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Information and Dataset System on the Rehabilitation of Degraded Tropical Forest Ecosystems Project for the International Network

M. Anazawa[1], H. Sawada[1] and S. Kobayashi[2]

Abstract

This information and dataset system aims to facilitate international exchange and synthesis of the scientific and technical information based on results of the CIFOR/Japan project on the rehabilitation of degraded tropical forest ecosystems. There are two main pathways. One path integrates general information at the study site from annual reports, site map, remote sensing data, aerial chart and vegetation map into plot data of each site. Their outputs are data on site condition, vegetation, soil, climate, etc. which are accessible to the public. Another path is to accumulate experimental raw data into "Download" the use of which is restricted and requires a password. Version 1 of this system is experimentally located on the website at: http://www.ffpri.affrc.go.jp/labs/fmrt/cifor/start.htm

INTRODUCTION

This information and dataset system aims to facilitate international exchange and synthesis of scientific and technical information based on results of the CIFOR/Japan project on the rehabilitation of degraded tropical forest ecosystems. Collaborators in this project have produced the annual reports, data directory and database which consist of the research results on the changes of forest ecosystems and soils. Final outputs are expected to contribute to the long-term monitoring of degraded forest ecosystems, information networking among collaborators (scientists, forest managers, small forestholders), site evaluation and zoning for rehabilitation, and syntheses of rehabilitation techniques. This information and database integration-reference system has two main path ways. One path integrates general information at the study site from annual reports, site map, remote sensing data, aeronautical chart and vegetation map into plot data for each site. Outputs are data on site condition, vegetation, soil, climate etc., which are accessible to the public. Another path is to accumulate the experimental raw data into "Download" the use of which is restricted and requires a password. This system consists of "Window display and links among "information" and "database retrieval and download". The main structure of this system directory involves "public directory structure", "open data directory structure in public directory", "image directory structure in public directory", "project directory structure and download files"and "project directory structure and image files". This system is necessary to develop "database retrieval system" and to discuss the "access restriction" for download files and easier "data supply format"for data integration

[1] Forestry & Forest Products Research Institute (FFPRI), Tsukuba, Ibaraki 305 Japan. Tel: +81-298-73-3211, Fax: +81-298-73-1541.

[2] Center for International Forestry Research, Bogor, Indonesia. Present address: Forestry and Forest Products Research Institute, Matsunosato 1, Kukizaki, Inashiki, Ibaraki 305-8687, Japan. Tel: +81-298-733781/733211 ext. 246, Fax: +81-298-731541, E-mail: ksige@ffpri.affrc.go.jp

from collaborators. Version 1 of this system is now experimentally on the website of http://www.ffpri.affrc.go.jp/labs/fmrt/cifor/start.htm The start window of this dataset is shown in Fig.1.

EXPLANATION OF THIS DATASET CD-ROM

Contents

There are three types files in this CD-ROM : a HTML file, a GIF file, and an Excel file (xls) as a download file. In the upper part of the left frame, contents contain the introduction of the CIFOR project and annual reports of several countries (Fig. 2-(a)). In the annual reports, the user can select each partner country of this project and can see the report which contains figures and tables. The user can see any table as a gif image, but cannot download the data file directly, if the download button below the tableis clicked the user will return to data download menu in the start window.

Data Download

DATA DOWNLOAD site is located in the lowest part of the left frame (Fig. 1). Clicking here, the data index and download table menu which lists seven countries will appear (Fig. 2-(b)). An authorised user can download any statistical data and inventory data as an Excel file (xls).

Data Open to the Public

DATA OPEN TO THE PUBLIC site is located in the lower part of the left frame (Fig. 1). From here the user can access the open data from experimental forest plots (Fig.2-(c)). First, the Start Menu shows seven countries with study sites and seven data items i.e., research organisation/project title, general information, preexperimental, postexperimental, control plot, publications and references. Furthermore, each item is divided into subitems, e.g., general information contains site information, and data on vegetation, soils, climate etc. (Fig. 3).

