as the Web sites for certain South-east Asian forestry institutions and businesses show. It has been stated that, at the present rate of increase, the number of people connected to the Internet will equal the current (that is, 1996) world population by the year 2002 (Rashbass 1996). However, in order to give a more rounded perspective on the current global situation it may be useful to quote from the Pactok home page cited above, as follows: “Contrary to the impression engendered by media myth-makers, the Infobahn still effectively begins and ends on the campuses of first world universities and in the offices of a few technologically adventurous corporations and individuals. Beyond these domains of privilege the superhighway quickly becomes a chaotic pattern of secondary roads dwindling to bush track status in most parts of a world where six out of seven people don’t have access to a telephone.”

It is difficult, if not impossible, to predict the technological, economic and legislative changes that will influence the transfer of forestry information (and knowledge) over the next few years. Some indications of current trends have been discussed above. However, developments are occurring so rapidly that certain topics mentioned in this paper are rapidly becoming of historical interest only. This applies, for example, to File Transfer Protocol (FTP), which is "vanishing into the mists of Internet time" because downloading files using the latest versions of Netscape Navigator is so easy (Lojkine 1996).

At present, as far as forestry is concerned, the Internet is mainly of use to provide information on people and institutions – access to hard data and full text documents is very limited. Although many research scientists and information technologists may be impatient with the slow move towards a "critical mass" of full text information on the Internet, an entire large sector of the world economy, the publishing industry, requires income from its products in order to survive. Difficult questions regarding how to pay for high-quality information on the Internet, and major difficulties in the area of copyright law, will need to be solved before "virtual libraries" on the Internet begin to reflect the contents of "real" libraries. Also, advances in telecommunications systems are needed to improve the speed of data transfer through cyberspace.

In spite of these constraints, some publishers, as mentioned above, are moving ahead boldly towards comprehensive availability of full-text products on the Internet. As the quantity of forestry information grows in both hard-copy and electronic formats and, hopefully, as ready access to the forestry knowledge base improves, interesting times lie ahead for forestry information providers, intermediaries and users.

REFERENCES

Brines, R. 1996. Net publishing. *In* J. Rashbass (ed.), *Trends Guide to the Internet*. UK, Elsevier. pp. 12-13. (URL: http://www.elsevier.com/locate/trendsguide)

Brooks, K. 1980. A comparison of the coverage of agricultural and forestry literature on AGRICOLA, BIOSIS, CAB ABSTRACTS and SciSearch. *Database* March, p. 44.

Burk, T.E. 1995. Forestry on the Internet: an introduction. *Journal of Forestry* 93(5): 6-7, 50-54.

Green, C.C. and D.A. Sommer. 1995. The World Wide Web: what's in it for foresters? *Journal of Forestry* 93(12): 24-29.

Hartley, J.A., E.M. Keen, J.A. Large and L.A. Tedd. 1990. *Online Searching: Principles and Practice*. Bowker-Saur, London. p. 1.

Krol, E. 1996. *The Whole Internet User's Guide and Catalogue*. Second Edition. O'Reilly and Associates, Sabastapol, California.

Lojkine, M. 1996. The ultimate head to head (Netscape vs Microsoft). *.net* Issue 25, November, pp. 47-50. (http://www.futurenet.co.uk)

McDonald, P. 1996. Characteristics of forestry and agroforestry literature. In P. McDonald and J. Lassoie (eds), *The Literature of Forestry and Agroforestry*. Cornell University Press, Ithaca. pp. 71-72.

Rashbass, J. 1996. Editorial. *In* J. Rashbass (ed.), *Trends Guide to the Internet*. Elsevier. UK. p. 3.

Tecglen, E.H. 1992. The anguish of abundance. *In* E. Poultney, J. Cruz, F. Magagnin and D. Vernet (eds), *Leonardo: the Age of Discoveries*. The Independent, London. pp. 159-160.

Vlosky, R.P. and R. Gazo. 1996. The Internet and the forest products community: the role of the Forest Products Society. *Forest Products Journal* 46(5): 19-25.

Note: Fuller information on the various databases and sites are available from the Editor, CIFOR.

APPENDIX 6

LIST OF PARTICIPANTS

Discussion Forum on Information Services in the Asia-Pacific
30 October - 1 November 1996, Bogor, Indonesia

Mr Eliseo M. Baltazar
Ecosystems Research and Development Bureau, Laguna - Philippines

Dr. Ken Becker
CAB International, Wallingford - UK

Ms Mastura Buang
Forest Research Institute Malaysia, Kuala Lumpur - Malaysia

Mr Jim Coles
ASEAN Forest Tree Seed Centre Project, Saraburi - Thailand

Dra. Endang I.S. Msc
Manggala Wanabakti Documentation and Information Center, Jakarta - Indonesia

Mr Md. Wan Fazali
ASEAN Institute of Forest Management, Kuala Lumpur - Malaysia

Dr. Pamela G. Fernandez
University of the Philippines at Los Banos, Laguna - Philippines

Prof. Ha Chu Chu
Forest Science Institute of Vietnam, Hanoi - Vietnam

Mr Michael Ibach
Center for International Forestry Research, Bogor - Indonesia

Mr Kamphay Manivong
Forestry Research Centre, Department of Forestry, Vientiane - Lao PDR

Ms Murianti
Library, Faculty of Forestry, Gadjah Mada University, Yogyakarta - Indonesia

Dr. Benny Nasendi
Forest Products and Forestry Socio-economic Research and Development Centre, FORDA, Bogor - Indonesia

Dr. Francis S.P. Ng
Center for International Forestry Research, Bogor - Indonesia

Mr Tom Niemann
ASEAN Institute of Forest Management, Kuala Lumpur - Malaysia

Mr Md. Anisur Rahman
Bangladesh Forest Research Institute, Chittagong - Bangladesh

Dr. Stephen Rudgard
CAB International, Wallingford - UK

Ms N. Sarojam
Library, Kerala Forest Research Institute, Peechi - India

Dr. Soetikno Sastroutomo
CAB International, Asia Regional Office, Kuala Lumpur - Malaysia

Ms Dina A. Satrio
Center for International Forestry Research, Bogor - Indonesia

Ms Joozee Schellenkens
Forestry Research Support Programme for Asia and the Pacific, Bangkok - Thailand

Mr. Heinrich Schmutzenhofer
International Union of Forestry Research Organizations - Secretariat, Vienna - Austria

Mr Amrish Kumar Sharma
Indian Council of Forestry Research and Education, Dehra Dun - India

Ms Becky Skidmore
ASEAN Forest Tree Seed Centre Project, Ottawa - Canada

Ms Yuni Soeripto
Center for International Forestry Research, Bogor - Indonesia

Mr Irwan Surjadi
United States Agency for International Development - REM, Jakarta - Indonesia

Ms Aree Thunkijjanunkij
Royal Forest Department, Bangkok - Thailand

Mr Nguyen Tien Dat
Documentation and Information Division, Forest Science Institute of Vietnam, Hanoi - Vietnam

Mr U Sann Lwin
Forest Research Institute, Forest Department, Pyinmana - Myanmar

Mr Suaesi Valasi
University of the South Pacific, School of Agriculture, Apia - Western Samoa

Dr. Meng Yongqing
Institute of Scientech Information, Chinese Academy of Forestry, Beijing - China

Dr. Yoo Byoung Il
Forest Research Institute, Seoul - South Korea

Dr. Ahmad Zamzam Moh.
CAB International, Asia Regional Office, Kuala Lumpur - Malaysia

AGRIS/CARIS IN THE 21ST CENTURY

REPORT ON THE ASIA-PACIFIC REGIONAL CONSULTATION

4 - 6 NOVEMBER 1996
BOGOR, INDONESIA

EXECUTIVE SUMMARY

The Integrated Information System for the Agricultural Sciences and Technology (AGRIS) and the Current Agricultural Research Information System (CARIS) are part of the FAO's larger network providing an extensive, world-wide database of information on research in agriculture and related issues. Both AGRIS and CARIS were first introduced in the mid-1970s and are international co-operative systems in which participating counties input references on the research conducted and literature produced within their boundaries. The systems are managed and maintained by the AGRIS/CARIS Co-ordinating Group, Library and Documentation Systems Division, FAO, Rome. Forestry is just one of the categories used for entry, but forestry-related literature or research can be found in a number of categories ranging from Forestry to Engineering, Plant Sciences and Environment.

With the rapid expansion of knowledge and the technology associated with accessing and using this knowledge, it is time to reassess the effectiveness and coverage of such projects as AGRIS and CARIS. Have these tools been effective in making information more widely available to researchers and decision makers? How can participating countries be assisted to become more pro-active in their association with AGRIS/CARIS in this information age? Many countries in the Asia-Pacific region neither are able to access or use the products of the information databases because of lack of funding, training or opportunity.

To address the issue of AGRIS/CARIS in the 21st century, an Asia-Pacific Regional Consultation was convened in Bogor, Indonesia, from 4-6 November 1996. This meeting was held in conjunction with the Discussion Forum on Forestry Information Services in the Asia-Pacific. The objectives of the meeting were to:

- enhance co-operative activities and to develop new approaches to improve the coverage of forestry literature in AGRIS and for forestry research information in CARIS among the countries in the Asia-Pacific region; and
- review new developments in information technology and their impacts on information providers and users.

The consultation was supported by FAO, FORSPA and CIFOR and brought together representatives from a number of national institutions of the region as well as from FAO, FORSPA, IUFRO, CSIRO, CIFOR and CABI. Participants brought with them a range of expectations with emphasis on hopes to expand their knowledge of AGRIS/CARIS; to exchange ideas and experiences with other users and identify problems and sources of improvement; and to specify actions which might improve participation, coverage and access. The role of new technologies was a key discussion topic.

Speakers from the international organisations presented information on their respective facilities to enhance and expand the opportunities for effective access and utilisation of material available. Each emphasised the need to recognise forestry as separate from agriculture and a key subject area in itself. Country representatives outlined the position of AGRIS/CARIS databases nationally and in their own institutions. They identified a number of areas where assistance is needed to facilitate their participation in the systems. In most centres, the key issues are funding, manpower training and access to modern equipment and software.

At the conclusion of the presentations, three working groups deliberated on whether their expectations for the meeting were fulfilled, issues regarding the role of forestry in AGRIS and broader issues concerning AGRIS/CARIS, and possible solutions to the problems raised. The working groups noted the declining participation in AGRIS and CARIS and identified reasons such as lack of commitment to the role of AGRIS/CARIS, unclear responsibility and coverage, and incapability of input systems. The profile of forestry information as an important part of the databases needs to be raised .

The participants expressed some concern about:

- ownership
- operational aspects
- transparency in process
- benefits to and orientation towards end users
- user friendliness
- visibility

In particular, it was felt that special attention needs to be given to coverage of forestry information in AGRIS and CARIS.

RECOMMENDATION

The participants of the *Asia-Pacific Regional Consultation on AGRIS/CARIS in the 21st Century*, held at Bogor, Indonesia, from 4-6 November 1996, recommend that:

a detailed, independent review to be undertaken to evaluate the value of AGRIS and CARIS, and their future directions in the 21st Century.

FAO, WAICENT, AGRIS, CARIS FORESTRY INFORMATION SERVICES FOR THE 21ST CENTURY

Joseph R. Judy
WAICENT/FAOINFO Dissemination Branch,
Library and Documentation Systems Division, FAO, Rome, Italy

The intent of this presentation is to do several things in order to set the stage for our discussions over the next several days and to help in developing an agenda for future activities that would lead to improved information services, specifically in this case, for forestry. I would first like to express my deep appreciation to Francis Ng, Michael Ibach, the management and entire staff at CIFOR who worked so hard to organise and make this meeting possible. They immediately began the work to develop this programme from the moment this idea was first discussed late last year. They made all the arrangements for the facilities and contacted all the relevant institutions in the region. Thanks also to FORSPA for their contribution that helped with the travel. FAO also contributed to travel and to the costs for other arrangements as well.

I would first like to set the stage for our discussions by bringing you all up to date with the current developments at FAO concerning new information systems and services to our many audiences around the world. Secondly, I will describe some recent changes within the Library and Documentation Systems Division, in which AGRIS and CARIS have always been a part, and the impact of this in terms of organisation, mission, activities and personnel. Finally, on the specifics of AGRIS and CARIS, I will briefly go over the philosophy behind these systems, their history, current status, output products and future plans. I will sum up with some of my suggestions and recommendations on how we might improve the coverage and output products for AGRIS and CARIS as they specifically relate to forestry.

WAICENT (WORLD AGRICULTURAL INFORMATION CENTRE)

A description is given first of WAICENT, the World Agricultural Information Centre, an information service in the form of an "umbrella project", of which AGRIS and CARIS are now integral parts.

WAICENT was launched in 1989, as a response to the increasing problem of consolidating the 40 independent databases developed throughout the Organization over the years. The first prototype was presented to the bi-annual Council of Member Countries at FAO in November 1991, and met with wide consensus.

The main reasons for the establishment of WAICENT were:

1. improved data management in FAO, and consequent enhancement of quality and coverage of the information released by the Organization;
2. reduction of processing costs in the compilation, analysis and dissemination of information;
3. improved flow of information to and from Member Countries, through inhouse synergy and horizontal co-operation; and
4. a more effective outreach to FAO's target audiences.

The practical advantages hoped for were principally three:

1. the capitalisation of the intellectual output of the Organization through the maintenance of an institutional memory in electronic format;
2. availability of the information at the user's desktop computer, bringing greater efficiency and cost-effectiveness; and
3. reduction of the burden on the national offices of Member Countries in reporting to FAO.

It is important to stress from the beginning that the aim of WAICENT was not to create a centralised environment which controls the flow and content of information. The intention was, rather, to foster a corporate atmosphere – to co-ordinate the information and, through a co-operative and well-structured approach, enhance the content and widen still further its outreach. This is the reason why WAICENT is termed an "umbrella" project: the connotation is one of cumulation or protection, *not* of control.

WAICENT is made up of three principal components which are interactive and complementary: FAOSTAT, for the storage and dissemination of statistical information, and FAOINFO, which covers hypermedia

information (viz. text, images, audio and video). The third component, FAOSIS, covers very specialised information systems, including AGRIS and CARIS.

FAOSTAT

FAOSTAT contains a collection of time-series data on demography, agriculture, fisheries and forestry covering 210 countries and territories to date. There are data on trade flows, food aid, development assistance and the results of the World Agricultural Census on household budget and food consumption surveys. Software was developed to allow users to select and organise the statistical information into tables and charts that meet their individual needs.

The idea behind FAOSTAT is very similar to AGRIS and CARIS, statistical data is supplied by each country and inter-governmental organisations and then merged and put into one database by FAO. The difference is that there is not a standardised format for FAOSTAT, the data is mapped and converted once it reaches FAO.

FAOINFO

FAOINFO covers a wide range of information on food and agriculture, including: monthly reports on global food production, a comprehensive collection of internationally accepted food standards, updates on the distribution of animal diseases and plant pests worldwide, and country-level nutrition, fisheries and forestry profiles. FAOINFO is FAO's information gateway to the world. Technical and public information, in both textual and other hypermedia formats, can now be delivered in a responsible and comprehensive way.

There are at present three principal and closely intertwined projects under FAOINFO:

- CERESTronics
- Virtual Library
- SGML Project

CERESTronics

CERESTronics is the name given to the electronic text and multimedia vehicle by which FAO communicates on the Internet with the rest of the world. General interest stories on FAO – what it is, what it is doing today and how experts and even individual farmers in developing countries are participating in FAO's programmes and utilising its technical expertise – are transmitted by this electronic, real-time "e-zine" **CERESTronics**.

CERESTronics was launched as a pilot project in May 1996. CERESTronics contains text, photographs and video clips, that are organised, edited and formatted for reading on a screen or downloading and printing from a computer. It allows users to see and hear FAO in action and provides an integrated, illustrated, animated introduction and news report on the work of FAO.

The majority of countries in the developing world, however, are still obliged to look to other network channels for the information generated by FAO. Most of the information available on the Internet is produced for the Gopher and e-mail distribution, although this necessarily implies the loss of graphical and photographic impact. There are plans to produce a CD-ROM product for regular distribution, that will mirror what is found on the Web site, for computer workstations where Internet access is not available or is limited.

The virtual library project

At present the access to much of the information produced by FAO is still paper-based and, within FAO, the staff still rely on many paper-based external publications, notably journals, reports and other such information products. The Virtual Library Project is intended to radically transform these roles: output documents from FAO will shift from being a paper and microfiche-based archive to an electronic archive – providing world-wide access to FAOINFO documents. Staff working within the Organization will be provided with access to the growing number of external publications that are being published and distributed electronically.

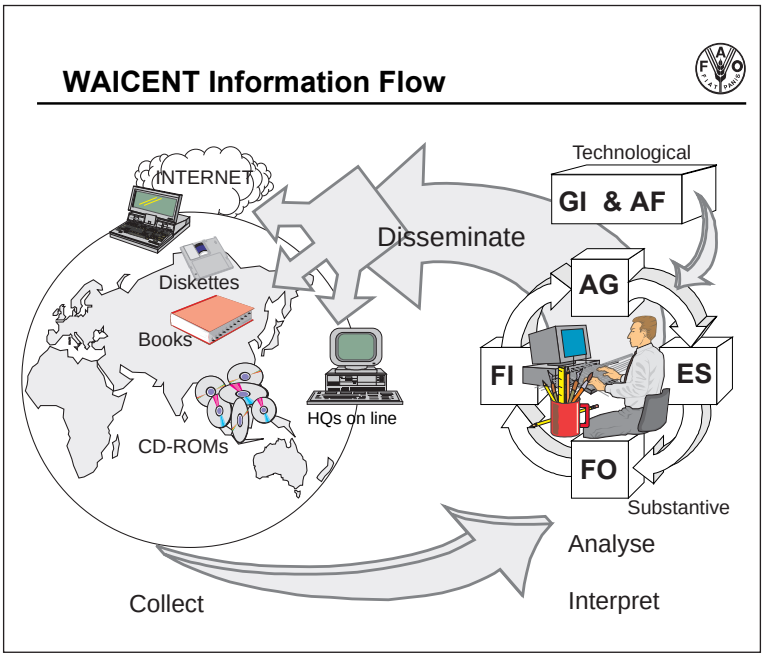
SGML project

FAO's document production process must be changed to one based and maintained in an electronic format. We are currently developing the tools and procedures to automatically convert documents prepared with standard word processing software to a coded, structured document format using a standardised mark up language called SGML. This process will give us the flexibility to take these document files and make the information available in a variety of formats: on our Web site, on CD-ROM, diskette or in print.

WAICENT is an example of how organisational activities can be integrated across departments and divisions with reciprocal advantages providing greater efficiencies and overall lower costs for the Organization. WAICENT provides the corporate tools for electronic processing and dissemination making information equally available to all units, including those outside Rome, and eliminating unnecessary duplication of files.

FAOSIS

This activity is directed to the development, maintenance and delivery of specialised databases within FAO. These include systems such as DAD-IS which is a global information system supported by FAO and its member countries to document, enhance and preserve the world's animal genetic resources. Another example is ARTEMIS operated by the Remote Sensing Centre to deliver satellite data. AGRIS and CARIS also fall into this category of specialised information systems.



AGRIS AND CARIS: PAST AND PRESENT

The slogan for the 20th anniversary celebrations of AGRIS and CARIS was "20 years of sharing world agricultural information". This is an apt description of both as the network of centres and their services are world-wide in scope. The success of both systems is due to all the participating countries and organisations who provide the political, logistical and financial support which is necessary for their continued operation. Most importantly, it is due to the individual efforts of the staff within each centre who collect, organise and prepare the input and who provide information services for their users.

It is important to note and remember in our discussions that representatives from all the AGRIS and CARIS participating centres serve as the board of directors and that they are the managers of the systems. The AGRIS/CARIS Co-ordinating Group (now part of the FAOINFO Dissemination Branch) in Rome and Processing Unit in Vienna have always served the role as system coordinator and central processor for the data. We provide the support to both systems but under the direction of our members who usually meet every two years or so, in a general Technical Consultation. There we discuss and reach a consensus on how the systems should be developed in the future. As in any open, participatory system of this type, not any one country or institution can have their own way and changes must be introduced in a careful and measured manner so as not to cause problems for the others.

This leads me to also highlight another important feature. The input to both systems is also determined within each country. There is no outside agency deciding what gets selected to be catalogued and indexed. The centres alone decide on which of their national publications or research projects to include and thus making them better known not only within the country but to a world-wide audience.