Clickable World Map

In the right frame (Fig. 1), the user can select the country of the study site. Clicking here, the Main Menu of each country will appear and this is divided into Report/Data and Map /Image (Fig. 2-(d)). This Main Menu has several buttons which links annual report, plot data (open to the public), forest map, aeronautical chart, satellite image, NDVI image with DCW (digital chart of the world) and study site detailed map. Clicking these buttons, the user can open new windows of these images. Also, the user can directly move to Main Menu of the another country by selecting the country button at the bottom (Fig. 4).

The general disposition structure of tropical plot data is divided into vegetation, climate, soil and miscellaneous as essential categories, in some cases site, water, socioeconomics etc.are added to these categories.

Figure 1. Start Window of this Dataset (Start window consists of two (left and right) frames

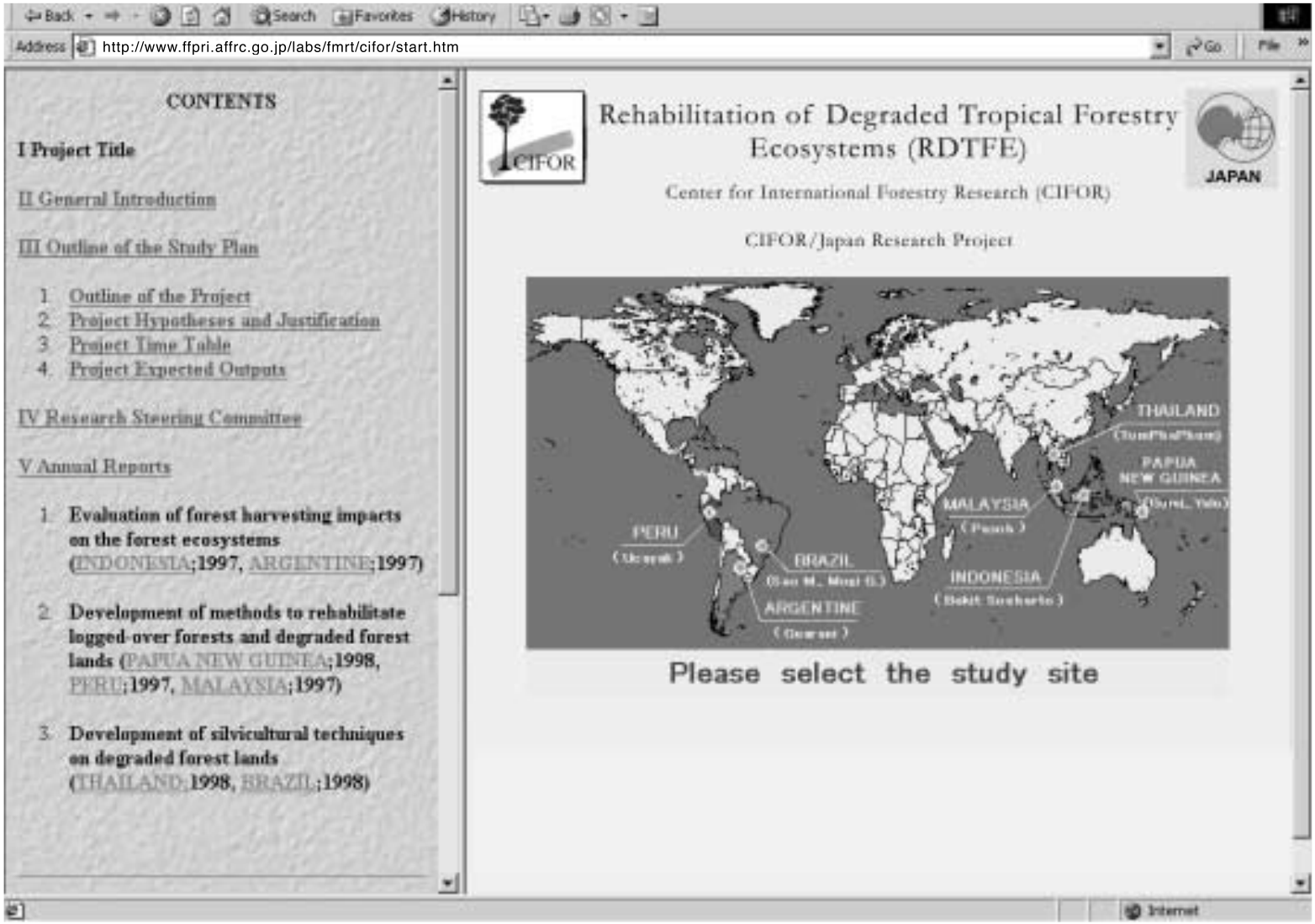
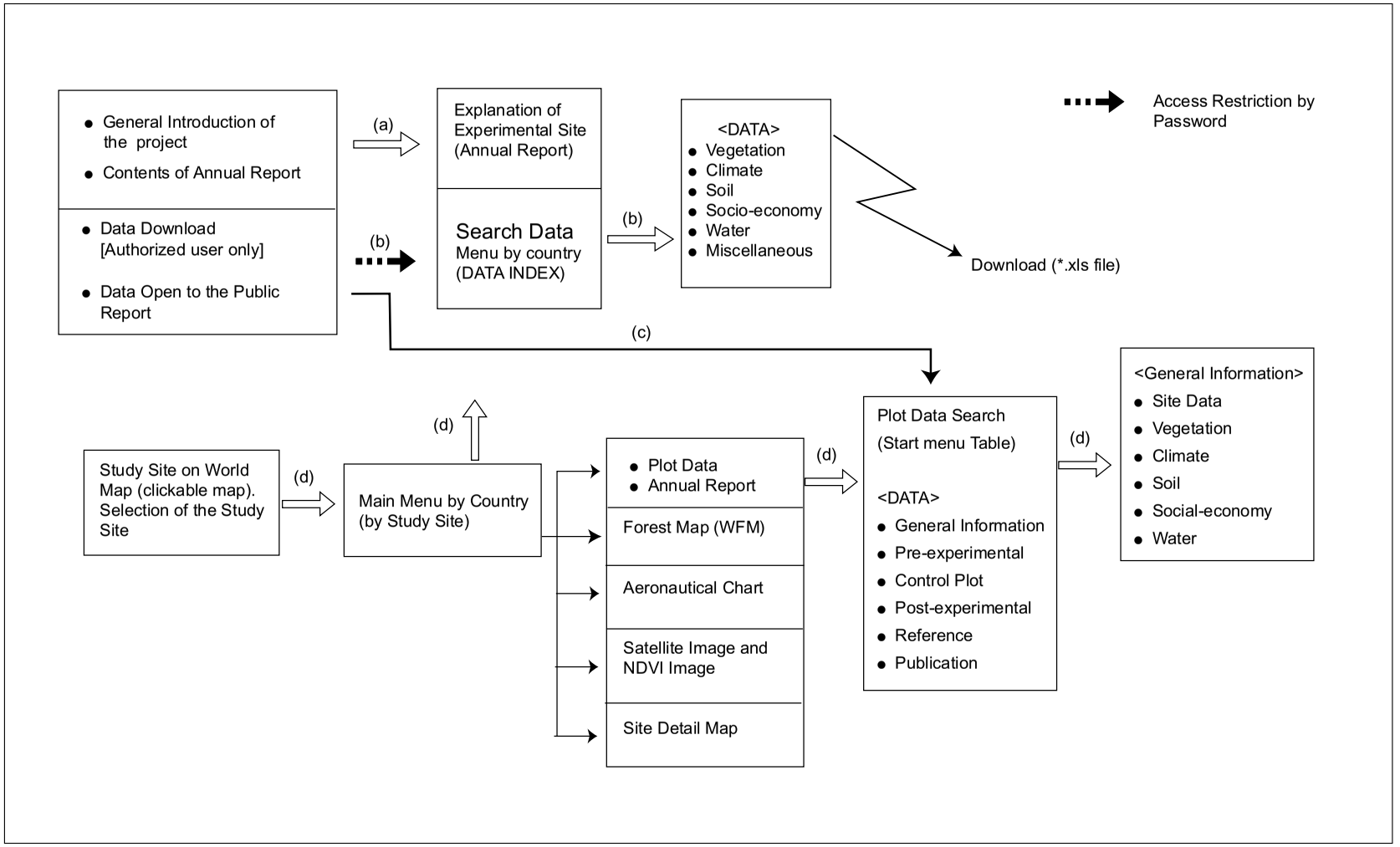


Figure 2. Flow Chart of Information and Dataset System on RDTFE



(a), (b), (c), (d) represents the entrance and its link route, repectively

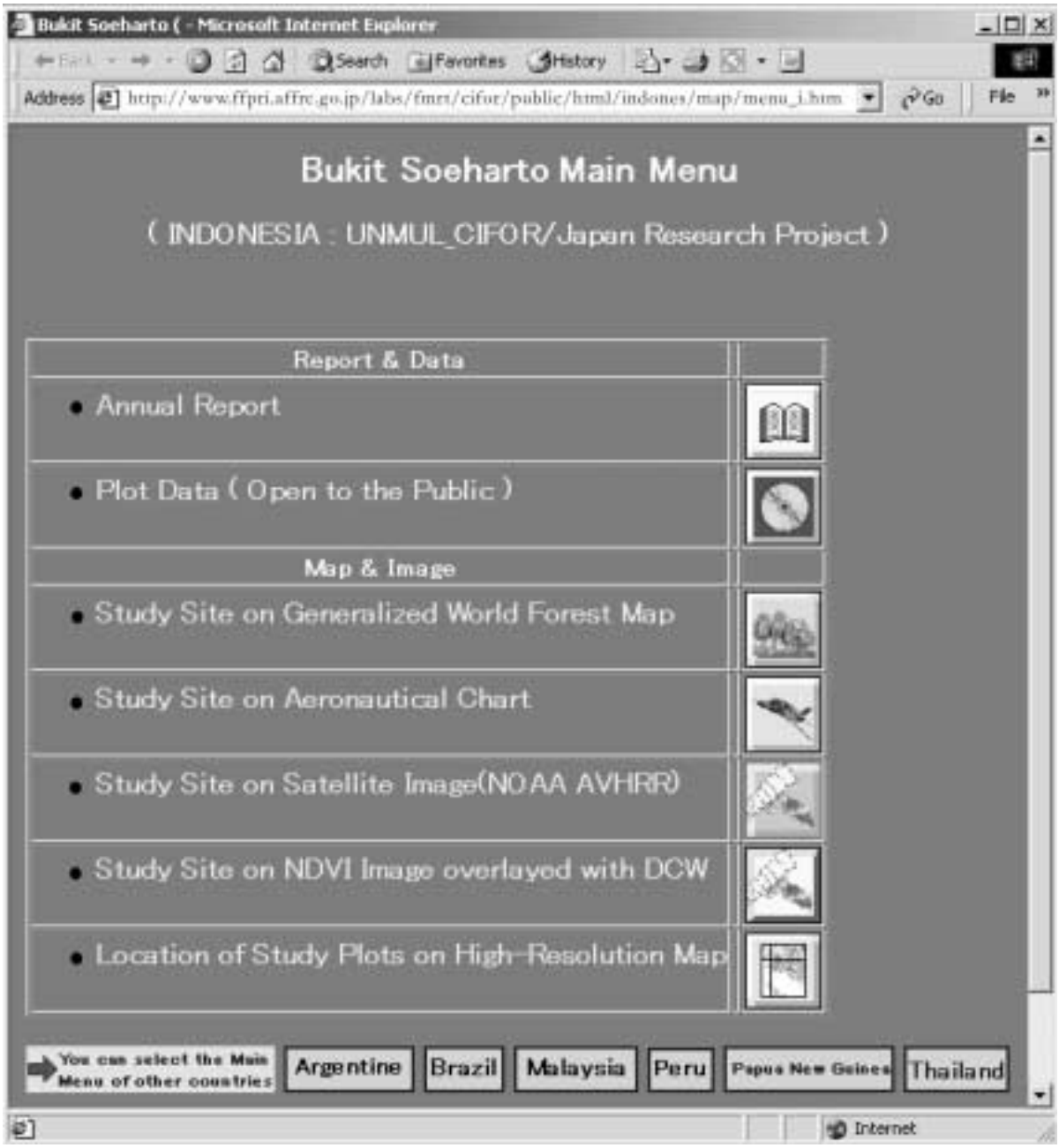
Figure 3. Start Menu Table Window

Start Menu  (table of data directory)
Select a Menu Box on the table

Partner Country	Research Organization/Project Subtitle/Activity Title	General Information	Experimental plot before the treatment	Control plot	Experiment plot after the treatment	Publication	Reference
Indonesia(1997)	○	○	○	○	○	—	○
Argentina(1997)	○	○	○	○	○	—	—
Papua New Guinea(1998)	○	○	○	○	○	○	○
Peru(1997)	○	○	○	○	○	—	○
Malaysia(1997)	○	○	○	○	○	—	—
Thailand(1998)	○	○	○	○	○	—	○
Brazil(1998)	○	○	○	○	○	—	—

 **return to Home Page**

Figure 4. Main Menu Window by Study Site Country



26 FORSPA Initiative for Rehabilitation of Tropical Forests in the Asia-Pacific Region

S. Appanah[1] and C.T.S. Nair[2]

Abstract

Tropical forests of the Asia-Pacific region are the most heavily threatened from high population density and rapid economic growth. Extensive forest areas have become degraded as a result of over-exploitation and poor management. Unless these degraded forests are rehabilitated, they will come under pressure from other land uses. Recognising this, the Forest Research Support Programme for Asia and the Pacific (FORSPSA) of FAO initiated a Rehabilitation Programme and has started to set up a series of model plots of about 100 ha in each of the eco-climatic regions of Asia and the Pacific. Unproductive second growth forest areas will be rehabilitated using indigenous species of commercial value and techniques that are most familiar locally and well-proven. The plots will be model areas for research and training extend the methods to other parts of the region with similar ecological conditions. These plots, which are accessible to international scientists, will be maintained for long enough to achieve and extend results. To further enhance the rehabilitation work, the group of scientists and forest managers will be soon linked through the Asia Pacific Forest Rehabilitation Network (APFReN). This will link together scientists and managers engaged in rehabilitation work to share experiences and solve problems. The Rehabilitation Programme will include training courses, workshops and publication of literature on forest rehabilitation issues.