Along with the co-ordination role, FAO provides support, generally through technical development projects, to provide the resources and training to countries who need assistance in developing their documentary infrastructure. Over the years we have supported a large number of projects in this way not only to enhance the coverage within AGRIS and CARIS, but in helping to provide the training and facilities for the development of national documentary systems and services. Many of you know Mr. Robert Portegies-Zwart from our office who has been managing this programme for some time now.

AGRIS and CARIS were first introduced in the mid-1970s. AGRIS was modelled on the International Nuclear Information System (INIS) that was implemented by the International Atomic Energy Agency (IAEA) in Vienna, Austria. Computer software was written for INIS to process the data submitted by their participating centres and output products, such as the camera-ready copy for the printed *Atomindex* which was computer produced using special photocomposition programs. The IAEA provided FAO access to the software to also be used for AGRIS and a Processing Unit was established there to handle the input from all the countries and institutions. The Unit remains there under the able direction of Ms Helga Schmid as manager. CARIS processing is under the expert control of Ms Ingrid Perciballi-Prince and Bokary Guindo who has just recently joined us from SPAAR.

Back then the normal method for data submission was typed input sheets, paper tape or magnetic tape. Over the years the input sheets have given way to data supplied on diskette from our Micro CDS/ISIS input preparation programs, AGRIN and CARIN, and the data is now regularly submitted via the Internet by FTP. In fact, over half the input received for both systems is submitted in this way.

Both AGRIS and CARIS are quite healthy at the moment. The number of active participants is at an all time high. The total number of records in AGRIS is now over 2.5 million, with almost 30,000 current research project records in CARIS. In addition, we are working with the SPAAR group at the World Bank to incorporate their SIS database into CARIS. The SIS database is structured much like CARIS and contains research projects from the funding agencies on agricultural research in Africa.

However, we know that this is not anywhere near a complete inventory of publications or of research

projects world-wide. The challenge is to improve coverage and this is the major goal in all of our activities. I hope that the discussions over the next several days and the activities that we trust should follow, will help us to advance this effort.

The strengths of AGRIS and CARIS are derived from their participatory nature as co-operative information systems. Each country is responsible for collecting and indexing the literature or research project information within their borders thus capturing information that is not often available in other systems. Certainly none that is available on a world-wide basis. Most importantly, 20% of the literature indexed for AGRIS is non-conventional, the "grey literature" of reports, conference papers or theses that are not well covered by other abstracting and indexing services. In addition to citing this material, centres also include a note on where a copy of the document is held.

This strength can also prove a weakness. As resources are scarce, ministries change and staff change, so do the capabilities to prepare and submit input. A country might offer excellent coverage one year but not the next. FAO and other organisations do sponsor projects to train and equip centres. These are certainly important but not every country can be provided with assistance year after year. This situation is not confined just to the developing countries. This task has to be addressed on a country-by-country basis as each situation is different. It constitutes the main undertaking involved in managing the system.

Another important attribute of AGRIS and CARIS, as noted above, is that they serve as a catalyst for improving national and regional documentation systems. Training in cataloguing and indexing, in database development methodologies, software tools, reference manuals, information retrieval and data transfer techniques, all contribute to enhancing these capabilities and related information services within the participating countries.

Tools for data submission and output products for both systems continue to evolve. We are currently working on new versions of both AGRIN and CARIN for data input, database management and retrieval. These allow for easier data entry and improve data quality. New manuals are also under preparation.

The printed *Agrindex* is no longer being published. This was in part a budgetary consideration, but one made much easier by the widespread availability and use of PCs with CD-ROM readers. The third edition of our AGROVOC Thesaurus was published at the end of 1995 and is available from FAO in English, French and Spanish. It can also be downloaded via the Internet by FTP from Vienna and printed locally or loaded into a local computer system. Christine Ebermann maintains AGROVOC in Vienna using thesaurus maintenance software that we recently developed and implemented. New terms and other changes are suggested by the participating centres. Other centres are currently working on other new language editions. A supplement will be issued next month covering further additions and changes made during this year.

AGRIS is available on CD-ROM from SilverPlatter from 1975 up to the current time. It is updated quarterly. SilverPlatter provides FAO with enough copies of the CDS so that we can supply each participating centre with a set. It is also available for sale at a 50% discounted price for developing countries. Additional information on this is included in the AGRIS fact sheet.

We are using an updated version of Heurisko software for our new AGRIS Forestry and CARIS-SIS CD-ROMs which I will demonstrate here. Copies of the AGRIS Forestry disk are being provided to all the delegates and we will send them the CARIS-SIS CDS later in December. This software may not match the ease of use of the Silver Platter user interface but FAO does not pay royalties for distribution and can therefore make it available to any centre free of charge.

AGRIS and CARIS/SIS are being added to FAO's expanding WAICENT list of Internet information services along with the complete AGROVOC Thesaurus. Our Web homepage address is: http://www.fao.org. I will demonstrate a prototype of the service this morning. Gabriel Stergiou and Stefka Kaloyanova are currently working on developing this and are responsible for producing the Heurisko CDS at FAO.

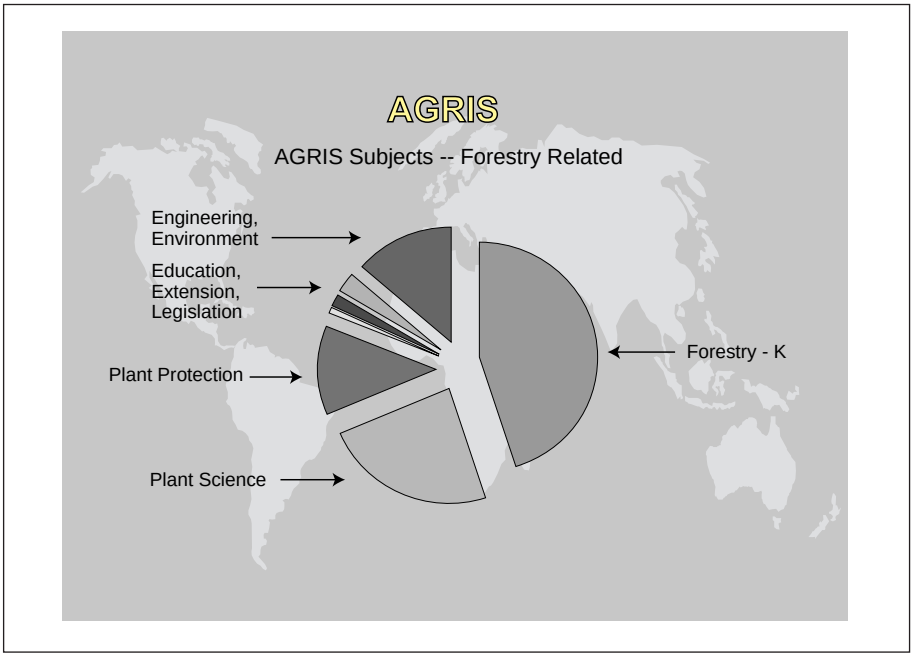
Our newsletter is now called *Agile* and is edited by Fynvola Le Hunte-Ward. It is distributed to all our participating centres and is available from our pages on the Internet.

You may always contact us by e-mail at GIL-Agris-Caris@fao.org and Kris Jellinek-Fusco will take care in seeing that your requests or questions are promptly handled by the appropriate individual. A new e-mail listserve is also being set up by our AGRIS Processing Unit in Vienna to handle questions relating to input preparation or the distribution of the monthly AGRIS computer files.

AGRIS, CARIS AND FORESTRY INFORMATION

In forestry, which is why we are all here, there are a number of issues and opportunities to discuss and act upon.

Let us first look at the coverage of forestry-related subjects. One of the factors with AGRIS is that it is difficult to get an exact breakdown and count of the number of records that relate in one way or another to forestry. Our current subject category arrangement does not do this since a reference can carry subject categories in the Plant Science area, in Plant Protection, Engineering, Economics, and not necessarily in a "K" forestry category as well. The pie chart illustrates this. What has to be done to get a good count of the forestry-related records is to prepare a rather lengthy and involved word search using all the terms that might be



used, including species and common names of trees, names of forest products, specific forest pests, etc. Christine Krieger, one of our specialists at the AGRIS Processing Unit, has prepared a very comprehensive word search and she provided me with the numbers that were used for the pie chart as well as those used to show input by country.

Next, we have the number of forestry-related records entered into AGRIS by all the participating centres in this region

There is no doubt from looking at these numbers that more can be done and there are various approaches that would help to improve coverage of forestry as well as in other subject areas.

AGRIS Forestry References

	86-Sep 96	86-88	89-90	91-92	93-94	95	Jan-Sep 96	Total
New Zealand	831	103	166	117	229	64	57	1567
China	3655	375	719	670	713	337	301	6770
Australia	3562	156	205	212	201	1029	365	5730
India	1824	335	284	306	302	191	151	3393
Japan	1769	473	374	191	333	152	64	3356
Malaysia	2316	746	352	330	317	161	94	4316
Indonesia	1548	241	361	217	362	101	95	2925
Philippines	3894	571	332	382	238	131	108	5656
Pakistan	744	214	104	162	60	60	52	1396
Korea Republic	863	99	93	129	194	113	65	1556
Viet Nam	302	36	20	41	75	38	37	549
Thailand	1240	419	117	149	241	104	77	2347
Nepal	568	166	87	69	95	44	46	1075
Bangladesh	707	143	108	133	166	56	57	1370
Whole world	226066	44006	41175	32403	34380	22356	17925	418311

One approach is working to help develop a new configuration of participating centres and sub-centres. The policy that was agreed upon from the beginning of AGRIS and CARIS is that each country has the responsibility for designating its own liaison and input centre(s). In some countries it is one institution, in others there is a primary liaison centre and other designated sub-centres. Each country assumes the responsibility for developing their own national information infrastructures. We advise and assist in any way that we can but the responsibility remains with the country.

We can of course be more active in identifying those countries where forestry literature, for example, is not being well covered. We could then work with the institutions within the country and the national centre to either develop sub-centres or to be sure that the local institutions' publications reach the countries' input centre. It is difficult and counter-productive to dictate from the outside that one is an input centre and another not. This is an important reason for bringing you all together to help to facilitate this process in a mutually beneficial fashion.

An inducement for adding sub-centres is to ensure that each receives all the AGRIS and/or CARIS working tools and output products free of charge. This may seem self-evident but it has not been the practice up to now. For example, every country currently receives one set of the AGRIS CD-ROMs and one copy of the AGROVOC Thesaurus. A country must purchase extra copies as required. This is no inducement for expanding the system. Changing this, however, runs us up against hard budgetary facts at FAO. The budget is fixed or declining while our costs are going up. We are, however, going ahead and doing this by providing to all participants free copies of the AGROVOC Thesaurus as well as other reference and training manuals. We are also making these publications available electronically on diskette, CD-ROM or via the Internet. In fact, the English, French and Spanish versions of the current AGROVOC Thesaurus can be obtained via an FTP connection with the AGRIS Processing Unit in Vienna. Countries can download the file and print or distribute copies for local usage. Another approach is to include AGROVOC and the reference tools as part of the input programs AGRIN and CARPlus. The latter is a new Micro CDS/ISIS software product that we are beta testing with some of our CARIS centres this winter.

Perhaps we could look at some types of funding and training to help those developing countries with their network of centres for input.

We can see about making the CD-ROM versions of the AGRIS and CARIS databases available to sub-centres, especially those in the developing countries as required.

Back in the early years of AGRIS there were plans to have so-called Level I and Level II centres. The latter would be specialised information centres that would provide additional coverage in a particular subject area with more in-depth levels of indexing. They might also provide additional document delivery services. Co-ordination between these two levels would be required to avoid any unnecessary competition for resources and duplication in the database(s). This idea never progressed beyond the paper and discussion stage. Perhaps it could be pursued with specific forestry centres as special contributing centres or with other abstracting and indexing services in some type of a co-operative approach between services.

Perhaps we could develop a simple method that the researchers themselves could use to prepare entries to publications that they author. These references could then be submitted to designated centres for completion and entry into the database. The authors themselves would then be able to contribute to the system and publicise their works as well.

This brings me to another area for discussion. That relates to a simplified set of input rules for AGRIS and CARIS records. We are just now updating our input manuals for both systems and have just recently updated our input software for CARIS with a new program CARPlus. We have tried to simplify the rules for data preparation in both systems and allow for greater flexibility in accepting input in different computer formats. If this is a problem for some centres, it needs to be discussed and reviewed with the parties involved.

New services

The whole issue of document delivery, especially for the non-conventional literature, also needs to be reconsidered. A specialised centre might be in a position to scan and store electronically their documents. These could be made available for access and downloading via the Internet. A note in the AGRIS citation that includes the electronic address of the full document could then be made. The AGRIS record could also serve as the indexing access point to that document in the same way as a traditional card catalogue entry serves as the access point to a document in a library's collection except in this case there would be a direct link between the reference and the electronic document. At the minimum, there could be a link from a reference to the institution that has the document and a copy could then be requested by e-mail. We are planning at FAO to try this out shortly. The AGRIS database will be accessible through our Internet homepage and we will be linking the references to FAO documents that we have available at our site to the full text document itself or to at least a lengthy part of the document. We are looking to do the same with other centres. If they have some documents available electronically at their Internet site, we would like to add in a hypertext link from the reference in the AGRIS database to the document at the local site.

The idea for CARIS is to have the centres include the e-mail addresses of the researchers in their research

project records so that users could easily contact them electronically. We also will be asking the institutions that are sponsoring the research and who are engaged in the projects themselves to supply their Internet addresses so that users of the database can easily link to that institution for further information on their programmes, resources and activities. This, I believe, will give the CARIS database a capability that will dramatically influence how it is used and viewed in the future.

We are all eager to see the coverage expanded in AGRIS and CARIS for forestry as well as other subjects. We hope that from this meeting we can carry forward some new ideas and approaches to attain that goal and we welcome your suggestions and assistance.

IN SUMMARY

To sum up, I believe that AGRIS and CARIS will gain significant new support through the FAO WAICENT programme initiatives. The new step is that together we need to build on this to develop new and better ways to expand our information services for the benefit of our whole community of interests. Thank you.

ACTIVITIES OF THE FORESTRY DEPARTMENT OF FAO IN RELATION TO RESEARCH AND INFORMATION

Oudara Souvannavong
Forest Resources Division, FAO, Rome, Italy

INTRODUCTION

According to its Constitution, the main functions of the Food and Agriculture Organization of the United Nations (FAO) are (i) to serve as an international forum and secretariat for food and agricultural matters (including fisheries and forestry); (ii) to provide technical assistance in its field of competence; and (iii) to promote exchange of information and know-how between nations.

Information is an important item of the mandate of FAO. AGRIS, the International Information System for the Agricultural Sciences and Technology and CARIS, the Current Agricultural Research Information System, are central parts of the information system of FAO. The General Information Department is the main operator in this field. Other departments of FAO contribute to the information function of the Organization in their respective fields: Agriculture, Economy and Statistics, Fisheries, Forestry and Sustainable Development.

Support to research, as a means to produce knowledge necessary to increase productivity while improving the sustainability of natural resources and the environment, is an important activity of FAO.

This paper gives a brief overview of activities of the Forestry Department of FAO in relation to research and information.

FAO is not a research organisation, its role is to facilitate research and co-operation between researchers, to assist national forestry research systems and contribute to their strengthening. Activities include (i) production and dissemination of technical information; (ii) facilitation of international co-operation; and (iii) strengthening of national research systems.

TECHNICAL INFORMATION

Review, synthesis and dissemination of technical information are essential tasks of FAO. The Forestry Department regularly publishes results of information surveys and analyses, such as the *World Forest Resources Assessment*; studies exploring new trends in forestry activities like *The Role of the Private Sector in Forestry Research*; or reviewing the status and prospects of recently developed techniques, *Biotechnology in Forest Tree Improvement*. Practical guidelines are also published to promote the implementation of new knowledge in development activities, for example: *FAO Model Code of Forest Harvesting Practice* and *Mangrove Forest Management Guidelines*.

Directories of institutions or organisations engaged in different categories of activities are also published. For example: the *Directory of Forest Research Organizations*. This directory is in high demand, and the last issue published in 1995 is already out of print. It is however accessible through the Internet. The directory is currently being up-dated.

The Forestry Department also publishes information bulletins and newsletters covering different field of interest, for example: *Non-Wood News* on non-wood forest products; the *Forest Harvesting Bulletin*; and the *Forest Genetic Resources: information bulletin*.

UNASYLVA, an annual forestry review published in English, French and Spanish, is also produced by the Forestry Department.

INTERNATIONAL CO-OPERATION

In addition to promotion of international co-operation through general information (directories, newsletters, etc.), the Forestry Department, through its facilitating role, contributes to the co-ordination of international research activities in fields such as provenance selection. For instance, the Department co-ordinated the first international provenance trials of *Eucalyptus camaldulensis* carried out in the 1960s on 32 sites in 18 countries. International provenance trials of *Tectona grandis* and *Gmelina arborea* were organised in the 1970s. More recently the Forestry Department co-ordinated the provenance seed collection and subsequent establishment of the first international provenance trials of *Azadirachta indica* in the Framework of the International Neem Network.

STRENGTHENING OF NATIONAL RESEARCH SYSTEMS

The recognition of the need to strengthen the global forestry research system has been acknowledged in recent years by the establishment of CIFOR and ICRAF as international research centres of the CGIAR system, and the broadening of the programme of IPGRI, another centre of the CGIAR, to cover forest species. By mandate, the centres of the CGIAR focus on strategic research and applied research at global level.

National Research Systems, including institutions from both the public and the private sectors, are an essential component of the global research system, undertaking applied and adaptive research, capitalising and transferring research results to local development. International research programmes, even successful ones, will have limited impact without appropriate participation and complementary research by national institutions. Apart from a few exceptions, developing countries do not have the adequate capacity to participate in international research projects and to capitalise, adapt results and transfer the results at local development level. Thus, strengthening national research systems is of highest importance.

Activities in this field include (i) assistance in formulation of national forest research development strategies; (ii) training and information; and (iii) promotion of international and regional co-operation as means to transfer know-how and experience from most-advanced collaborators to others.

These activities are carried out under the regular programme by the Forestry Department in collaboration with other concerned units of FAO and other international organisations, and through field projects supported by extra-budgetary funds, such as FORSPA (the Forestry Support Programme for Asia and the Pacific). The experience and achievements of FORSPA demonstrated that shared and co-ordinated support at regional level is an efficient approach for strengthening national forestry research systems, while developing adequate co-operation among them. The Asia Pacific Association of Forest Research Institutions (APAFRI) was established in 1996 as an independent body to carry out activities presently undertaken by FORSPA.

In Africa, the Forestry Research Network for Sub-Saharan Africa (FORNESSA) was launched, with similar objectives to APAFRI, by a nucleus of National Forest Research Institutes. FAO is assisting FORNESSA to establish itself in close collaboration with IUFRO, in particular its Special Programme for Developing Countries (SPDC), CIFOR and the European Tropical Forest Research Network (ETFRN).

PRINCIPLES OF ABSTRACTING AND INDEXING

as applied by CAB INTERNATIONAL

K.M. Becker
CAB International, Wallingford, UK

HOW TO WRITE AN ABSTRACT

What is an abstract?

Although there is fair agreement about what an abstract is, there is no such agreement about a precise definition. The American National Standards Institute's definition is one of the most terse:

> An abstract is defined as an abbreviated accurate representation of the contents of a document, preferably prepared by its author(s) for publication with it. Such abstracts are also useful in access [abstracting] publications and machine-readable databases.

What is important is that the abstract should be:

- **self-contained**, i.e., intelligible by itself or in combination with the document title, without need to refer to the original text;
- **objective**, i.e., should not contain any criticism or interpretation by the abstractor
- **factually accurate**;
- **high in information content**, i.e., emphasis on reporting new facts and devoid of non-significant information; and
- **immediately clear in its meaning**.

What is abstracted?

Primary publishers provide abstracts with almost all of the articles on theoretical or experimental research that they publish. These abstracts are usually written by authors. Publishers do not normally provide abstracts with editorial material, short communications or letters to the editor.

"Access" (abstracting and indexing) publishers publish collections of abstracts in abstract journals and/or maintain them in files that are generally stored in computer memories for retrieval on demand. In addition to comprehensive coverage of the items that are abstracted in relevant primary publications, access publishers also selectively abstract books, editorials, patents, research progress reports, conference proceedings and letters to the editors of scholarly publications, as well as information contained in such non-print materials as film strips, cassette tapes and visual aids. These abstracts are normally written by abstractors.

What is an abstract used for?

The essential purposes of an abstract are:

i) To help workers in the subject of the article to decide quickly whether or not they need to read the article in its complete version.

ii) To give readers for whom the article is of peripheral interest as much information as possible, so that they can keep abreast of new developments without it being necessary for them to read the full article.

iii) To substitute for the whole article when a copy of the original cannot be obtained (e.g., when library facilities are limited), when it is in a language unintelligible to the reader or when the reader simply has not enough time to read it in full. (This applies to informative abstracts only)

iv) The abstract serves as a cumulative store of information and, moreover, can act as a powerful tool in that it contains terms, other than those in the title and index, that can be searched for by computerised information retrieval techniques.

Why do you want to write an abstract?

You may have many different reasons for wanting to write an abstract, including:

- As an "advert"
  You will often be asked to submit an abstract of a proposed conference paper or poster.

- As part of a paper submitted for publication
  Most publishers ask for an abstract. You are probably expected to supply an abstract with your thesis.

- For your personal database
  You may be building up a collection of papers relevant to your research interests. If you have access to a PC and database management software you can create your own database. You may already have abstracts of some papers from literature searches. You can add your own abstracts for other papers in your collection, to produce an integrated database.

Content of abstracts

Abstracts generally contain up to four, usually sequential, information elements that describe or extract information from the basic document:

i) purpose,
ii) methodology,
iii) results, and
iv) conclusions/recommendations.

Different types of abstract

Depending on the original document, its subject interest, content and scientific value, an abstract may be:

i) informative,
ii) indicative, or
iii) a combination of informative and indicative.

Informative abstract

A full informative abstract is usually required for documents reporting new findings published for the most part in conventional scientific journals, technical bulletins, monographs and some conference proceedings. This kind of abstract should contain a concise factual summary of the contents of the article, providing as much qualitative and quantitative information as space permits.

Example of an Informative Abstract

AGNIHOTRI, Y.; AGARWAL, M.C. Investigations on optimum size and shape of plots with *Dalbergia sissoo* (Roxb.) in Shiwalik foothills. Indian Forester (1995) 121(9) 792-796 [En, 3 ref.] Central Soil and Water Conservation Research and Training Institute, Research Centre (Chandigarh), India.

Investigations on the optimum size and shape of experimental plots and their arrangement in blocks were made with *Dalbergia sissoo* at the Research Farm of the Central soil and Water Conservation Research and Training Institute, Research Centre, Chandigarh. Height and diameter at breast height observations of all the individual trees spaced at 2x2 m in a 24x24 tree compartment were recorded. The coefficients of variation (CV) for different sizes and shapes of plots and blocks were calculated and used to determine the optimum size and shape of plots and blocks. A plot of 8-12 trees was considered to be the best size. Arrangement in blocks was in general found to be more efficient that no block arrangements. Bigger blocks were less efficient than small blocks

Indicative abstract

This type of abstract differs from the informative abstract in being essentially a descriptive statement of the nature, scope or content of a document, especially a book or review; it does not contain actual facts and figures. Indicative abstracts are usually appropriate for:

i) reports of surveys, data collections, mathematical or other articles for which it is not possible to describe the work reported except in general terms;

ii) research articles of lesser importance or of marginal subject interest but which are nevertheless considered worth a notice; and

iii) the contents of books, book chapters, reviews, extension and other types of literature not reporting original research findings as such.

Example of an Indicative Abstract

GANGULI, B.N. Breakthroughs in forestry development: experience of the Asian Development Bank. Manila, Philippines; Asian Development Bank (1995) xvii + 269 pp. [En, 7 pp. of ref.].

This book has been written as a stand-alone reference document for development agencies (both multilateral and bilateral), consultants, NGOs, and private sector and other stakeholders who are involved with and interested in promoting sustainable forestry to combat deforestation and degradation of forest resources. The book is in 2 parts. Part I, Background, has 4 chapters: (1) The Asian Development Bank and its forestry activities - an overview; (2) Forestry in the Asian and Pacific Region - resources, institutions and issues; (3) Project appraisal procedures and practices in the Bank; and (4) Recent shifts towards sustainable forest management policy. Part II, Sustainable forest management case studies, has 7 chapters, each a case study from a different country/region – Nepal (management and protection of natural forests), Bangladesh (a community forestry project), Malaysia (plantation forestry to promote conservation of tropical forests), Indonesia (a forestry development project), Thailand (the Regional Community Forestry Training Center at Kasetsart University), FORSPA (the Forestry Research Support Programme for Asia and the Pacific), and the Philippines (sustainable management of rain forests).

Informative/Indicative abstract

In practice, the distinction between informative and indicative abstracts sometimes becomes blurred. Mixed informative/indicative abstracts may be required for papers which report original results as well as providing a literature review. Sometimes an indicative abstract may be expanded into an informative abstract by the addition of the author's major conclusions, suggestions or recommendations.

Example of an Informative/Indicative Abstract

Robertson, L.N. An extraction method used to study vertical and lateral distribution of soldier fly *Inopus rubriceps* (Diptera: Stratiomyidae) in sugar cane soil. *Journal of the Australian Entomological Society* (1984) 23(1) 21-24 [En, 13 ref.] Dep. Entomology, Queensland Univ., St. Lucia 4067, Australia.

A method is described that was developed in Queensland, Australia, for extracting larvae, pupae and pupal remains of *I. rubriceps* from soil in sugar cane fields by suspension in moving water. The vertical and lateral distribution of larvae and pupae in relation to sugar cane plants is also described. About half the larvae and pupae were within 7.61 cm of emergent canes, and it was assumed that the numbers of larvae more than 30 cm from the stools were negligible. More larvae were found in the upper soil levels in January to April (before the autumn emergence period) than at other times. All pupae and pupal remains were found at the highest level, and the highest proportion of larvae in the lowest levels monitored (19-25 cm) occurred in July, when the soils were driest.

Preparing the abstract

Writing an abstract is not easy, especially if it is to be of the informative kind. Abstracting represents an intellectual challenge which demands:

i) a sound basis of scientific knowledge;

ii) an ability to identify the key facts in a document; i.e., good judgement as to what is important and what is not;

iii) an ability to organise the information in a suitable fashion; and

iv) an ability to write clearly and concisely.

Elements of the informative abstract

The sequence of contents in many scientific articles will follow a broadly similar logical order. There is usually an introductory section reviewing the state of knowledge of the research topic, including past findings, and setting the objectives of the work reported, with details of the organisms, systems, etc. involved. Materials, methods and treatments imposed are detailed, and then the results of the work are given. Finally, the results may be discussed in general terms and conclusions drawn.

Abstracts of articles of this kind should generally follow the same order of presentation contents and will typically include information on the following elements.

- Purpose of the investigation
  This should be stated at the beginning of the abstract unless it is already adequately indicated in the title or can be inferred from the treatments or other details reported in the abstract.

  In general, ignore historical detail, though sometimes a brief note to explain why the work was done or background information on the nature of the system examined may be needed in order to explain the context.

  Users of abstracts should be assumed to have a general understanding of the subject background. Such notes should therefore not repeat information they can reasonably be expected to know.

- Organisms, materials, etc.
  To the extent necessary, specify basic details of organisms, chemicals, products, soils, systems, etc. that are the subject of the work reported or relevant to it, including cultivar names, breeds of animals and any other details of importance.

- Location
  In field experiments or studies involving ecological or geographical aspects in which the environment is significant, specify the location or region concerned with other relevant details such as soil types, rainfall, solar radiation, altitude, etc.

- Duration of the experiment
  Give this where known. It indicates the time setting of the investigation and, for field experiments especially, it can help indicate the degree of confidence to be attached to the results reported.

- Experimental techniques, design and methods
  Give selected details of treatments imposed or other variables studied. These should normally include, for example, the range of dosages, numbers of animals, cultural or management practices, concentrations, temperatures, spray volumes, chemicals or other pesticide names, fertilisers, pharmaceuticals, etc. Be careful, however, to avoid too much detail. Mention methods, techniques and apparatus where important and especially if they are novel or have new features. Specify experimental design, number of replications or statistical design only if important and not where these are conventional practice.

- Results
  Give key factual and descriptive data on the most important results of the work. Where quantitative data have been analysed statistically, quote only those of statistical significance, with level of significance indicated if necessary.

  Data for check (control) treatments will often be needed in order to provide a basis for comparison.

  Some articles contain valuable compilations of data or other information. Mention this by such phrases as "Amino acid compositions for 18 species are tabulated".

- Discussion and conclusions
  This section may contain useful information on the author's estimate of the significance of his results for practice (perhaps with practical recommendations), or for the development of new theories or the general advancement of knowledge of the subject or system under study. Such information should normally be noted only briefly and should not repeat conclusions that are obvious from factual data already cited in the abstract. Ignore the frequent recommendation that "more research is required".

In this sequence of presentation it is often possible to include many of the elements listed above within a single sentence, especially if the title also provides relevant details. But over-long, complex sentences should be avoided.

Elements of the indicative abstract

Indicative abstracts should contain the following information:

- an indication of the nature of the document (e.g., review, general account, popular account, extension literature, collection of conference abstracts);
- intended readership (e.g., forestry researchers, veterinary practitioners, farmers, agricultural advisors);
- a list of the main contents of the paper using the contents table, or the headings/sub-headings of the text, or a general description of the work done in the paper; and
- if appropriate, note the author's main conclusions or recommendations.

Style

Use direct, straightforward English, preferably with short, complete sentences and the fewest words consistent with good grammar and intelligibility. Some abstracts may, however, open with or consist of a phrase that is not a complete sentence, e.g ., "A paper presented at a conference on ...", "An extended review", etc.

Verb forms are preferred to abstract nouns ending in "....tion", e.g., "forming" rather than "formation", "producing" rather than "production", as in "a means of producing high yields" rather than "a means for the production of high yields".

Avoid colloquialisms, jargon, non-standard English, or sentence constructions or expressions that may confuse readers, especially those who do not have English as their first language.

Definite articles, especially at the beginning of sentences, can often be omitted without impairing the sense, but do not overdo this to the extent of writing telegraphese.

Preambles such as "The author describes ...", "This book reviews ....", "It was found that ...." are usually unnecessary.

Tense and voice

It is not possible to draw hard and fast rules, but the main principles are:

- for informative abstracts reporting experimental or observational studies completed and results obtained, use the past tense.
- for indicative abstracts or indicative elements in abstracts reporting the scope, subject, contents or other publication details of a document, use the present tense.

Both tenses may be used in abstracts that contain both informative and indicative elements.

Examples are:

Past tense. To report research done and results obtained.

> "Of 7 nematicides evaluated in field trials in Georgia, all but 2 increased maize yields."
>
> "Life and fecundity tables were constructed for *Eutetranychus orientalis* populations."

Present tense. To indicate topics, apparatus, proprietary products, methods, techniques, etc.

> "A breeding programme is specified in detail."
> "Possible side effects are described."
> "An adaptation of a rotary plough is described."
> "Results of a survey are presented under the following heads: .....".

Present tense. To give publication details.

> "Papers from this symposium are abstracted elsewhere."

Combinations of present and past tenses. For abstracts containing both informative and indicative elements.

> "Pastolakt is a cultured milk product. From storage experiments it is concluded that the shelf life of Pastolakt was .....".

When using the past tense, the active voice is preferred, e.g., "fertiliser application increased yields", rather than "yields were increased by fertiliser applications".

Length

Abstracts should be as short as possible, having regard to the value and information content of the original document. Do not exceed 200 words except for good reason.

Some general guidelines for preparing standard abstracts

i) State the purpose, methods, results and conclusions presented in the original document.

ii) Make the abstract as informative as the nature of the document will allow, so that readers may decide, quickly and accurately, whether they need to read the entire document.

iii) As a general rule, use fewer than 200 words for most papers and portions of monographs and fewer than 100 words for notes or short communications. For long reports and theses try not to exceed 500 words. Usually only one paragraph is required.

iv) Avoid including background information or citing the work of others in the abstract unless the study is a replication or evaluation of their work.

v) Do not include information in the abstract that is not contained in the textual material being abstracted.

vi) Verify that all quantitative or qualitative information used in the abstract agrees with the information contained in the text of the document.

vii) Use standard English and precise technical terms, and follow conventional grammar and punctuation rules.

viii) Give expanded versions of lesser known abbreviations and acronyms, and verbalise symbols that may be unfamiliar to readers of the abstract.

ix) Omit needless words and phrases.

PRINCIPLES OF INDEXING

The purpose of indexing

The purpose of indexing in a database or journal is to make it easy for users to identify and locate the records they want. Typically, the user wishes to find all and only the records relevant to a particular topic.

The retrieval performance of a database and its index language is usually judged by the average recall and precision observed by a skilled searcher. These terms are defined as follows:

$$\text{Percentage Recall} = \frac{\text{Number of relevant records retrieved}}{\text{Number of relevant records in database}} \times 100\%$$

$$\text{Percentage Precision} = \frac{\text{Number of relevant records retrieved}}{\text{Total number of records retrieved}} \times 100\%$$

The efforts of indexers and searchers are mostly aimed at improving the characteristics of precision or recall or both. Unfortunately, recall and precision tend to be inversely related and the trade-off between the two must be taken into account while indexing.

The relative ease or difficulty of retrieval is greatly influenced by the database or corpus in which the information is being sought. Indexers need to be aware of the expectations of searchers.

Types of index

The type of index affects the way in which terms are written and selected. Restraints of finance, manpower or time are important considerations before embarking on a particular scheme of indexing.

The three principal types are:

- Printed indexes
  A printed index is convenient and portable and is available for consultation at any time. However, it is expensive to print and to accumulate over a series of years and it cannot be consulted at intermediate stages in its production. Indexes which are typographically sophisticated and which make full use of typeface, indenting and aggregation are quick, easy and pleasant to use. Indexes which are poorly differentiated by typographical aids are much less easy and pleasant to use.

- Indexes on computer storage media
  A computer-stored index can be interrogated from the moment it is first set up and it can be progressively updated. Computer indexes are designed for on-line retrieval. But they may also be printed, in which case layout must be considered.

- Card indexes
  Card indexes have largely been superseded by computer-stored indexes. They may still have a place where the production of a printed index cannot be justified on financial or other grounds and where suitable computers are not available.

Indexing process

The indexing process is carried out in four stages, as follows:

- examining the source item to understand its subject and purpose;
- choosing the important concepts in the item;
- expressing those concepts to match the retrieval needs of the users, which may involve use of a controlled vocabulary; and
- arranging selected groups of descriptors in pre-coordinated strings.

The final stage above is needed for printed indexes only, and will not be considered further.

Stage one: examining the source item

This process will usually take place during the preparation of the abstract.

Stage two: selection of concepts to be indexed

Keyword units are the basic elements of indexing and each keyword unit represents a specific concept or entity. They may be synonymous with index terms, if they are being selected from an abstract or document which has been written with reference to a controlled vocabulary or they may need a great deal of refining to become valid index terms.

In selecting concepts the indexer should consider a checklist of possible concepts. (A similar checklist of concepts covered by the document should have been considered while abstracting and a list of concepts will have already been compiled. Concepts should be selected from this list.)

Concepts to be considered should include:

- Organisms
- Crops
- Commodities
- Chemicals
- Products
- Processes
- Biological and physical effects
- Geographical location
- Climatic region
- Soil type
- Equipment
- Techniques
- Bibliographic terms

Stage three: converting concepts to index terms (descriptors)

Having collected the key concepts from a document the stage of refinement must begin. The terms used in the index must match the retrieval needs of the users, which vary according to the users' knowledge of the subject area. Do not use highly technical terms if the users are primarily concerned with field work or small-scale projects but do use these if the users are research scientists with very specific areas of interest.

Terms should be standardised by reference to a controlled vocabulary (word list or thesaurus). The object of applying vocabulary control is to label each important concept in the source item with one unambiguous name, preferably the name a searcher would choose for the same concept. Problems such as whether to use singular or plural forms of words, American or British spelling, and which of the hundreds of terms available to describe processes should be used, can be sorted out at an early stage by compiling an in-house word list or using one compiled by another organisation which can be adapted to local needs. One such controlled vocabulary is the CAB THESAURUS.

Using the CAB Thesaurus

The next step is to translate the concepts deemed relevant into the appropriate terms from the CAB Thesaurus. Look up the thesaurus at the most likely entry point. When a relevant descriptor is found, check its whole entry carefully to make sure there is not a more appropriate term among its Broader Terms, Narrower Terms or Related Terms. Check also that the scope of the thesaurus term (as revealed by scope notes and by the hierarchy of broader and narrower terms) coincides with the concept you intend. If it does not, you must seek another way to express your concept. To use a term in any sense other than that indicated by its hierarchy and scope notes is a serious fault because it will result in searchers retrieving records on topics they do not want.

It is important to be aware of the dangers of homonyms (terms with more than one meaning). For example, in the Thesaurus "Tribolium" is a genus of beetles and with the BT Coleoptera and so on. There is also a plant genus called Tribolium, which is not in the Thesaurus. If this is indexed with the term "Tribolium" the searcher is being misled into retrieving the item when information about the beetle is required. When it is necessary to index the plant genus, this must be done by adding a qualifier, to produce a term such as "Tribolium (Poaceae)".

The Thesaurus often makes it clear which terms should be used to distinguish homonyms and these terms must be used in the appropriate situations. For example, in the Thesaurus "Lens" has the BT "Papilionoideae", making it clear that this term should

only be used for the plant genus. A USE reference indicates that for "lens, eye" then term "eye lens" should be used.

If you choose a term other than the first one you looked up, you should turn to the full entry for this term and check it in the same way as you did the first.

If you cannot find a descriptor in the Thesaurus which accurately describes the concept you need, you may consider entering an appropriate new term. This may be necessary if the term is new to the subject area or is a concept that is rarely researched or written about. Before doing this, you must search the Thesaurus thoroughly. If the concept is present as a non-preferred term, then the preferred term(s) must be used in its place. If the new concept is a plant, animal, micro-organism or chemical, an authority file or reference source should be consulted for the correct term.

Precision and recall will both be enhanced if the Thesaurus is consulted by searchers as well as indexers. The descriptors chosen to describe a given source item, or a search query, should be at the same level of specificity as that item (or the needs of the searcher) to avoid loss of precision.

Summary of Dos and Don'ts for database indexing

Dos:

- Do index all concepts within the scope of the database about which a record contains useful new information.
- Do index concepts at the most specific significant level.
- Do index geographic location whenever relevant.
- Do index concepts which are not explicitly expressed in the record but which are always implicit in a combination of concepts that is the subject of the record.

Don'ts:

- Do not index concepts that are mentioned only in passing or whose presence in a document is incidental.
- Do not use any arbitrary limits for the number of concepts indexed per record (but note any system limits).
- Do not use a combination of terms to express a concept if an appropriate specific term exists in the thesaurus; e.g., do not use "potatoes" and "harvesters" when "potato harvesters" exist in the thesaurus.
- Do not index concepts, however relevant to some users or under some circumstances, if they are not discussed (explicitly or implicitly) in the record.
- Do not use terms whose meaning depends on their context, e.g., responses, effects, resources.

CAN WE SEE THE FOREST FOR THE TREES?

An Australian Perspective of Forestry Information Needs and the Role of Supporting Research Databases

Mikael Hirsch
Evaluation and Natural Resources Policy, CSIRO, Canberra, Australia

INTRODUCTION

The purpose of this paper is to examine the ability of research databases to assist in meeting the information needs for forestry research and for the industry in general. Based on some of our recent experiences in Australia, a number of wider information management issues will also be raised, the relevance of which extends well beyond forestry. It is hoped that this Australian perspective may assist in the progress of CARIS and AGRIS for the benefit of the users and the progression of the databases.

CARIS and AGRIS are not well known or used in Australia as a source of information on forestry or agriculture in general. Instead, we have our own two databases, Australian Rural Research In Progress (ARRIP) and the Australian Bibliography On Agriculture (ABOA). The scope of these databases is similar to CARIS and AGRIS but they do only hold Australian data. Collectively, they are known as the Australian Rural Research Databases.

These databases have recently undergone a fundamental review of their role, management and operation that challenged their very existence, and as a result a number of changes are now being implemented.

WHY DO WE NEED THESE TYPES OF DATABASES?

CARIS and other Research-in-Progress databases give a snapshot of what research is now under way; AGRIS and other bibliographic databases provide a historical record of published research outputs. Individually, these databases are important for researchers as well as staff involved in information transfer such as librarians and industry extension advisors. The value of a bibliographic database in particular increases as it grows over a period of time, as they also provide a means to evaluate developmental trends of the quality of literature produced.

Their real strength, however, is evident when the complementary databases are used together. They are then a powerful tool for research management and are particularly important for the purposes of:

- measuring performance and output of the innovation and information chain;
- identifying potential for unnecessary duplication by listing prior work;
- providing contacts to create a basis for collaborative research;
- providing measures of performance of research staff and institutions; and
- providing policy makers with an overview of current research issues and projects.

Without access to these databases we would have less effective research i.e., research which is not fully informed about prior work or what has – or has not - been produced and published, and the opportunity for collaboration or planning thereof would be reduced.

Further, both databases are important information sources for agri-businesses, individual producers, academics, students, natural resource managers, libraries, politicians, etc., and in fact there are large groups associated with primary production and resource management who should know about their existence and use them. Consequently, we view both types of databases as equally important parts of the innovation and information transfer process.

The capture of grey literature is important in order to reduce the considerable risk of duplication of effort but this is often overlooked. By grey literature I mean non-conventional literature which may not be published through regular commercial sources and is often not picked up by indexing/abstracting sources. It includes generic titles of some institutions, some workshop or conference proceedings, extension literature, annual reports, etc. Research managers need to read and appreciate the grey literature as it provides an indication of the research capability of collaborating institutions or the ability of producers to capture research outcomes and new technologies.

No matter how thorough the collection of data is, the databases are only valuable when assisting in the key task of delivering information to those who seek it as part of their work. This includes not only good

search capabilities and robust computing technology, but more importantly physical access to the literature reference material required by the end-users. Without the facility for users to access what they need, a database output, in the form of a long print-out, is almost useless.

The challenge for information brokers, such as librarians and database managers, is to continuously improve the capacity to deliver the sought information, taking full advantage of improvements in information technology whilst having regard to local conditions and barriers in terms of access to the references themselves.

CURRENT SOURCES OF RELEVANT FORESTRY RESEARCH INFORMATION

Unfortunately, there is no single effective database on forestry that services all our needs in Australia. A number of different information sources are available to find specific environmental or production-related information relevant to forestry research, but there are some overlaps between these sources. The most commonly used are:

- Current Contents
- CARL Uncover [aimed as full text document delivery service]
- CABI
- AGRICOLA (USDA)
- CRIS (USDA)
- AGRIS (International)
- Infoterra (UNEP)
- Life Sciences Collection (Cambridge Scientific Abstracts)
- BIOSIS
- ABOA (Australian)
- ARRIP (Australian)
- HERA (Australian)
- Streamline (Australian)
- CORDIS (European Union)
- CIESIN (Consortium for International Earth Science Information Network) but there are many other sources of more specific information used in forestry research.

However, given such a fragmentation of information sources, several searches are often required and it is not unusual to capture the same information more than once but in different formats. Similarly, there are probably also some valuable references which are not captured by any source and we do need a clear primary reference source for forestry research.

AGRIS is barely known or used within the Australian library community. Without knowing the exact reasons for this, we suspect some of the reasons are:

- printed outputs are difficult to search;
- some of the listed reference material is hard to obtain;
- references in ABOA and other bibliographic databases are more relevant;
- there are possibly concerns about comprehensiveness and currency of data;
- access to alternative data sources is easier for end users;
- AGRIS is not really marketed in Australia;
- the value of AGRIS to Australian users has not been demonstrated; and
- perhaps Australian users are not a target audience.

THE AUSTRALIAN RURAL RESEARCH FRAMEWORK

In simple terms Australian forestry research can be divided into three categories:

i) Ecology and biodiversity within the forest environment.
ii) Management and productivity of the forestry resource.
iii) Utilisation of forest products (sawlogs, pulp, fibre, etc.).

However, the boundaries between each category are now indistinct. There are strong ties to both the larger rural research framework and to the environmental and natural resource framework.

Rural research, including that in support of the forest industries, is primarily performed by national research organisations (such as CSIRO and federal government departments), state government departments, universities and some private companies. Several co-operative research centres have been established as joint ventures between some of these research providers to address specific problems.

The total rural research budget is about AU$700 million which is funded either directly via government grants or indirectly via funds from 19 industry-specific research and development corporations where the Australian government matches levies collected from producers. Another relevant funding agency is the Australian Centre for International Agricultural Research (ACIAR) which is sponsored by the Australian international developmental assistance programme.

Adoption of research outputs is often facilitated by state government department extension or advisory services, although there is now an increasing number of private consultants providing independent extension services.

National policy co-ordination between the states and the federal government takes place in a number of ministerial councils, supported by standing committees

of officials. Wider rural issues – including databases – are now under the auspices of the Standing Committee on Agriculture and Resource Management (SCARM), comprising chief executives of federal and state departments responsible for primary industries, although a separate Standing Committee on Forestry deals with specific forestry issues. The national expenditure on agricultural research is about ten times as great as that on forestry research.

A National Strategy for Innovation in Australian Agriculture has recently been developed through SCARM to enhance co-ordination of research nationwide; this significant strategy is now being implemented across Australia. The strategy recognised the need for research databases as being an important mechanism to allow research providers to be better informed about current activities as an element of the identification of research need and priorities.[1]

ARRIP AND ABOA – AUSTRALIAN EQUIVALENTS OF CARIS AND AGRIS

ARRIP – an overview

- ARRIP was established in 1984 to provide a printed annual compendium of agricultural research-in-progress; it was later modified for on-line access.

- ARRIP contains some over 5000 records at any one time. The annual turn-over of 1500 records reflects the three-to four-year term of research projects. There are nearly 6000 completed projects in an archived file.

- The database provides descriptions of individual research projects within agriculture, horticulture, fisheries, forestry, soil science, land and water resource management and food technology.

ABOA – an overview

- ABOA was created in 1975 to capture the Australian contribution to AGRIS and was later expanded to cover all published information produced for Australian agriculture.

- The scope of the database covers agricultural production (including economic, engineering and environmental aspects), fisheries, forestry, food and human nutrition. A separate forestry index was created some years ago but has never been computerised; it is now intended that Australian forestry literature will be captured on ABOA.

- About 43% of ABOA records are published outputs from Australian workshops, conferences, technical reports, etc. which are not covered in international journals.

- ABOA contains over 75 000 records with some 3000-4000 records added annually.

Streamline – a natural resources sister to ABOA

It may be relevant to briefly mention Streamline which is a separate bibliographic database, owned by the Land and Water Research and Development Corporation and the Urban Water Research Association of Australia. Streamline has over 36 000 records and focuses on natural resource management issues.

For some years it has been made available on the same CD-ROM as ARRIP and ABOA, but an opportunity is now arising to further integrate ABOA and Streamline as both databases are maintained by the same contractor, Infoscan Pty Ltd, and management links have been established between the two databases.

Management of ARRIP and ABOA until 1994

ARRIP was initially managed by the federal department of Primary Industries and maintained by CSIRO until about 1993 when SCARM took over the management responsibility. Since its inception ABOA was operated by CSIRO on behalf of SCARM.

Input to the databases took place via forms sent to research staff (for ARRIP) and to librarians (for ABOA) within the participating agencies. CSIRO employed about three people to operate and promote the databases. On-line access was available through the CSIRO Australis network but has now been transferred to the OZLINE National Library system. A CD-ROM called Ag.round was produced twice annually and various hard copy outputs were produced on request for specific industry sectors.

The cost of operating ARRIP and ABOA gradually escalated to about AU$359 000 in 1994/95 of which $229 000 were provided by SCARM with the balance coming from the R&D corporations and revenue from CD-ROM sales. In comparison with the total Australian research budgets, the databases only cost about 0.05%.

Reviews of the databases' future

As the collective owners of the databases, the chief executives of SCARM member agencies were not

[1] A copy of the Innovation Strategy can be found on the following World Wide Web page: Http://coombs.anu.edu.au/SpecialProj/NFF/innoag.html

impressed about an unexpected but on-going increase in the annual cost of operating ARRIP of the order of $100 000 and called for a review of both databases, seeking evidence of their usage and value to Australian agriculture.

The review showed that there was a strong demand for comprehensive databases of this kind but that urgent attention was required regarding completeness, quality and accessibility.

SCARM was also in the process of finalising the national agricultural Innovation Strategy mentioned earlier. Despite an initial intention to close ARRIP, it was recognised that improving ARRIP would provide the necessary support for this strategy and SCARM subsequently agreed to keep ARRIP. Instead, the possibility of achieving savings by closing ABOA was explored, pending consideration of the impact of such closure.

This further review of ABOA then provoked a proposal to achieve the desired savings by offering the operations of both databases to the private sector whilst vesting the management of the databases in a committee representing both SCARM and the R&D corporations as joint owners. SCARM accepted that proposal and asked for the immediate out-sourcing.

Current management arrangements for ARRIP and ABOA

In order to complete contractual arrangements with a private database service provider, the issue of ownership had to be resolved. This was achieved by a Deed of Agreement between the 23 owners being the member agencies of SCARM and all agricultural R&D corporations, delegating management and operational decisions to a new Australian Rural Research Database Committee. The Committee then entered into a three-year contract with Infoscan Pty Ltd as the service provider and the databases were transferred from CSIRO to Infoscan. The costs to SCARM members have fallen from $229 000 in 1994/95 to $150 000 in 1996/97.

Infoscan uses DB/Textworks software, produced by Inmagic, as the main database software and operates the databases on IBM-compatible personal computers supported by a number of in-house data conversion tools and publishing software running under Windows or MS DOS. A new CD-ROM using SilverPlatter software as the user front end is about to be released. A number of current activities include: enabling access to archived and completed research projects; capturing research projects which did not result in publications on ABOA; and the data collection from research management systems within the participating research organisations.

By recognising the role of R&D corporations as research sponsors and therefore part owners of the data, there is a now a stronger commitment by the corporations to ensure research staff input data on research projects into ARRIP and publications into ABOA as part of their funding mechanism. In some cases the final payment from the corporations will be dependent upon researchers having completed this requirement.

There are plans to expand the ownership of the databases to make them truly national. In the first instance ACIAR is considering joining and a formal approach is likely to be made in the near future to the ten Australian universities to capture details of their agricultural research and publications.

Instead of relying on declining resources to specialist libraries, input to ABOA is now provided by part-time indexers appointed by Infoscan. This may increase the data validation effort to ensure no duplication of data entry occurs, but it also ensures that data are obtained from all states of Australia.

Why Australia needs both ARRIP and ABOA

While the databases have survived the review in the short term and achieved some tangible savings to the sponsors, the review highlighted some critical issues. Individually, each database services the needs of research and advisory staff respectively. However, collectively their application is much wider in terms of assisting networking between researchers in allied fields, providing the basis for initiating collaborative projects with other organisations, and identifying possible duplication between research and advisory groups in different organisations.

Both databases are part of the innovation and information chain for Australian rural industries and both are important in our pluralistic research and technology transfer framework. Strong links between the databases are critical; this linkage can be achieved by ensuring that publications eventually appear in ABOA as a result of the research projects listed in ARRIP.

It is critical not to lose sight of the significant strength in having both types of databases to facilitate evolution of national agricultural research systems. Access to mainstream and grey literature is critical for advisory staff, but both types of database are vital for research staff and in policy formulation, performance evaluation of research investments and measurement of technology uptake. The datasets are inter-dependent and are linked in their sources, inputs and applications.

ISSUES AND EXPERIENCES RELEVANT TO CARIS AND AGRIS

The recent experience in Australia indicates that there is considerable merit in reviewing databases such as ARRIP/ABOA or CARIS/AGRIS from a “first principles” perspective from time to time. When these data-

bases were created, they were probably a very good idea and a sound investment, but both technology and information transfer infrastructure have since changed dramatically. There is little point in continuing just to maintain a historical record – let alone attempting to justify costs – unless the overall purpose has been restated.

The principal issues to consider fall into four groups:

- management issues (primarily concerning customer focus and strategic leadership).
- operational issues (emphasis on cost efficiency).
- content issues (currency, relevance, comprehensiveness).
- information delivery issues (user friendliness, access to references, technology itself).

Due to the low level of interaction between AGRIS and Australian agencies, we are possibly ignorant of the specific issues relating to the current AGRIS operations. Therefore, we offer some comment based on our experiences instead of direct suggestions toward improvements.

Management issues

The principal management issue is to separate the day-to-day database operational concerns from the more strategic considerations of the databases' roles in the wider system of information transfer. The latter, naturally, have to take account of the local conditions and capabilities to access the information itself. We achieved this by reconfirming the commitment by the owners and separating the management from the operations through an external service provider. A contractual arrangement allows for the monitoring of delivery against established and agreed performance parameters.

The next critical issue for the management team is to adopt a customer service attitude and to listen carefully to the needs of the users as our customers. In our case both ARRIP's and ABOA's survival are dependent upon the goodwill of the owners, i.e., the government departments and R&D corporations who are removed from the operation and management of the information but who receive advice on the quality of information provided by the databases from their own research and advisory staff as our customers. Another approach could be to vest ownership with the actual end-users, but this was not feasible in our case.

It is important to have an effective mechanism to obtain feedback from all types of stakeholders and customers of the value of the databases, and to constantly assess how to improve access and information delivery as technology evolves. It is worth nothing that end-users of ARRIP and ABOA are the source of data and without their commitment, the datafiles will not be updated.

In Australia CD-ROM and Internet technologies are now widespread and accessible to everybody in their private homes; end-users of our databases expect to have on-line access to data of high quality and integrity. Seamless inter-connectivity of different database structures is possible and indeed expected. The moment customer expectations are not met, they will go elsewhere.

It is critical to ensure that a high profile of the databases exists among end-users. Our review in Australia indicated that many research staff did not know about ARRIP and ABOA although they contribute to the databases themselves. They would typically approach their librarians to undertake complex searches and be provided with an output without really being aware of its source.

The database management processes need to facilitate and encourage data capture. Until recently, data for ARRIP were captured by forms being sent out to research staff; filling them out was seen to be onerous and of no importance to their research. The process of manually filling out forms remained difficult until electronic submission became available. As an incentive, some R&D corporations then required the data to be submitted before research funds became available and some also required the final reports of research projects to be on ABOA before the final payment was released. Another avenue may be to tap into project-based management information systems used by the research providers or research sponsor organisations.

General awareness and marketing of database capability and potential is an important task at both management and operational level. One of the key objectives is capturing the commitment by contributing organisations which pays to be part of the database. The underlying principle is that if it costs money to be on the database, the data must be worth something; if it was free, the value of the data would be less.

Another key objective is to invest some time in educating the leaders of the sponsoring organisations about the role and importance of these databases. There is now a world-wide move to form inter-agency strategic research alliances and high-level collaborations as part of emerging National Agricultural Research Systems and these databases are critical support systems to know what others are doing. We have had to overcome a mentality of "*we have our own internal system that works well for us; we do not need to know anything beyond that"*.

Operational issues

There will always be significant pressure to keep operational costs low. Despite the best intentions, full cost recovery is not feasible for these types of databases and a user-pays system is unlikely to be successful, as it will keep users away. There are wider, public benefits to be achieved by considering agricultural research

databases as public property and as such should be available to users free of direct costs.

Bibliographic databases have often relied on librarians to ensure data on new publications, especially within the grey literature, are incorporated. However, as resources become increasingly limited, professional library services are under severe cost pressures which means that indexing within the libraries may not occur due to lack of time. Accordingly, alternative arrangements may have to be considered. In Australia, Infoscan employs its own indexers who visit several libraries in each State. We are also investigating electronic transfer directly from CSIRO Publishing of the contents of their publications; and, as indicated earlier, some R&D funding bodies require abstracts of publications to be incorporated into ABOA as a research output.

It is important that operators of the database keep abreast of the rapid advances in information technology and actively improve their capacity to deliver information products at the cheapest possible rate. Reducing costs will improve users' interest in accessing the database, ensure their own data are incorporated and therefore improve the relevance of the database.

Significant cost efficiencies can also be gained in the presentation of the output. We used to concentrate on producing a nice compendium of high print quality as output, but we have realised we will achieve better penetration by cheap, laser-printed documents for a targeted audience.

Database operators need to be visible in the information marketplace to meet customer needs and to develop user confidence in the database product. In our case, Infoscan is actively seeking views of immediate users and is building up relationships with specific contact people in all participating agencies. This role is similar to that of the national correspondent for AGRIS, but in our case the lack of action from Australia over several years has not yet stimulated action from FAO.

Database content issues

The value of these databases is defined by their use which is limited by the quality of their contents. There are at least three elements to this:

- currency of data,
- relevance for user, and
- comprehensiveness of database coverage.

Users expect databases like CARIS and ARRIP to reflect current research, not projects that have been completed and where the research staff has dispersed. Similarly, AGRIS and ABOA are expected to contain the latest publications, even to the point of having references to journals just being published. It is essential to shorten the inevitable time-lag between data generation and actual appearance on the databases. The dynamic nature of these databases can only be fully satisfied by automated electronic input using templates and on-line data access in real time; any printed or disk output is dated as soon as it is produced.

The term "user relevance" is often taken as meaning the delivery of database outputs to meet the needs and expectations of the customers; but users also expect access to the references contained in bibliographic records. A bibliographic reference is irrelevant if the user cannot access it.

Needs analyses, which must be undertaken on a regular basis, should include some evaluation of satisfaction with alternative information sources. It is important that the databases are comprehensive and provide as complete coverage as possible of current research and literature on the subject. If users have to rely on alternative information sources to provide a satisfactory output, the quality of the databases will be challenged and it becomes a matter of competing against other information providers.

The databases must be comprehensive and seriously attempt to meet the needs of users. Integration with other databases may provide a seamless search capability of different datasets which – from a user perspective – will enhance the comprehensiveness of all databases. As an example, for a number of years our current CD-ROM product (Ag.round) allowed searches on both ABOA and Streamline although the databases were produced by two different operators. It is an unfortunate fact that the most readily available literature (e.g., high-profile journals) are abstracted several times over, while much other material remains unabstracted.

Information delivery issues

Databases such as ARRIP/ABOA or CARIS/AGRIS are not an end-point in themselves. These databases are only the starting point of much larger innovation and information systems. The enabling computing technology is assisting us in becoming more effective and to draw upon much larger resources than before.

As said earlier, what users want from bibliographic databases is not a print-out with a manageable number of key references, but the references themselves. It is frustrating to be told that an apparently valuable publication exists but is unavailable. This raises another key issue: Locating WHERE material is available and HOW it can be obtained is equally important. Full text electronic document delivery will play an ever increasing role in the future, but the cost of such a service could be prohibitive for some.

Another delivery issue relates to the technology itself. The user front-end of the databases must be as user-friendly as possible and accord with the current standard of desktop computer applications with which local users are familiar. If users are familiar with graphical user interfaces and good help screens from other software, a complicated text display and a proprietary command language for searches will restrict users

to those who interrogate the databases on a regular basis.

It has been said that the Internet has caused an information explosion where it is now much easier to access more useless information than ever before. However, there is plenty of good information out there, but we need careful management and good training, and better integration of separate data sources, preferable with a seamless search engine.

Finally, it appears to us that we have a number of independently operating information sources in this part of the world: AGRIS, Agricola, Infoterra and CABI are good sources of international publications that provide additional information to that which we currently have in Australia on ABOA. But they are all stand-alone activities and there is a degree of duplication while coverage remains incomplete; greater co-ordination could enhance cost effectiveness to the benefit of not only database operators but users too.

VISION TOWARDS THE FUTURE

Management of databases such as these is always a moving target as technology and user expectations evolve rapidly. It is essential to establish a clear developmental pathway, especially for database systems relying on distributed, co-operative efforts such as AGRIS or ABOA. As a participant in the AGRIS network we have not observed any clear statement of objectives for the direction of the network, nor any indication of performance evaluation and reporting.

The developing computing technology has changed the way documents are produced and published. More and more significant information is produced cheaply and made available to a limited audience and not captured through the normal indexing mechanism. This problem is a fact of life but some creative thinking is necessary to capture this information. By attempting to rationalise what we currently do, we may free up resources and enhance awareness of the need for others to get access to such information.

Instead of attempting to address all forestry information needs via AGRIS, we believe there is a clear need to enhance collaboration between several of these sources we have indicated earlier. Collaboration should embrace both data acquisition and search facilities.

One such example is Dialog from the National Agricultural Library of USDA. Dialog is a major database vendor and offers a multitude of bibliographic and full text databases. Searching on Dialog is expensive but it does provide a common command language for searching all the databases offered and many searchable elements recur in the various databases. This enables simultaneous searching across databases and also the elimination of duplicate records. There may be scope to build on this or even subsidise access for participants in the AGRIS network.

It would also be desirable to network national information centres and set up a number of one-stop information shops that have access to the actual references listed in the bibliographic databases, especially extension literature and conference proceedings. An important aspect would be to enhance exchange information between centres, not just communication between a central AGRIS office and individual, regional hubs.

Accompanying the building of international networks would be continuous analyses of needs and improvements in service deliveries reported as measurable outcomes against performance goals so that the value of the databases is made obvious to decision makers.

WHAT AUSTRALIA CAN CONTRIBUTE

The current awareness of, input to, and reliance on AGRIS in Australia indicate the value we put on this database. We accept that it may be a hidden treasure but it is currently not of much use to us. We believe that a paradigm shift is required to avoid AGRIS facing the same prospect of extinction as ARRIP and ABOA did due to escalating costs with few apparent benefits in the eyes of those who paid the costs. There are lots of parallels in how our decision makers looked upon ARRIP and ABOA and we believe we have some valuable experience to offer in that regard.

With our current improvements and renewed attention to ARRIP and ABOA, we can offer data contributions to CARIS and AGRIS as well as seriously consider strengthening the role of the Australian AGRIS contact.

We are hoping to have our databases accessible on the World Wide Web within a few years, possibly sooner, and to include information from ACIAR projects.

We will also pursue the development of seamless searching across our databases and work towards development of standard interfaces and search engines.

We also have expertise in strategic planning and performance monitoring, development of national agricultural research policy, information delivery through different IT systems, etc., which could be drawn upon if there is a wish to further improve networking and capabilities for information delivery.

CONCLUSIONS

- It is essential to consider **why** resources should be spent on databases like AGRIS and have a very clear perspective of the actual purpose of having them. It is critical to create and maintain an awareness of the value of these databases amongst both users and key decision makers and sponsors. In the day-to-day struggle to deliver better information services, the virtues of these tools may be hidden to outsiders.
- It is similarly important to consider **how** they should be managed and operated. Technology con-

stantly improves and there is a critical management challenge to search for a different but better way of information delivery.

- Another important consideration is who owners and potential collaborators are. Are there new opportunities to be gained from strategic alignment with former competitors similar to the way in which research providers are now often collaborating?

- Further consideration should also be given to **what** customers demand. The value of databases is determined by their use which is determined by their quality. There are separate, but inter-related and important issues to consider on the management and operational level, as well as on database content and the wider information delivery needed.

- Another consideration is **how much** decision makers and sponsors are prepared to pay. Declining costs of technology and telecommunications are revolutionising our attitudes and expectations of information world-wide and we can do more with less, but timely and adequate input remains essential. We must satisfy those who may not have a deep interest in these databases, and therefore we need to measure the value of what we deliver.

- A final consideration must be **where** do the databases fit into the innovation and information system. Research-in-progress and bibliographic databases are useless unless the customer can establish the contacts, avoid duplication and access the actual reference he or she needs.

ACKNOWLEDGEMENT

I would like to acknowledge the inspiration, encouragement and contribution provided by Ms Erika Leslie and Ms Roxanne Missingham, CSIRO Division of Forestry and Forest Products, and Wildlife Ecology, respectively.

IMPROVING ACCESS TO FORESTRY INFORMATION: THE EXPERIENCE OF FORSPA

Joozee Shellekens
FORSPA, Bangkok, Thailand

INTRODUCTION

The Forestry Research Support Programme for Asia and the Pacific has the broad mandate to enhance the capacity of member countries in Asia and the Pacific for undertaking forestry research for improved conservation and management of forest and tree resources. The programme has both regional and country-level activities that are inter-linked. The regional activities are focused on facilitating networking of all research institutions and activities that have a direct bearing on the regional networking function. These include:

i) Strengthening the Asian Pacific Association of Forestry Research Institutions (APAFRI)

ii) Supporting establishment of problem-specific networks;

iii) Development and updating regional databases; and

iv) Undertaking studies on issues concerning technology development and adoption by disadvantaged groups.

The country-level activities are mainly focused on capacity development of national research systems, especially those with inadequately developed systems. Support is specifically directed to improve research strategy formulation and planning, human resources development, information technology and developing twinning arrangements for technology transfer and adaptation.

Thus FORSPA's involvement in improving access to information is both at the regional level and the national level. At the regional level the main thrust is to develop databases that are of wider interest and relevance, while at the national level the emphasis is on providing access to information.

REGIONAL ACTIVITIES

The importance of enhancing access to information was realised right from the beginning of FORSPA Phase I and, accordingly, efforts were made to develop databases that were regarded as relevant. While some of them are being continued (database on forestry research professionals) others have been discontinued (database on social science institutions carrying out forestry-related research and database on grey literature), new initiatives have been taken to develop databases on short-term training courses and forestry research projects. The important databases now being developed/update are as follows:

Database on forestry researchers

This database was initiated in 1992 and contains biodata and publications information. A directory (in hard copy) was published in 1993, providing information on 881 researchers. In 1995, the format was changed to put more emphasis on specialisation and areas of interest of researchers. The database is maintained in MS ACCESS and currently has information on 725 forestry research professionals including their qualifications, specialisation, present and previous positions and publications.

Database on ongoing and completed research projects

Development of this database was initiated to facilitate closer interaction among researchers working on similar topics in different countries and institutions. Literature review undertaken prior to commencement of research programmes is generally limited to published information, and due to the limited scope and access of published information, researchers are not fully aware of what is ongoing in the areas of their interest.

Although all important institutions were contacted to provide information, with FORSPA meeting the costs of collection and compilation of information, hitherto a limited number of accessions have been obtained. At this time, the database contains details of only 62 ongoing projects and 118 completed projects from Bangladesh and Pakistan. We are expecting input from China, Malaysia, Thailand, the Philippines, India, Indonesia, Myanmar and Sri Lanka and to establish a wider coverage so that the database can serve as a source of reference for information on ongoing and recently completed forestry research projects.

The database is being developed using MS ACCESS and the information on ongoing research projects is comparable to CARIS. For completed projects, additional information on publications resulting from the project and main conclusions are included. The difference to CARIS is that it does not contain any information on previously completed projects.

Database on short-term training courses

The first version of this database was developed in collaboration with USDA Forest Service and a hard copy covering 171 training courses in 50 institutions was published in 1996. This database (also in MS ACCESS) provides complete details of each course (such as objectives, topics, methodology, target group, course fees, contact address, etc.) and also a profile of the institution organising the course. Presently, FORSPA is updating the information to publish an electronic version in 1997 covering all the short courses.

Constraints in developing regional databases

The objectives for development of the databases were to provide information by publishing a hard-cover copy once in a while and answering requests for information on various subjects from professionals involved in forestry. The database on ongoing and data on completed research projects are especially designed to inform researchers on projects to improve interaction which could facilitate sharing of information and avoid duplication.

Although the need for such information is well recognised, collection of information faces several problems. Generally the response to questionnaires is far from satisfactory and in some cases the overall response has remained very low. Despite enormous potential benefits of such databases, the willingness to participate and provide country-level information is far from satisfactory. Even when it was agreed that the actual costs involved in collecting and compiling information will be met, the response has not been encouraging. Also it was presumed that once a hard copy is published and circulated, it will evoke more interest to provide missing information and to get regular updates. However, this assumption seems to be rather over-optimistic.

COUNTRY-SPECIFIC INFORMATION SUPPORT SERVICES

Country-level support is focused on improving access to information. During 1992 and 1995 FORSPA (through CABI) provided 22 CD-ROM work stations, TREE CD archival disks and annual updates and a limited number of pre-paid document delivery vouchers to procure reprints of articles. Training was provided to librarians/information managers on the use of the CD-ROMs. Twenty institutions were provided with subscriptions for Forestry Abstracts. As part of the information support CABI, in collaboration with CIFOR, organised training for librarians in indexing and abstracting forestry literature. Twenty forestry research institutions were provided with facilities for e-mail connections.

During FORSPA Phase II some of these activities will be continued, but the thrust will be on enhancing the capacity of countries like Laos, Vietnam, Myanmar, Cambodia, Bhutan and the South Pacific island countries. FORSPA has drawn up an agreement with CAB International for additional information support services. As part of this, CAB International is fielding a mission in November 1996 to Cambodia, Laos, Myanmar and Vietnam to review the present status of information and to recommend measures to develop the information systems, taking into account the capability of the countries and developments in information and communication technologies. The review will also deal with access to information produced within the countries, mechanisms for in-country collaboration to rationalise the system to facilitate sharing of information, inputting of national information to global resources and designing an information system to meet the emerging needs.

New CD-ROM workstations will be installed in Laos and Cambodia, 10 institutions will be provided with TREE CD updates and a limited number of pre-paid delivery vouchers, and other institutions will be provided with subscriptions to Forestry Abstracts. To facilitate communication between researchers in the region, FORSPA intends to provide e-mail facilities to institutions in countries where a local Internet provider is operating. A questionnaire has been sent to focal points and in 1997 some institutions will be provided with these facilities (Bangladesh, Sri Lanka, Nepal, Papua New Guinea, South Pacific countries).

KEY ISSUES RELATING TO INFORMATION ACCESS

The use of TREE CD has been dictated by its wider coverage of forestry information, although it is more expensive and several of the institutions will not be in a position to procure annual updates on their own budget. It is hence imperative that measures be initiated to give wider coverage for forestry in AGRIS. This will require substantial efforts on the part of the AGRIS country focal points to incorporate forestry information. With regard to cost considerations, a possible option is to promote sharing of facilities especially through Internet.

Another issue relates to the need for optimising information systems. The ideal information system should be demand-driven, provide as much useful information as possible, be easily accessible and cheap. In order to make the databases demand-driven and extensive, a regular flow of information between users and generators of information needs to be ensured. Most users are pleased to have ready and cheap access to information, but they are less willing to be providers of information. This inevitably leads to a situation necessitating specific efforts to collect, compile and supply the information with its attendant costs. The result will be that access will be dependent on the ability to pay for the information and institutions with limited budgets in lesser developed countries will be left out of the information network. It is important to consider how this dilemma could be resolved.

IUFRO AND POSSIBILITIES OF ENHANCING COLLABORATION WITH AGRIS/CARIS

Heinrich Schmutzenhofer
IUFRO, Vienna, Austria

INTRODUCTION AND BACKGROUND

IUFRO and FAO have been co-operating on a general level in forest science and forestry since the foundation of FAO after World War II. From this general level, a more specific co-operation developed in the field of literature within the framework of AGRIS.

IUFRO's contacts with AGRIS go back to 1977; in 1980, IUFRO seemed to be ready to start as a proper Participating Centre. It was planned that IUFRO literature be placed on the AGRIS system. In the late 1980s, IUFRO contributed via ZADI and the local Federal Forest Institute in Vienna in a quite satisfactory way. Unfortunately, local support for IUFRO in Austria was not available to continue the services in the early 1990s. Efforts were made in 1993 to re-establish IUFRO Vienna as an entrance centre; since late 1994, IUFRO publications have been entered into the AGRIS system. We speak here only about IUFRO publications edited in Austria at IUFRO's headquarters. IUFRO proceedings resulting from IUFRO meetings should be entered in the local national Participating Centre where the proceedings are published.

No more difficulties in entering literature from Vienna have arisen, and IUFRO is not only co-operating with AGRIS; it is, of course, co-operating with CAB International through its structure of the IUFRO divisions.

IUFRO'S PUBLICATIONS AND CONFERENCE PROCEEDINGS

Overview: edited at the Vienna HQ

IUFRO News: published quarterly

IUFRO Annual Report: published in four languages

IUFRO World Series: approx. 1 volume per year

IUFRO Occasional Papers: approx. 2 papers per year

Information Bulletin for Developing Countries: normally published twice a year

Conference and meeting proceedings

Proceedings of the IUFRO World Congresses: until 1990, all invited papers were published in full format; the whole set of Congress Proceedings were published in the host countries. Since 1995, only Abstracts of Posters and Invited Papers are published and one volume of full-text papers of Sub-plenary Sessions and Inter-divisional Meetings.

Congress Reports: 1 or 2 volumes at each Congress published by the host country.

Conference Proceedings: all major meetings of IUFRO working units (Research Groups, Working Parties, Inter-divisional Meetings and all Division Meetings) edit proceedings containing mostly full-text papers. Approximately 50 volumes per year.

Meeting statistics

The statistics from 1991 to 1996 show a total of 346 meetings which amounts to an average of 58 meetings per year. It is notable that the number of meetings held in so-called developing countries or countries with economies in transition is steadily increasing and has already reached 25%. A good regional distribution of IUFRO meetings throughout the world can also be seen. Of course, North American and European host countries are still dominating.

IUFRO reference library

The IUFRO Bylaws state that the organisers of IUFRO meetings and conferences provide at least two courtesy copies for the IUFRO Reference Library. The publications and proceedings reaching the IUFRO Secretariat are automatically announced in IUFRO News and then placed into the Reference Library.

In October 1996, this library which was started in 1973 had more than 1000 publications in the database. From 1994 to August 1996, 116 volumes have been entered. This means that roughly 50 IUFRO publications containing 20-30 original papers, that is 1250 original papers, are published annually.

IUFRO in the AGRIS system

It is hard to obtain good statistics, but a request from the AGRIS Centre in Vienna at the UN HQ showed that from January 1995 to October 1996, 228 IUFRO references are listed.

The last Silver Platter (August 1996) contains 206 entries of IUFRO.

STRENGTHENING IUFRO'S PARTICIPATION IN AGRIS

Entries by IUFRO Vienna

There is no problem with entering IUFRO publications edited in Austria. Local arrangements have been recently improved and are secure for the future.

Proposal: entry of IUFRO proceedings not entered into the system by national centres

This is a proposal for discussion and could be implemented easily and at low cost.

Entries of IUFRO proceedings at national centres

It has been tried to enter IUFRO proceedings at national centres by means of IUFRO News and circular letters to IUFRO office-holders and officers hosting IUFRO meetings. Unfortunately, we were not able to achieve complete coverage.

Promotion of AGRIS/CARIS in IUFRO

The IUFRO homepage contains a link to FAO. In addition, the Latin America Information Network Working Unit, 6.03.04, has individual direct links to the FAO Documentation Centre and to AGRIS and CARIS.

Further circular letters to organisers of IUFRO meetings will hopefully strengthen the presence of IUFRO in the AGRIS literature database.

The forest research institutes will be reminded to communicate with the corresponding national indexing centres.

FAO-AGRIS has the ongoing possibility to place new information into IUFRO News.

FORESTRY RESEARCH INFORMATION IN BANGLADESH

Dr. M. Zahangir Kabir
Agricultural Information Centre, Bangladesh Agricultural Research Council, Dhaka, Bangladesh

THE COUNTRY

Bangladesh is one of the most densely populated countries of the world, which has implications for the forestry sector. Pressures on the forest resource have led to serious depletion and associated ecological and environmental damage. A number of research and development projects are being implemented to address the problems, e.g., ADB-aided Thana Afforestation and Nursery Development Project; the World Bank-funded Forest Resources Management Project; Agro-forestry Research and Demonstration Project.

The deforestation rate is projected to be 3% annually to the year 2000 causing serious ecological imbalance and recurrent natural disasters. Strengthening multi-dimensional research will help to arrest further deforestation and replenish denuded forest land. Access to forestry-related information is important in this research.

INSTITUTIONS CONDUCTING FORESTRY RESEARCH AND GENERATING FORESTRY INFORMATION IN BANGLADESH

Bangladesh Forest Research Institute (BFRI) which conducts forest management and forest products utilisation research, is able to cater to the current information needs of the nation with the database it has created and the technologies generated. Although administered by the Ministry of Environment and Forest, BFRI is a component of the National Agricultural Research System (NARS) and has strong collaboration with international forestry organisations and networks. BFRI maintains the richest forestry library and documentation facilities in the country.

An internationally abstracted forestry journal, Bangladesh Journal of Forest Science, is published from BFRI twice a year. In addition, research results are published and disseminated as research papers in local, regional and international journals, as well as bulletins, working papers, folders and leaflets.

The Institute of Postgraduate Studies in Agriculture (IPSA) has opened a new department of Agroforestry and Environment for MS/PhD degrees. Although the Institute of Forestry and Environmental Sciences of Chittagong University does not carry out research activity related to forestry, the students review forestry studies. The Institute is now offering both undergraduate and post-graduate degrees. The Forestry and Wood Technology Department of Khulna University and the Department of Agroforestry of Bangladesh Agricultural University carry out partial forestry research as part of their academic activities.

OTHER INSTITUTIONS RELATED TO FOREST RESEARCH AND INFORMATION

Bangladesh Agricultural Research Council (BARC) is the apex body of the National Agricultural Research System (NARS). It plans, supports, co-ordinates, implements and evaluates various sub-sectors of agricultural research including forestry, fisheries and livestock. The Forestry Division of BARC is responsible for planning, co-ordinating, monitoring and evaluating forestry research programmes. It also co-ordinates agroforestry research and training activities. BARC supports multi-disciplinary, inter-institutional co-ordinated research programmes and funds BFRI to facilitate forest research and assists in manpower development and technology transfer. The Forestry Division of BARC has a role to facilitate, monitor, evaluate and co-ordinate forest research.

The Bangladesh National Herbarium (BNH), currently a part of BARC's Forestry Division, provides an information service on flora. The Bangladesh Space Research and Remote Sensing Organisation (SPARRSO) acts as the national focal point for all remote sensing activities and space research in the country. Of particular interest are the activities using remote sensing technology in the field of forestry.

The Bangladesh Council for Scientific and Industrial Research (BCSIR) Laboratory at Chittagong

conducts research on cultivation and bio-chemical aspects of medicinal plants to determine optimal conditions for planting and harvesting and to develop appropriate agro-post harvest and chemical technologies along with the pharmacopoeia of the plants.

The Forest Department (FD) is implementing a study entitled Integrated Resource Development of Sundarbans Reserved Forest which is expected to provide baseline information for formulation of an integrated resource management plan for the development of the Sundarbans Reserved Forest. Involvement of BFRI in the study project will enhance its capability to conduct research on natural mangroves. Ford Foundation is supporting a Pilot Project for Agroforestry Research and Demonstration in the Sal forest zone. The project is being implemented by the FD. The FD has developed a computerised database for resources information management. The system is capable of updating resources information as new data become available and can simulate and forecast changes in resource status under various scenarios.

BARC-WINROCK AGROFORESTRY AND PARTICIPATORY FORESTRY RESEARCH AND TRAINING SUPPORT PROGRAMME

The objectives of the programme are to strengthen co-ordination and support collaborative research, training, dissemination of research results and networking in the field of agroforestry and participatory forestry in Bangladesh. BARC is the implementing agency for this programme. It is supported by grants from the Ford Foundation and PACT Bangladesh and publishes the Agroforestry Information Series to disseminate agroforestry and participatory forestry research results and development experience.

OTHER MEDIA FOR FORESTRY RESEARCH INFORMATION

- An Agroforestry Newsletter is published by the National Agroforestry Working Group (NAWG) with financial support from Asia-Pacific Agroforestry Network (APAN) of Bogor, Indonesia. This quarterly Newsletter is designed to disseminate agroforestry information on technologies, research and development efforts at the national as well as international level.

- *Agroforestry in Bangladesh* is edited by Prof. Md. Abdul Haque, Head Department of Agroforestry, Bangladesh Agricultural University. The book gives elementary information on agroforestry with special reference to Bangladesh.

- *Annotated Bibliography on Agroforestry in the SAARC Region* (published by SAARC Agricultural Information Centre, Dhaka, Bangladesh) presents an annotated bibliography of 1125 research works on agroforestry in the SAARC region of which 93 are in Bangladesh.

- Database on Forestry, developed by the Agricultural Information Centre (AIC) of BARC, provides detailed information on agriculture and allied areas including forestry on national, regional and world basis. The database contains valuable data on forestry information and it is growing rapidly.

AGRIS INPUT

About 12 000 records have been prepared so far by AIC of BARC and sent to AGRIS Processing Unit, APU, Vienna. Approximately 5% relate to forestry information from Bangladesh. However, there has been a declining trend in the AGRIS input from Bangladesh in recent years due to the following problems:

- Inadequate and inappropriate computer facilities.
- Non-functioning CD-ROM player.
- Scarcity of funds for literature collection from the National Agricultural Research System.
- Lack of professional personnel.

We are in favour of wider participation in the International Information System for the Agricultural Sciences and Technologies (AGRIS) in the coming years. We need help and co-operation to solve our problems in achieving this goal.

THE STATUS OF CHINESE FORESTRY INFORMATION

Meng Yongqing
The Institute of Scientech Information, Chinese Academy of Forestry, Beijing, China

Scientific and technological information of the People's Republic of China has developed greatly over the past 40 years. Forestry information is an important part of Chinese science and technical information and has made great contributions to the forestry economy, research, education and production. Under continuing reform and opening to the outside world, our forestry authority is formulating strategies and policies for information development in order to promote forestry information in the 21st century.

THE STATUS OF CHINESE FORESTRY SCIENTECH INFORMATION

China has 251 forestry research institutions, 11 forestry universities and colleges, and 56 forestry schools which house forestry literature. The library of the Chinese Academy of Forestry attached to the Institute of Scientech Information is the biggest in the Chinese forestry sector with over 350 000 volumes, including more than 1000 Chinese and foreign periodicals.

The literature storage system is at three levels. The Library of the Chinese Academy of Forestry, Library of the Institute of Survey and Design, Library of the Institute of Forest Products Design, as well as the libraries of six forestry universities and colleges, are the main sources of forestry information. Each centre maintains a specialist collection based on region or subject. The provincial institutes of forestry research and forestry colleges also maintain their own libraries. Institutes of forestry research and forestry schools in the prefectures and municipalities also have some collections.

The development and application of forestry information database

The forestry information database is an important fundamental element of a modern system. The Chinese forestry information unit has been using foreign forestry literature databases such TREE-CD, AGRIS, CABI and AGRICOLA. Development of the forestry information database began in the 1980s. Since 1982, CAB computer retrieval tape, jointly developed by the library of the Chinese Academy of Forestry and the Library of the Chinese Academy of Agriculture, has been providing a retrieval service to about 200 forestry users annually. A database in Chinese characters was initiated in the mid-1980s at the Institute of Forestry Research of Sichuan province. More than 20 forestry databases have been completed or are being developed, which include literature databases on the protected forest, the forestry economy, general forestry, tree physiology, a paper database of academic degrees from the Chinese forestry sector, a catalogue database of Chinese and foreign periodicals stored in forestry libraries, and a database of scientific and technical results of the forestry sector. The combined database of Chinese literature on agriculture and forestry is one of the current important databases in the country.

Construction of a forestry information network

The development of a computer-based forestry information network is in its infancy. An information network has just been established by the Institute of Scientech Information. The database includes literature stored by the library, and Chinese and foreign language periodicals. Supported by the Ministry of Forestry, scientists including computer experts and forestry professionals of the Institute of Forest Resource Information, are developing the Information Network of the Chinese Academy of Forestry, which will become the most important forestry network in China.

Publication of Chinese forestry periodicals

Forestry periodicals are widely used by forestry professionals in China for information exchange. There are about 50 regular forestry periodicals published by forestry universities and colleges, the institutes of forestry research at the central and provincial levels, and the Chinese Forestry Society. Because of language

problems, these Chinese character periodicals are difficult to exchange with foreign counterparts.

Organisation of Chinese forestry information

The Information Department of the National Committee of Science and Technology is responsible for formulating strategy and policy for national information development. In the forestry sector, the agencies are the Institute of Scientech Information, 13 forestry centres in provinces and autonomous regions, as well as the information agencies belonging to other ministries and departments.

In 1985, the Library Information Committee of Forestry University, College and Academy was set up. The Coordination Committee of Forestry Scientech Literature of China and the Information Center of National Forestry University and College were established in 1992. In addition, the Chinese Society of Forestry has its own branch committee of forestry information.

These information centres play an important role in the development of Chinese forestry information. The Institute of Scientech Information has made great contributions to the dissemination and promotion of forestry information in China. It publishes Abstracts of Chinese Forestry, Abstracts of Foreign Forestry, and Abstracts of Foreign Forest Products. Supported by CIFOR, it publishes Abstracts of Chinese Forestry Scientech Information in English, which provides an opportunity for overseas scientists to understand forestry science and technology of China. Its Research Division is engaged in research on forestry information from both China and overseas.

ISSUES FOR FORESTRY INFORMATION AGENCIES IN CHINA

- The amount of forestry literature acquired has decreased because of inadequate budget and soaring costs of publication. However, the user demand for forestry information is increasing rapidly.

- Although forestry periodicals are an information source widely used in the Chinese forestry sector, a crisis of inadequate funding has emerged to hamper publication. The cost of paper, printing and distribution is raising rapidly, while subscriptions are limited. To continue some scientific and technical periodicals have had to carry advertisements and others retrieval periodicals have reduced their size and number.

- A lack of a centralised plan for information database development means that management is not effective or standardised. Consequently, database service capabilities are not strong and, as a result, the use of existing databases is very low.

- Inadequate opportunities are available for training forestry information professionals. With the rapid growth of information resources and development of information technology, training is essential. However, a low proportion of librarians receive specialist higher education, there is little chance for computer training of editors, few library staff can use English well, and low wages attract few newcomers to the job.

DEVELOPMENT PLAN FOR CHINESE FORESTRY SCIENTECH INFORMATION (1992 TO 2000)

The Chinese forestry information sector is facing both problems and opportunities for development. The Ministry of Forestry has paid great attention to forestry information development with an information development plan for Chinese forestry science and technology.

The plan aims to promote forestry information for forestry research, education, production and policy making; develop information centres at all levels; establish a national computer retrieval system; develop information products; and make contributions to the national goal of forestry development.

Major tasks are to:

- improve the national forestry information system through improving forestry information centres and stations at each level;

- establish and perfect the system of forestry literature and service;

- establish a national computer retrieval system of forestry Scientech information;

- strengthen forestry information research, and establish a system of information research and policy making consultation to meet demand;

- promote forestry information-oriented industry development; and

- strengthen international co-operation and exchange.

STATUS OF FORESTRY INFORMATION IN INDIA

Amrish Sharma
National Forest Library and Information Centre, Indian Council of Forestry Research and Education, Dehra Dun, India

Access to the increasing amount of knowledge available needs to be rationalised to reduce costs of accessing information in terms of time and money. This paper provides an overview of the information services and features of the National Forest Library and Information Centre, Indian Council of Forestry Research and Education (NFLIC), India.

CD ROM NETWORKING

During 1995, the National Forest Library and Information Centre (NFLIC) installed a CD-ROM Network to allow multiple users to access the CD-ROM disks. Those available include TREE-CD, CAB-CD, ECODISC, AGRICOLA, AGRIS, Biological Abstracts, Woods of the World, Science Citations Index, ANICAP and Agricultural Economics CD.

The CD-ROM database facility extends through the National Informatics Centre Network to all the other institutes of ICFRE and forest universities and State forest research institutes. The users outside Dehra Dun can access the CD Juke box and download desired information from the CD database. Regular training programmes are conducted at NFLIC for users on CD-NET databases. As more databases are acquired, better equipment is needed to improve access and reduce waiting time for users.

GREY LITERATURE

An enormous amount of information in forestry is available in informal publications. These include doctoral theses, post-graduate dissertations, PG Diploma assignments, working plans/schemes, institutional and departmental reports, pre-prints, newsletters, articles in local newspapers and magazines, proceedings of local and regional seminars, minutes of meetings/conferences, and proceedings of professional get-togethers.

NFLIC has a unique grey literature collection on forestry in India, from the inception of forestry research in 1875 to the present day. Literature acquired from such non-conventional sources are abstracted, classified, indexed, referenced and filed. For every article, index cards and reference sheets are prepared for author, subject and plant species. The miscellaneous literature is kept in files by subject and plant species. Over 100 000 index cards and 6600 files are maintained.

For management of this grey literature at the National Forest Library and Information Centre, a machine-readable system would be useful. In addition to participation in the regional and national networks, sharing grey literature maintained on machine readable language by various forestry research organisations across geographical boundaries is made easier. The documents can be scanned and the keywords identified for searching. The classification number could also be stored. Once this database is set up, CDs could be made for distribution.

PUBLISHING WITHOUT PAPER

The *Indian Forester*, a pioneer journal of forestry research since 1875, is very closely associated with the continued advancement of forestry, and is a storehouse of forestry information for researchers in forestry science. However, this valuable document is gradually becoming inaccessible due to problems with preserving old documents. The retrieval process from these journals is very tedious and time consuming. To preserve these documents they should be stored on electronic media. This will also ease the retrieval process. The necessary groundwork has already been started.

Today's available electronic publishing tools can create publications that can be viewed, navigated, annotated and distributed via CD-ROM, over a network, or through an on-line service.

Similarly we are planning to create a CD-ROM for all internal publications of ICFRE. This will allow the user to access the information easily from remote stations via the WAN (Wide Area Network) which is already established.

INFORMATION SERVICES AND PRODUCTS

To keep forest scientists informed about the latest scientific and technical information, the following services are available:

- Retrospective Search Services (RSS) from in-house databases, CD-ROM and on-line information systems, for different outside organisations or in-house demands;
- Current Awareness Services (CAS) of the new reading materials;
- Automated Selective Dissemination of Information Service (ASDIS) personalised to meet specific needs of the user community by maintaining a user profile and subject profile of all the sectors of industry and running this profile bi-monthly against on-line searches. It can provide information from the world's leading databases;
- Document Delivery Service (DDS/CAPPS) provides photocopies of the contents pages and author abstracts of the selected core titles of reference from the list of acquired journals on forestry science and applied geo-sciences. Papers from core journals, research papers and references from CAS, RSS, etc. are available on price basis;
- CD-ROM Based Information Service (CDIS) for providing information services to forestry as a whole by creating a subset of wider database available in CD-ROM;
- On-line Alert Service (OAS) exploiting the on-line databases to provide an alert service according to the requirements of different segments and directly mailing the information to the users.

CONCLUSION

More than two years after starting the computerisation activities at the Centre, we are now seeing the benefits of our earlier planning; usage in all sections is increasing, and the profile of information services has been considerably improved in the process. I believe that we need to continue with provision of user-friendly information services and that researchers are trained and educated to make the fullest use of the information services.

AGRIS AND CARIS ACTIVITIES IN INDONESIA

Liannie K. Daywin
Agency for Agricultural Research and Development, Bogor, Indonesia

POTENTIAL INFORMATION SOURCES

The main sources of scientific information are the research centres/research institutes within the Agency for Agricultural Research and Development (AARD), scattered in several provinces but mostly located in Bogor. They produce journals, bulletins, reports and proceedings. About 35 Journals are produced within AARD and 425 research programmes conducted yearly.

Apart from AARD, most state universities have research departments and there are also regional and international organisations such as BIOTROP and CIFOR. Each produces various publications.

FLOW OF INFORMATION/PUBLICATIONS

All publications published within the Ministry of Agriculture should be deposited in CALREC (Center for Agricultural Library and Research Communication), but because of budget constraints some institutions do not comply. Staff changes also affect distribution policy or knowledge about rules.

Some universities have an exchange agreement with CALREC publications.

STAFFING

Sixteen part-time librarians are involved in processing the AGRIS documents for agricultural information published in Indonesia, with 10 part-time computer operators for inputting. Staff changes affect the quality and rate of processing.

AGRIS/CARIS INPUT

During 1995-1996 we sent 600 articles and an additional 300 articles are still in the editing process. CARIS information is still being edited.

AGRIS PRODUCTS

Recently we received a new version of AGROVOC (1995); AGRIS, 1975-1996; AGRIS, Fisheries (Prototype) 1975-1983; AGRIS FHN, 1975-Dec. 1995; AGRINDEX, up to 1995.

USE OF AGRIS CD ROM

Most users are researchers from AARD and post-graduate students from Bogor Agricultural University. We have received requests for information using AGLINET from 6 countries. To serve our local users, we also seek international information by fax and e-mail. This is faster but still considered expensive. Image scanners have been tried for document delivery but it uses a lot of storage space.

CONSTRAINTS

- Limited availability of documents in AGRIS increases search and access time and costs. Non-conventional literature is backed up by microfiching the document internally.
- Lack of staffing: quality and quantity with keyboarding and language skills.
- The language barrier: articles in AGRIS are not always in English.
- Document delivery: has improved with new technology such as fax and e-mail but still considered expensive.
- Frequency of publication: often irregular
- Searching documents is expensive in time and money
- Currency of information: most documents received are 1-3 years old and processing takes time.

THE PRESENT CONDITION OF THE AGRIS PROJECT IN JAPAN

Noriko Kotobuki
Agriculture, Forestry and Fisheries Research Information Center, Tsukuba, Japan

CO-OPERATION WITH THE AGRIS PROJECT

Japan joined the AGRIS project, and has been co-operating with this project at the national level, from the beginning of the production of AGRINDEX (experimental issue) in 1973. We have been collecting and inputting literature related to agricultural science in Japan, and the Agriculture, Forestry and Fisheries Research Council Secretariat has been in charge of this project.

Japan has been able to co-operate with AGRIS from the beginning because it has been publishing the *Japanese Agricultural Science Index* since 1970, selecting and treating papers and articles carried in about 500 journals (about 10 000 items per year) including agricultural science and its peripheral fields. It has been captured in databases since 1981.

The Agriculture, Forestry and Fisheries Research Information Center is in charge of collection and selection of literature as the input centre and input work is done by out-sourcing.

COLLECTION, PROCESSING AND TREATMENT OF INFORMATION

Forestry literature comprises 3.8% of the total AGRIS database. Over the last 5 years about 3% of the inputted data has been on forestry related material.

The number of records input to the database has declined slightly in recent years because of the increase in labour costs. The level since 1993 has been between 7000 and 8000 records.

Data was originally mailed to FAO in the form of a magnetic tape, but since 1996 Japan has sent data by FTP (File Transfer Protocol) and electronic mail. This method operates very smoothly.

SUPPLY AND USE OF AGRIS DATABASE

The Agriculture, Forestry and Fisheries Research Information Center constructs the AGRIS database based on the magnetic tape returned from FAO and supplies the contents for use.

The staff members of the Ministry of Agriculture, Forestry and Fisheries can carry out on-line retrieval through MAFFIN (Ministry of Agriculture, Forestry and Fisheries Research Network) and can output retrieved results. Other users can retrieve AGRIS from DIALOG. The use of on-line retrieval is more popular than the printed product or CD-ROM form in Japan. In addition to these conventional methods, we have had access to AGRIS through the Internet since 1995.

Further increases in use from various fields is expected in the future.

FUTURE PROBLEMS

Under the present budget conditions in Japan, we are unable to increase the number of inputs because of the increase in labour costs. An increased budget in line with the increasing output of agricultural literature would solve this problem. A trial to use a scanner to input abstracts is still experiencing problems.

PAKISTAN NATIONAL AGRIS/CARIS CENTRE FORESTRY INFORMATION SERVICES

Shahnaz Zuberi
Directorate of Scientific Information, National Agricultural Research Centre, Islamabad, Pakistan

The total forest area of Pakistan is estimated at 4.20 million hectares or 4.8% of the total land area of the country. The forest sector contributed about 0.2% of the GDP during 1995-96. The reported forest cover does not meet the country's wood requirement. The government is trying to increase the forest area, especially by social forestry programmes with attractive incentives in the form of subsidised supply of planting stock, partial payment of planting cost, free protection of planted areas for a limited period of time and fair return to the farmers.

FORESTRY SECTOR

The Pakistan forestry sector is administratively controlled by six government departments. At the federal level is the Ministry of Food, Agriculture and Livestock, with a Forest Division. There are forestry departments in all four provinces of the country and AJ&K. There are eight major research and development organisations in the forestry sector and other organisations which indirectly deal with forestry. Some NGOs, as well as international organisations like FAO, IUCN and WWF, are also active in the forestry sector in Pakistan.

FORESTRY INFORMATION SERVICES

The concept of establishing specialised information centres in specific areas like forestry is not yet established in Pakistan. At present there is no single agency acting as a national centre for the collection and dissemination of information on forestry. Forestry information is dispersed among various organisations and departments and there are no formal links among them, hence there is no systematic and regular information location, collection, processing and dissemination service. In fact there are many agencies in Pakistan maintaining the data on forestry or, to be more specific, a product of their own research and development work, but these organisations do not have co-ordination with each other, especially for information exchange.

Almost all forestry research and development organisations maintain libraries but their services are restricted mostly to their own employees. Resource sharing and inter-library co-operation does not occur in forestry libraries. The biggest forestry library in Pakistan is located at the Pakistan Forest Institute, Peshawar, with more than 30 000 books/documents and 150 periodical titles.

The *Pakistan Journal of Forestry* is a quarterly publication from the Pakistan Forest Institute. More than fifty other journals/magazines on agriculture and biological sciences contain articles on forestry. Research and development organisations also publish research reports, monographs, proceedings of seminars/workshops/training courses, etc. About 50 theses are annually released by the Pakistan Forest Institute, and Department of Range Management and Forestry, University of Agriculture, Faisalabad.

FORESTRY INFORMATION AND NATIONAL AGRIS/CARIS CENTRE

There is no single agency in Pakistan that devotes its energies towards the collection and dissemination of forestry information. There is no effort to co-ordinate information at the national level. The National AGRIS Centre – Pakistan attempts to trace, acquire, index and disseminate, at the national level, information on agricultural literature, including forestry, produced locally. However, there is no effort to collect comprehensive information on various aspects of forestry, especially financial, human, physical and natural resources data, problems affecting forestry production, environmental aspects with reference to land, water and ecological quality control and minimising hazards to ecosystems.

ORGANISATION

The National AGRIS/CARIS Centre is located at the Directorate of Scientific Information (DSI), National Agricultural Research Centre (NARC), Islamabad. The sections of the Directorate are: database; documentation; library; public information; microfilming; and

photographic. In addition there are Directorates of Audio-visual Communications, Publications, Training and Technology Transfer in the NARC.

SERVICES

The DSI is a centralised information facility on all aspects of agriculture including forestry, fisheries and livestock for the use of researchers, extension workers, administrators, students, faculty members and farmers. Major information processing and disseminating services of the Directorate include:

Pakistan Agriculture Database

The Pakistan Agriculture Database consists of references to documents published in Pakistan or elsewhere in the world about Pakistan's agriculture, and which are input into the AGRIS database. Created in 1988 on INMAGIC software, more than 18 000 records have been entered, with 600 on forestry. During 1995 it was decided to include abstracts. The database helps scientists identify, locate and use literature and obtain specialised bibliographies. Copies are maintained at major agricultural research and academic libraries in Pakistan.

Union database of journals in agricultural libraries

This is a computerised database of journal holdings of agricultural libraries in Pakistan. It is a menu-driven, user-friendly system that needs minimal training for use and produces a variety of outputs meeting the requirements of the users. Searches may be for a specific library or all libraries and by journal, volume or issue. It contains information from 2794 periodicals with available volumes and issues in 28 agricultural libraries, including the holdings of the biggest forestry library, i.e., Pakistan Forest Institute's Library.

National Agricultural Information System of Pakistan (NARISP)

The National Agricultural Information System of Pakistan (NARISP) is a designed to provide information to policy makers, research managers, programme leaders and scientists about personnel and projects in various disciplines of agriculture and allied subjects including forestry. Data has been collected from 600 scientists.

International database searching facilities

To help scientists search world literature, the Centre provides retrospective searching facilities of 23 international databases available on CD-ROMs, including major agriculture and life sciences databases like CAB, AGRIS, AGRICOLA and Biological Abstracts as well as specific databases like TREE-CD, ECONLIT, FASTA, Pest Bank, Tropog & Rural, Aquatic Science and Fisheries Abstracts, etc. About 8-10 search requests are undertaken daily and results supplied as print-outs or computer file(s).

National Agricultural Library

The Directorate maintains the National Agricultural Library of Pakistan. About 10% of its total holdings are on forestry and related subjects.

Document delivery

Under this service, the requested documents are searched from within the country as well as procured from abroad for scientists. Foreign requests for the supply of Pakistani literature are also handled under this service.

Public information

This section contributes articles, briefs and news items related to agriculture for the information of farmers and the general public in the national newspapers, based on the research achievements of the scientists.

Microfilming

The main function of this Unit is to microfilm non-conventional literature of the major agricultural research and academic institutions, as well as useful old literature present in the National Agricultural Library. Duplicate copies can be made on request.

Miscellaneous

The staff of the Directorate is involved in testing and introducing the latest information handling techniques like computers, CD-ROM databases, e-mail and Internet. They also conduct training courses, seminars and workshops, as well as write papers on different information technology and related subjects. The Directorate also arranges individual training and provides advice on development of information systems. The Directorate publishes specialised bibliographies, information directories and catalogues. It is also involved in the development of different types of library/documentation software.

FACILITIES

The Directorate has computers with printers, CD-ROM drives, and modems; scanner; photocopiers; complete microfilming laboratory; scientific and tech-

nical photography; slide making/duplication, projection and audio-visual aides. It has the facilities of e-mail, Internet and fax, and is in the process of developing a Local Area Network (LAN) and planning to develop Wide Area Network (WAN) also.

CONSTRAINTS

There is no specific plan, policy or programme for the development of libraries and information centres in Pakistan. These centres are still in the formative stage of their development, with few standards or uniformity in the operation and management.

Management at government departments often fails to appreciate the importance of information in the research and development process, so there is a scarcity of funds for the development of a national information infrastructure. Other problems include a lack of qualified and motivated staff in the field of library and information services.

DEVELOPMENT OF AGRIS/CARIS IN PAPUA NEW GUINEA

Nicks Maniha
PNG National AGRIS/CARIS Centre, Konedobu, Papua New Guinea

The lack of appropriate information is a major constraint to agricultural research and development in Papua New Guinea. In fact, what is often perceived as a lack of information is a lack of access to information, due to poor skills in information technology, lack of appropriate equipment and insufficient funds to develop adequate information systems. Although a certain amount of information on agriculture and related subjects is published in Papua New Guinea, there is a very strong reliance on information published abroad and a general distrust for what is produced in this country, to the point that scientists have a tendency to publish their papers in foreign journals and not at home. Publishing activities include journals, meeting reports, research reports, technical reports, bibliographies, posters, training and extension materials, programme leaflets and press releases.

Nowadays, scientific information from developed nations is easily accessible through sophisticated means provided by computers and satellite communications. However, the acquisition of foreign literature is expensive. Although funds for the acquisition of foreign material are scarce, there is a certain amount acquired and held by various Government institutions through various means, in particular from projects operating in the country.

Consequently, time-consuming and expensive searches for information produced in the country or abroad could be considerably reduced if there was an effective way of collecting, recording and disseminating agricultural information. Consequently, one of the Government priorities is to ensure that an efficient system of controlling and disseminating agricultural information for researchers, trainers, policy makers, extension workers and other users in Papua New Guinea, which would allow a better recording and flow of information within the country as well as in and out of the country. Also, mechanisms of exchanging and sharing information must be developed to make the most of information resources available in the country.

The AGRIS/CARIS project has attempted to address these problems and to initiate an agricultural information system as an embryo for a nation-wide system. The National AGRIS/CARIS Centre was established in 1989 by the United Nations Development Programme (UNDP). This provided a focus for the Government to seek broader-based assistance in agricultural documentation from FAO. Within this framework and also because of the financial crisis in the country, the Government requested FAO/TCP assistance to support the strengthening of the AGRIS/CARIS project in Papua New Guinea and designated the Department of Agriculture and Livestock as the implementing body. Information on AGRIS/CARIS databases are not limited to agriculture. They also include information on fisheries, forestry and related fields.

The PNG National Forest Authority and the PNG Forest Research Institute have contributed significantly to the development of the National AGRIS/CARIS databases. In fact, 50% of the data contained in the CARIS database are records of new and on-going research undertaken by the PNG Forest Research Institute.

Systematic collection of information is a major problem in Papua New Guinea. Information is obtained on *ad hoc* basis. A network is needed to enable systematic collection of data. We also need to have one uniform software programme such as CDS/ISIS installed in all relevant libraries and information centres for documentation and export of AGRIS/CARIS information.

The concept of regional co-operation is excellent. Papua New Guinea has vast amounts of information on agriculture, fisheries and forestry scattered in libraries across the country which need to be documented and shared. However, first a comprehensive national database must be established before data can be effectively shared and benefits derived from the national, regional and international databases.

The South Pacific Island member countries have formed a Standing Committee on Agricultural Information Networking in the Pacific (SCAINIP). SCAINIP is responsible for developing regional agricultural databases. Papua New Guinea National AGRIS/CARIS Centre is the focal point for SCAINIP. With the co-operation already in place, SCAINIP sees no problem in developing a Pacific regional forestry database which will be linked to the Asia/Pacific regional network. SCAINIP would therefore need financial and technical assistance from the Asia/Pacific regional organisation to develop the database.

CARIS-PHILIPPINES IN THE 21st CENTURY

Lilia G. Bayabos
Applied Communication Division,
PCARRD, Los Banos, Laguna, The Philippines

INTRODUCTION

The agency behind CARIS (Current Agricultural Research Information System) in the Philippines is the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

PCARRD is one of the five councils of the Department of Science and Technology (DOST) and it is responsible for:

- Formulation of policies, plans, strategies, programs, and projects for science and technology (S & T) development in agriculture, forestry and natural resources;
- programming and allocation of government and external funds for research and development (R & D);
- co-ordination, monitoring and evaluation of R & D programmes/projects;
- generation of funds for R & D; and
- upgrading of institution capabilities.

The National Agriculture and Resources Research and Development Network (NARRDN) implements R & D programmes to support the government's development goals. The NARRDN is composed of 125 agencies and stations throughout the Philippines.

To further strengthen the network, PCARRD introduced the consortium concept designed to optimise the use of limited resources among research centres at the regional levels. It involves a number of satellite institutions around a lead agency selected for its manpower capability, resources and facilities. These consortia provide technical and scientific advisory, consultancy, training, information and communication services in the regions. Thus through these networks and consortia, PCARRD is able to fulfil its mandate in research management.

NATIONAL RESEARCH AND DEVELOPMENT INFORMATION SERVICES

PCARRD's concern does not end with the generation and evaluation of technologies and monitoring of research activities. It is equally concerned with the dissemination and utilisation of research information and technology from researchers and scientists to the farmer end-users. Two divisions in PCARRD implement programmes and activities aimed at developing strategies for research information disseminating and sharing throughout the country. These are the Applied Communication Division (ACD) which manages the Scientific Literature Services (SLS) Program and the Management Information Services Division (MISD) which maintains a computer-based information system called the Agriculture Research Management Information System (ARMIS).

The SLS was established in November 1973 as an information facility for effective access to knowledge (documentary sources) to serve the research information needs of various types of clientele in NARRDN. Its objectives include the establishment and maintenance, at a national level, of documentation, dissemination and exchange of agriculture and natural resources research output, and promotion of a scientific literature collection in agricultural libraries at the PCARRD network of research centres and stations.

As the implementing arm for CARIS and AGRIS, SLS undertakes activities geared towards the collection and making available current information in agricultural literature appearing in research reports, conference papers, books, etc. It provides the user services for CARIS/AGRIS information through current awareness, SDI (Selective Dissemination of Information), technical inquiry service and document delivery services.

ARMIS, on the other hand, was developed to support the R & D management functions of PCARRD. Three databases comprise ARMIS:

- the Research and Development Management Information System (RDMIS) provides useful and

consolidated information on all approved, ongoing and completed research in the country which is useful to assist research managers in monitoring research projects and reduce if not totally eliminate duplication in research effort;

- the Research Information Storage and Retrieval System (RETRES) provides a bibliographic database with abstracts of all terminal reports of completed research and the NARRDN publications which facilitates literature search and supports scientific literature services; and

- the Agriculture and Natural Resources Regional Technology Information System (ARRTIS) provides complete description of selected technologies, including its advantages and disadvantages, economic analysis and its possible uses and site adaptation and utilisation which are necessary in technology transfer activities.

SUSTAINING CARIS AND AGRIS ACTIVITIES IN THE PHILIPPINES

PCARRD's strong position and its integrated approach to the management of research has enabled the Philippines to be the largest contributor to the CARIS South-east Asia inventory.

PCARRD, as the national centre for CARIS and co-ordinating centre for AGRIS, has continuously improved its capacity to serve the information needs of the national agriculture and natural resources research system through efficient and effective information transfer, research utilisation and document handling by scientists, researchers and extension workers for research and development programme. This is compatible with the objective of CARIS and AGRIS world-wide.

The recent developments in information and communication technologies, i.e., CD-ROM and Internet provide opportunities for improvement in information management and scientific literature services.

In 1995, the establishment and operationalisation of the Regional R & D Information Service (RRDIS), a one-stop information shop in agriculture and natural resources is a new initiative to electronically linked the 13 regional consortia and institutionalised data management systems and referral service to make domestic and international agriculture and natural resources information available to the different user groups.

PCARRD maintains a continuing commitment to promote CARIS and AGRIS activities in the Philippines.

FORESTRY INFORMATION IN THE SEAMEO REGIONAL CENTER FOR GRADUATE STUDY AND RESEARCH IN AGRICULTURE DATABASES

Benefa M. Dayao
SEARCA, Laguna, Philippines

Forests, like marginal lands, croplands and coastal areas contribute to the life support systems in many developing countries. They are crucial as an important source of economic activities for the local people. Forest resources have contributed immensely to the social, ecological and economic development of many countries. For a while, timber was regarded as the "green gold mine" in Indonesia. However, with the increase in foreign exchange earnings, there came a point where progress itself became a constraint.

The continued misuse and abuse of forest resources have led to land degradation and soil erosion. Unabated exploitation and destruction of forests goes on viciously. The resource base will soon be impoverished if no concrete actions are immediately taken. There should be consolidated efforts to respond to this crisis. Yoichi Kuroda, Co-ordinator of the Japan Tropical Forest Action Network explicitly expressed that the "whole economic system must be altered to find a solution to problems such as excessive consumption of tropical timber. There must be a 180 degrees turnaround with respect to our present lifestyles and economic system". He further suggests to discontinue an economy that destroys the livelihoods of people and the global environment.

All is not bleak however. In response to the identified environmental problems, the common concern now is to implement an active and vigorous nature conservation programme through information, education, communication and other extension activities.

In the latter part of the seventies, SEARCA partly addressed this concern when it participated in the International Information System for the Agricultural Sciences and Technology or AGRIS, a project of FAO. SEARCA serves as the South-east Asian regional network centre tasked with co-ordinating the information activities of the AGRIS member countries. Together with AGRIS, FAO also sponsored the CARIS or Current Agricultural Research Information System. This contains a listing of on-going research projects in the South-east Asian region. SEARCA also serves as the CARIS Regional Co-ordinator.

Specifically, AGRIS is a co-operative and decentralised information system that collects current information on world agricultural literature through more than 100 participating national and multi-national centres. AGRIS has an information product called AGRINDEX, a monthly publication available both in printed form and as a compact disc.

CARIS, on the other hand, is an international co-operative network for the collection, organisation and dissemination of information on current agricultural research. CARIS facilitates the exchange of such information among developing countries and between developing and developed countries.

SEARCA, as the regional centre for these two information systems, has developed two regional information by-products, namely: AGRIASIA, a current bibliography of South-east Asian agricultural literature and CARIS-SEA, a listing of on going agricultural projects in South-east Asia.

CARIS-SEA has been temporarily shelved pending the re-activation of the network and the establishment of new linkages.

ASIAN PACIFIC INFORMATION NETWORK ON MEDICINAL AND AROMATIC PLANTS (APINMAP)

The renewed interest in the essential and vital qualities of medicinal and aromatic plants prompted UNESCO to establish the Asian Pacific Information Network on Medicinal and Aromatic Plants (APINMAP) in 1987. As APINMAP Network Centre, SEARCA is also responsible for consolidating the data collected from all National Nodes (NNs) located in each Network member country, processing and redistributing copies of the merged data to the NNs. SEARCA also advises and arranges training for the NN staff, co-ordinates activities according to the approved work plan of the Network and assists the Philippine-based secretariat in disseminating information on APINMAP activities.

APINMAP has developed two databases which are being maintained by SEARCA: the integrated database and the factual database. The APINMAP Integrated Database (IDB) was started in 1987 to establish an inventory of published and unpublished literature pro-

duced or available in APINMAP member countries. The literature contained in the IDB may be scientific or an extension type of publication, including literature published outside the South-east Asia region but is primarily about medicinal and aromatic plants growing in the Asia-Pacific region.

The IDB also compiles information on research projects, institutions and researchers of medicinal and aromatic plants. It covers subject areas such as agriculture and forestry; plant biology; chemistry and chemistry of natural products; pharmacy; health, and medicine (including veterinary medicine); ethnology; industrial applications; economics; policies and legislation; education, extension and information; and the general aspects about the plants.

The IDB provides the following information to its users:

- literature references on a plant or on a particular country
- extension literature available in the region
- list of references on a plant growing in a particular country
- list of research conducted on a plant or in a field of particular study relating to the plant
- list of institutions dealing with the plant
- list of experts on medicinal and aromatic plants

The APINMAP Factual Database (FDB) began in 1989 as a means to update scientists on the latest information about medicinal and aromatic plants. The FDB provides users with data on five major areas of study on plants, namely: botany, chemistry, pharmacy, medicine and marketing. It contains the following data sets:

- Data Set Plant (PLT), which contains the botanical description, chemical contents and geographical distribution of the plants.
- Data Set Plant Phytochemistry (PHY), which holds data on the chemistry of plants and plant processes.
- Data Set Indication/Preparation/Administration (IPA), which is composed of data on the indication (e.g., ailments, disorders, diseases), preparation and administration of the plants.
- Data Set Marketing (MKT), which contains information on the marketing aspects of the plant.

OTHER SERVICES

SEARCA also maintains a library database that is primarily a collection of donated publications in agriculture and allied disciplines. Although the mandate of the library is to provide "access to information" through mechanised means, it keeps all SEARCA publications and those of SEARCA scholars.

FORESTRY LITERATURE IN THE PHILIPPINE AGRIS DATABASE

Leonor B. Gregorio
UP Los Baños, Laguna, The Philippines

BACKGROUND INFORMATION

The University of the Philippines Los Baños, started as a College of Agriculture in 1909, followed by the College of Forestry in 1910. Other colleges, institutes and centres were later established. In 1972, UP Los Baños became the first autonomous unit of the University of the Philippines System.

The University Library consists of the Main Library and twelve college, institute and centre libraries. It has the most extensive collection of agricultural materials in the country and is particularly strong in the plant and animal sciences. At present it is in the process of transition from printed to electronic materials and services and has started computerisation of its collection.

Logically, it was designated the national AGRIS Center, charged with indexing relevant agricultural literature in the country for inclusion in the AGRIS database. The Center has 3 indexers who are subject specialists: one with a master's degree in Agronomy, one in Forestry and one with an undergraduate degree in Home Technology and graduate units in Library Science. Since the 1980s, the Center has had trainees from Sri Lanka, Nepal, Vietnam, Korea, Iraq and recently, Papua New Guinea.

SOURCES OF FORESTRY DOCUMENTS

The sources of forestry and related information are spread throughout the country.

Major sources

- University of the Philippines at Los Baños (UPLB): College of Forestry including Institute of Forest Conservation and Forestry Development Center
- Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)
- Ecosystems Research and Development Bureau (ERDB)
- Forest Products Research and Development Institute (FPRDI)
- Department of Environment and Natural Resources (DENR)

Other sources

- Gregorio Araneta University Foundation (GAUF)
- Benguet State Uniersity (BSU)
- Bicol University (BU)
- Camarines Sur State Agricultural College (CSSAC)
- Central Mindanao University (CMU)
- Don Mariano Marcos Memorial State Uniersity (DMMMSU)
- Ifugao State College of Agriculture and Forestry (ISCAF)
- Isabela State College of Agriculture (ISCA)
- Mindanao State University (MSU)
- Nueva Viscaya State Institute of Technology (NVSIT)

Types of documents

Documents included in these library databases are monographs including conference proceedings and seminar papers, journal articles, theses and patents.

Forestry Inputs by Type of Document
(AGRIS Database: 1991 to August 1996)

Publication Type	1991-1992	1993-1994	1995-1996	Total
Monograph	73	44	19	136
Journal	44	68	34	146
Thesis	33	26	34	93
Patent	7	0	0	7
Total	157	138	87	382

Philippine Inputs

	1991-1992	1993-1994	1995-August 1996	Total
Total Phil. Input	5225	2589	2605	10419
Forestry Input	157	138	87	382

USES OF FORESTRY LITERATURE FROM DATABASE

On-site users of the various CD-ROM databases for a year numbered 3365; of this figure, 2809 were from UPLB and 556 non-UPLB. We do not have the figures for forestry alone. However, forestry is the 10th most requested topic of inquiry, with 97 inquiries; Plant Science and Production is at the top, with 1968.

Off-campus use, mostly by mail and e-mail, included requests from the Philippines and other regions of the world.

THE STATUS OF FORESTRY RESEARCH INFORMATION SYSTEM IN KOREA

Dr. Byoung Il Yoo
Forestry Information, Forestry Research Institute, Seoul, South Korea

INTRODUCTION

In Korea, up to 1983, the AGRIS national centre was the KIET (Korea Institute for Industrial Economics and Trade). After 1984, the AGRIS/CARIS national centre changed to the Rural Development Administration, with the research support division in charge. To date, the information from a total of 78 Korean journals have been submitted to the AGRIS centre in Vienna such as the *Journal of the Korean Forestry Society*.

The forestry administration has no direct relationship with AGRIS in Korea. However, FRI and FGRI have been able to use AGRIS through the national computer network system since the early 1990s.

STATUS OF FOREST RESEARCH INSTITUTE

In Korea, there are two national forestry research organisations: the Forestry Research Institute (FRI) and the Forest Genetics Research Institute (FGRI). Each of the nine provinces and some universities have a forest research institute. These strongly co-operate on research projects.

The Forestry Research Institute, founded in 1922, studies both forestry and forest products. The main research activities cover policy and silvicultural and management systems linked with the Forest Resources 10 Year Plan, forest resource survey, and the management of the Forest Museum and Arboretum.

The Forest Genetics Research Institute, founded in 1956, works to develop tree species for erosion control, improve native species, develop new nut-bearing species for income and preserve genetic resources. The Institute also devotes its efforts to preserve genetic resources for tree species improvement and to develop new bio-technology materials from trees.

The number of researchers in national research institutes is about 450 persons. During the past ten years, human resources have doubled. Therefore now we have enough researchers to carry out research related to forest and forestry industry.

STATUS OF RESEARCH ACTIVITY

In 1996, FRI had 94 projects. FRI and FGRI publish several journals and information leaflets. The research budget of FRI and FGRI is about 9423 million won (about US$11 million). The share of the research budget among the total budget for Forestry Administration was about 7% in 1996.

The total number of publications related to forestry is estimated to be more than 30, including the scientific journals in Korean. Publications are distributed to libraries and official organisations. The *FRI Journal of Forest Science* is distributed abroad to about 200 recipients. This stimulates exchange with other countries' forest research papers. FRI provides general forestry information and research output via public computer networks in Korea.

Each year more than 200 articles appear in Korean journals. However, only about 40-50 articles appear in *Journal of the Korean Forestry Society*, which is submitted to AGRIS. Therefore forestry references in AGRIS cover only 25-30% of total references in Korea.

STATUS OF FOREST LIBRARIES

The Forestry Research Institute and Forest Genetics Research Institute have their own libraries. The Forestry Information section is in charge of the FRI library and the input/output of national and international forestry information including the publication of FRI's research output, and purchase of books and journals, exchange of forestry information. Forestry Research Institute is the forestry information centre in Korea, and the importance of linking with other organisations has increased.

In 1996 FRI purchased 102 journals, of which more than 90% were imported. FRI subscribes to Current Contents in the Agriculture, Biology and Environmental Sciences (ABES). IUFRO provides the information bulletin for developing countries quarterly, which is useful for searching the forestry bibliography.

FRI uses the Korean Library Automation System (KOLAS), which was developed as the library information system by Korean National Central Library in 1994. KOLAS is used on personal computers and it is possible to store 100 000 references. FRI inputs information to KOLAS and submits the file every year to the Korean National Central Library as part of the national library automation system.

KOLAS was developed for the Korean language (Hangul), but it is possible to also use English, Chinese, Japanese, etc. It is convenient for library management, especially for searching the information held in the library.

The most frequent users of FRI's library are the researchers, but it is also open to the public and students of elementary schools and universities. FRI's library is the biggest professional forestry library in Korea. It has also a lot of forestry-related materials like video tapes and maps. Recently it became possible for users to search the international forestry information via Internet. However up to now, it is not available for use on the regional forestry computer network.

CONCLUSION

Even though the Korean forests are young, they are an important living environment. To increase the efficiency of forest management, especially sustainable forestry management (SFM), it is essential to develop the forest research information system in Korea. We have to increase efficiency and co-operate with developed countries in forestry information systems and international forestry organisations such as FAO and IUFRO.

THAI NATIONAL AGRIS/CARIS: FORESTRY INFORMATION SERVICE

Piboonsin Watanapongse
Kasetsart University Main Library, Bangkok, Thailand

BACKGROUND

The Thai National AGRIS/CARIS Centers were established in 1975 under the responsibility of the Thai National Documentation Center and Kasetsart University Main Library. In 1981 the activities were transferred solely to Kasetsart University Main Library. The main functions have been collecting and managing agricultural and related information from journals, theses, monographs and other publications written on Thailand.

The AGRIS/CARIS databases contain information on forest management, forest biology, forest products, silviculture, forest engineering, conservation, taxonomy, forest economics, plantation technology, and environment impact. The Royal Forestry Department, Ministry of Agriculture and Cooperatives, and the Faculty of Forestry, Kasetsart University, conduct most forestry research.

RESEARCHERS' ACCESS TO FORESTRY INFORMATION

Forestry researchers usually seek information from their own organisations as their first resource, and specialist libraries and information centers are consulted for research and statistical data. Occasionally information from other sources in Thailand and from abroad are used.

Thai National AGRIS/CARIS Centers as providers of forestry information

Information held by the Thai National AGRIS/CARIS Centers represent the largest resources on agricultural sciences in Thailand and include forestry information. Services include bibliographic references, on-line/CD-ROM database searching, document delivery and inter-library loans. The Centers also co-operate with the Document Service and Library of the Royal Forestry Department when referral service is needed for specialist information not available from the Centers. The Centers also have access to the relevant universities for referral services and inter-library loans. Information can be provided from commercial information services such as the Technical Information Access Center (TIAC) where world-wide information is provided on a fee for service basis. Grey literature and primary sources from non-governmental organisations, such as the national forest parks, are important sources when needed.

Current awareness service for forestry information

The National AGRIS/CARIS Centers introduce the Current Awareness Services through traditional reference services such as bibliographic compilations for users who request information on specific topics, and circulation of contents pages.

The Centers plan to construct an Internet homepage so that information can be accessed by more users, and a wider exchange of information will be possible among the user groups. Current information on ongoing research projects as well as new publications can be disseminated immediately and thus information can be updated efficiently.

The Main Information Resources

- A complete collection of bibliographical references in hard copy and in electronic format are available from the Main Library;
- Journal titles in the field of agriculture and forestry related areas;
- Full-text papers on microfilm for Thai agricultural information sources appearing in the AGRIS database;
- Inter-library co-operation and resource sharing among libraries of universities and government as well as private organisations throughout the country; and
- Using international resources through the Internet, the Main Library has access to the World Wide Web and other commercial information database vendors.

PROBLEMS AND COMMENTS ON THE INFORMATION SERVICE

In Thailand, information users are faced with the problems of scarce information resources, especially full-text documents from foreign publications. With the availability of the Internet, users are more aware of the need for information. Libraries and information services still need to increase their resources in terms of volumes of hard copies, on-line and CD-ROM databases, as well as acquire new technology to enable services to be more effective. Technologies have changed very rapidly and librarians and information specialists have to keep up with the changes. In order to achieve effective library and information services, I believe that more opportunities are needed for professionals from all levels – policy to practical – to meet and communicate. Access to the Internet as well as the opportunity to learn how to use the facility means a short-cut to increasing our knowledge. Users have become more aware of the information technologies that can produce and disseminate voluminous amounts of information. Users themselves create the information in new fields. We, the information professionals must keep up to date with the developments of technology, as well as with the contents of information, in order to plan for good services to provide information accurately, quickly and at acceptable cost.

FOREST SCIENCE AND TECHNICAL INFORMATION SERVICE IN VIETNAM AND THE NEED TO STRENGTHEN CO-OPERATION WITH OTHER COUNTRIES IN THE REGION

Ha Chu Chu
Forest Science Institute of Vietnam, Hanoi, Vietnam

GENERAL

Forest science and technology in Vietnam have developed only recently compared to the surrounding countries. Only after the war for independence ended in 1954 scientific and technical activities including information services began to develop.

The two main information sources serving national forestry activities are the National Information Service and the Specialized Forestry Information Service

NATIONAL INFORMATION SERVICE

The National Information Service consists of a network of scientific and technical libraries of which the Central Scientific and Technical Library in Ha Noi (CSTL) plays the most important role.

CSTL is a multi-disciplinary science and technology library with a large collection, 97% is in foreign languages. It has links and exchanges documents with over 100 establishments in 40 countries. There are libraries in the ministries, universities and scientific research institutes. The libraries of Ha Noi University, Ho Chi Minh City University and Hue University have many valuable documents.

Provincial and town scientific and technical services manage separate libraries and almost all production units have their own reading rooms, mostly with collections in the Vietnamese language. Books on forestry are very rare.

SCIENTIFIC AND TECHNICAL INFORMATION SERVICE

The scientific and technical information service operates throughout the country. A network of information services covers almost all economic, scientific and technical fields, and has some specialised offices with documents (scientific reports, patent information, standardisation and technical norms information, etc.).

The network is linked at all administrative levels: central, local and grassroots. In addition there are the big libraries such as the National Library, and Central Scientific and Technical Library.

The collections consist of books, journals, periodicals, invention descriptions, reports on research results, technical standards and procedures. Formerly all foreign books and journals came from the former Soviet Union, China and eastern European countries, with those from western Europe and the United States being in great shortage.

Products are usually printed materials. Presently the National Centre for Science and Technology Information, Documentation (NACESTID) has Internet exchanges throughout the world. Information exchanges have taken place with UN agencies, international and regional organisations. Bilateral relations have been established with 8 countries and document exchanges made with over 300 libraries in 100 countries.

Information centres in the Ministries and localities are under the professional management of the NACESTID. This centre has also the responsibility of training information personnel for the whole country and provides information services.

FOREST SCIENCE AND TECHNICAL INFORMATION SERVICE

The Forest Science and Technical Information Service is part of the state information network. In the former Ministry of Forestry, now the Ministry of Agriculture and Rural Development, the information system consists of:

Forestry Review

The *Forestry Review* was started in 1982, and is issued monthly. It carries information on forest management, production, science and technical matters, State policies, and results of scientific and technical research. A scientific and technical bulletin attached to the *Forestry Review* contains scientific and technical research results.

Forest Science and Technical Information Centre (FOSTIC)

The Centre started in 1982 to provide easy access to scientific and technical activities of the forestry

branch. The information bulletin of the Centre is issued bi-monthly. A bulletin, *Vietnam Forestry*, is sent to overseas countries twice a year. There are also reviews on subjects of special interest.

FOSTIC is part of the NACESTIC (in the Ministry of Science Technology and Environment - MSTE) and also has an information network of information divisions in production units, institutes and professional schools. The information bulletin issued by the Centre contains news on scientific and technical activities translated into Vietnamese from foreign books and journals. Scientific reports or subjects that need wide circulation are published in the form of Reviews. Publications of FOSTIC are free to local units. The target audience of FOSTIC is medium to higher level technical personnel working in production, research and teaching units. This kind of information however is also needed by managers at all levels, helping them to plan and guide production.

Forestry Extension Centre

The Forestry Extension Centre supports forest development programmes by:

- educating people in forest resource protection, environment protection;
- forest techniques and technology transfer; and
- linking organisations related to local forestry activities.

The extension system began at the end of 1991 using PRA methods and other tools suitable to each locality for information collection, analysis and synthesis. It consists of the extension centre at the Ministry of Agriculture and Rural Development, extension groups in provinces and production units and targets the households engaging in forestry.

Extension work in social forestry development is quite new in Vietnam. Co-operation needs to be promoted with other countries in the region to improve this work.

INFORMATION AND DOCUMENTATION SERVICE OF THE FOREST SCIENCE INSTITUTE OF VIETNAM (FSIV)

The Information and Documentation Division (IDD) of the Forest Science Institute of Vietnam (FSIV) includes a computerised library. In 1995 FSIV began computer links with the national centre and with the National Information Network.

Responsibilities and ongoing work

Information supply

- Computer connection is available to national VESTENET databases on related sciences from international CD-ROM systems, but little use is made of these sources due to limited English ability of scientists. The FSIV has also e-mail connections.
- Publications: *Forest Science and Technical Information* mainly carries articles written by researchers of the FSIV; *Information on Overseas Countries' Forest Science and Technology* is a translation of foreign journal articles; irregular publications of research results, books, reviews with financial support of international organisations (APAN, CIFOR).
- Library: foreign and Vietnamese journals and publications
- CD-ROM: with TREE-CD supplied by CABI and DAI CD-ROM disks from IDRC of Canada.
- Video/Photographs: one M7 camera.

Information storage

- Books
- Journals
- Computer databases: a database of about 600 forestry book titles (in Russian, English, French and Vietnamese). In addition a database has also been established of articles carried in the journal of FISV from 1985-1995 using ISIS software in Vietnamese.

EQUIPMENT

The IDD presently has limited hardware capacity. Up to the early 1980s, the IDD received assistance from the former Soviet Union and Eastern European countries. Between 1985 and 1995, budget problems restricted maintenance and expansion. Following the start of the renovation policy, international and regional organisations (CABI, CIFOR) have assisted development. The infrastructure has been upgraded step by step.

In comparison with the information service in countries in the region however there is still a rather large gap in all fields. In order to keep pace with other countries, renovation of the information service must be continued vigorously and strengthened in all aspects from infrastructure to skills and knowledge of the personnel. Especially in the field of electronic information the IDD has just only made some initial, limited steps. Thus more investment by the state and assistance of international organisations are badly needed.

GENERAL EVALUATION OF INFORMATION SERVICES

Information services in Vietnam in general, and especially forestry information, still have many shortcomings:

- The information system is not yet complete so cannot fully meet the requirements of managers from central to local levels. There is a lack of national and international information to serve production, business and scientific research activities.

- Relevant forestry information is lacking and related services are weak both in organisation and material facilities. Modern information technology is not widely applied in forestry production. Due to limited contact in the past with countries in the Asia-Pacific region and other tropical countries, there has been a great shortage of documents needed for the development of tropical forestry, social forestry and household forestry. A large part of forestry documents available in the national library as well as in specialised libraries of forest institutes and college are those of the eastern European countries and Russia. Forests and social situations of these countries are different from tropical ones. They are also different from the developing countries in Asia.

Today, forestry in Vietnam is changing from a centralised system to social forestry, applying market mechanisms. Thus learning from experiences as well as studying forest science and techniques of tropical countries, especially of those in the region, is an urgent task. Widening and strengthening information exchange is of great significance, allowing Vietnam's forestry sector to keep pace with the development of the countries in the region and of the tropical world in general.

CURRENT SITUATION OF AGRIS/CARIS IN THE UNIVERSITY OF THE SOUTH PACIFIC

Suaesi Valasi
School of Agriculture, University of the South Pacific, Apia, Western Samoa

BACKGROUND

The University of the South Pacific was founded in 1968 and is now made up of 12 small island countries, ranging in size from Tokelau to Fiji, and including the Cook Islands, Kiribati, Marshall Islands, Nauru, Niue, Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa. The economies of most of these countries are dominated by the primary sector – agriculture, forestry and fisheries – on both commercial and subsistence levels. Forestry sectors are sizeable in some countries.

The University of the South Pacific was commissioned to serve the needs of the people of the South Pacific. To ensure this is achieved, the University set up Extension Centres in each country to deliver distance learning education for those capable, potential students who cannot afford to study full time on campus.

There are three campuses of the University, the main campus in Fiji contains three schools. The campus in Vanuatu has the Law School, and the campus in Western Samoa has the School of Agriculture. This paper will focus mainly on the School of Agriculture which is also the co-ordinating centre for AGRIS and CARIS.

The School of Agriculture (SOA) was founded in 1977 and has a research arm, the Institute for Research Extension and Training in Agriculture (IRETA). The SOA and IRETA aim to provide training through a wide range of formal and non-formal programmes.

THE REGION'S INFORMATION NEEDS

Since these countries are agriculturally based, it is important to provide useful and relevant information on agriculture, science and appropriate technology to assist national development. However, systems for the provision of such information are not adequate. In the region there are a number of organisations which are actively involved in the collection, recording and dissemination of information in all subject areas. These include the University of the South Pacific Libraries, South Pacific Forum Secretariat, South Pacific Commission, etc. In past years some surveys on agriculture and technological information needs of the South Pacific region were carried out by consultants. The highlights of these surveys recommended the establishment of a regional agricultural information service through a network of national agricultural agencies inputting their records to the regional centre. They also recommended the use of satellite communication for a question and answer service on agricultural matters. This has now been implemented in the Agriculture and Rural Development Information Network (ARDIN), administered by USP's Institute for Research Extension and Training in Agriculture. The ARDIN Centre is based in the Library of the School of Agriculture.

ESTABLISHMENT OF THE AGRIS/CARIS CENTRE

In the late 1980s USP became an AGRIS/CARIS centre and agreed to contribute to the databases by collecting, processing and sharing agricultural information regionally and globally. The School of Agriculture (SOA) was made the co-ordinating centre with implementation by the ARDIN Centre – the information arm of IRETA. Funds from USAID and CTA were used for computer equipment and a qualified information management staff member to implement the project.

IRETA appointed Agricultural Liaison Officers (ALO) in each country, to be the link between farmers and information needs. One duty of the ALOs was to collect published and unpublished research and forward it to the ARDIN Centre for entering into the database and storing for easy retrieval and distribution. The ALOs distributed and collected the CARIS forms from researchers and forwarded them to the Centre for processing. Some training was provided in the region for AGRIS/CARIS data processing, but qualified staff changed.

The Centre used PROCITE for processing CARIS data. By the end of 1992 more than 600 records had been entered. Much of this data was incomplete and could not be accepted by the CARIS Centre at FAO. Additionally, PROCITE is not compatible with the

standard CDS-ISIS software used by CARIS. Records have since been completed and were entered into the main CARIS database in mid-1996. The aid money that funded this position ended in 1992 and the staff member left. The Centre is now staffed on an unqualified, temporary basis under the supervision of the SOA's Librarian. AGRIS and CARIS work has been dormant for some time and effort must be activated to move forward. Researchers have to be convinced of the usefulness of placing their research in this database and that, by doing so, the region benefits by receiving the CD-ROM databases distributed by FAO to the Co-ordinating Centres.

CONSTRAINTS

A number of problems restrict work on AGRIS/CARIS in our university region, including:

- Lack of qualified staff;
- Lack of funds;
- Geographic isolation and nature of land;
- Not enough training on the format of data input; and
- High staff turnover and reluctance to use the software.

We lack qualified staff in our region to take up positions, such as the one that should look after the AGRIS/CARIS work. We are still relying on expatriates to fill some of our posts. In line with this is the lack of funds to send people for training and pay the appropriate salary to attract qualified people.

Another constraint, affecting all countries, is small physical size and remoteness, separated from each other by vast areas of ocean. The consequences of this isolation are high transportation costs, infrequent air and sea services. Compounding their small size, many island countries have a narrow resource base and the coral-based islands such as Niue and Tokelau are virtually "resourceless rocks" lacking arable land for doing agricultural research.

The CARIS forms we distribute to the ALOs and researchers are being simplified and when they are returned, the information is transferred to the more detailed form required by FAO. These forms are quite complicated and need proper training to complete.

High staff turnover is a further issue. Most of the early staff who have worked at this centre received some training on using CDS-ISIS for this project. However, when one leaves, the next one needs to be trained. The use of PROCITE instead of CDS-ISIS has meant data needed re-formatting before acceptance for the main CARIS database.

We are now again actively distributing CARIS forms to our researchers and hopefully they will complete and return them to us. The SCAINIP (Standing Committee on Agricultural Information Networking in the Pacific), of which most countries of the university are members, met in Fiji from 2-11 September 1996. AGRIS and CARIS was one of the topics discussed and the meeting concluded that this body will help the ALOs collect data and send to the Co-ordinating Centre in Apia, Western Samoa.

CONCLUSIONS

The AGRIS/CARIS project is currently not well-established in the region. A workshop is needed again for our region to train new staff and increase knowledge and experience with the software. Alternatively, we need an interface program to convert data from either INMAGIC or PROCITE, programs with which we are more familiar.

We will continue to be part of AGRIS/CARIS and will try our best to improve contributions to this project.

APPENDIX 1

LIST OF PARTICIPANTS

AGRIS/CARIS in the 21st Century – An Asia-Pacific Regional Consultation
4 - 6 November 1996, Bogor, Indonesia

Ms Lilia G. Bayabos
Philippines Council for Agriculture, Forestry, and Natural Resources Research and Development
Los Baños, Laguna - Philippines

Dr. Ken Becker
CAB International, Wallingford - UK

Ms Mastura Buang
Forest Research Institute Malaysia, Kuala Lumpur - Malaysia

Ms Liannie K. Daywin
Agency for Agricultural Research and Development, Bogor - Indonesia

Ms Benefa M. Dayao
South East Asian Minister of Education Organisation Regional Center for Graduate Study and Research in Agriculture, Laguna - Philippines

Dra. Endang I.S. Msc
Manggala Wanabakti, Documentation and Information Centre, Jakarta - Indonesia

Dr. Pamela G. Fernandez
University of the Philippines at Los Baños, Laguna - Philippines

Ms Leonor B. Gregorio
University Library, University of the Philippines at Los Baños, College, Laguna - Philippines

Prof. Ha Chu Chu
Forest Science Institute of Vietnam, Hanoi - Vietnam

Dr. Mikael Hirsch
Commonwealth Scientific and Industrial Research Organization, Canberra-Australia

Mr Michael Ibach
Center for International Forestry Research, Bogor - Indonesia

Mr Joseph Judy
Food and Agriculture Organization of the United Nations, Rome - Italy

Dr. M. Zahangir Kabir
Agricultural Information Centre, Bangladesh Agricultural Research Council, Dhaka - Bangladesh

Mrs Noriko Kotobuki
Japan AGRIS, Forestry and Fisheries Research Information Center, Ibaraki - Japan

Mr Nick Maniha
Papua New Guinea National AGRIS/CARIS Centre, Konedobu - Papua New Guinea

Dr. Meng Yongqing
Institute of Scientech Information, Chinese Academy of Forestry, Beijing - China

Dr. Francis S.P. Ng
Center for International Forestry Research, Bogor - Indonesia

Mr Nguyen Tien Dat
Documentation and Information Division, Forest Science Institute of Vietnam, Hanoi - Vietnam

Dr. Stephen Rudgard
CAB International, Wallingford - UK

Mr Chuichi Satow
Research Planning and Coordination Division, Japan International Research Center for Agricultural Sciences (JIRCAS), Ibaraki - Japan

Ms Dina A. Satrio
Center for International Forestry Research, Bogor - Indonesia

Ms Joozee Schellekens
Forestry Research Support Programme for Asia and the Pacific, Bangkok - Thailand

Mr H. Schmutzenhofer
International Union of Forestry Research Organizations - Secretariat, Vienna - Austria

Mr Amrish Kumar Sharma
Indian Council of Forestry Research and Education, Dehra Dun - India

Dr. Oudara Souvannavong
Food and Agriculture Organization of the United Nations, Forest Resources Division, Rome - Italy

Ms Soetitah S. Soedojo
South East Asian Minister of Education Organisation Regional Centre for Tropical Biology
Bogor - Indonesia

Ms Yuni Soeripto
Center for International Forestry Research, Bogor - Indonesia

Mr Suaesi Valasi
University of the South Pacific, School of Agriculture, Apia - Western Samoa

Ms Piboonsin Watanapongse
Main Library, Kasetsart University, Bangkok - Thailand

Dr. Yoo Byoung Il
Forestry Information Forestry Research Institute, Seoul - South Korea

Ms Shahnaz Zuberi
National AGRIS Centre, Directorate of Scientific Information, National Agricultural Research Centre
Islamabad - Pakistan