INTRODUCTION

Annual surveys of forest statistics published by FAO indicate a poor situation for the Asia-Pacific Region. The rate of deforestation and degradation far exceeds that in the American and African tropics (Table 1). This is mainly because the Asia-Pacific region has had a longer period of agricultural development and has higher human populations. The extent of degradation varies between countries, but all are anthropogenic in origin. The degradation results from: unsustainable shifting agricultural practices; bad logging practices; mining; and fires escaping from land-clearings to forested areas during prolonged droughts. Other bad practices have also resulted in degraded forests, e.g., planting forests using unsuitable tree species. An example is in Malaysia where native forests were cut down and planted with the exotic *Acacia mangium*. This species has performed poorly and foresters are now looking for ways to rehabilitate such sites.

While forests converted to other forms of uses are lost forever, there are also large tracts of forests that have become degraded. Although still considered forest land in a country's statistics, the quality of the forest is reduced considerably (Table 2). The causes of this degradation are many, and include uncontrolled logging, shifting agriculture, mining and fires. The resulting lands range from those that are completely denuded to those that retain the tree vegetation but with few

[1] Forest Research Institute Malaysia, Kepong, 52109 Kuala Lumpur, Malaysia. Present address: Forestry Research Support Programme for Asia and the Pacific (FORSPA), FAO Regional Office for Asia and the Pacific, Phra Atit Road, Bangkok 10200, Thailand, Tel: +62-2 281 7844 Ext. 136, Fax: +62-2 280 4565, E-mail: simmathiri.appanah@fao.org

[2] FORSPA, FAO Regional Office for Asia and the Pacific, Phra Atit Road, Bangkok 10200, Thailand.

Table 1. Status of forest cover and change in tropical countries

Region	Total area 1990	Annual change (1980-1990)	Annual change (1980-1990)
	Natural forest (million ha)	Natural forest (million ha)	Natural forest as a percentage cover of total land
Africa	528	-4.1	-0.7
Asia-Pacific	315	-3.9	-1.2
South America	918	-7.4	-0.8
Total	1761	-15.4	-0.8

Table 2. Estimated harvesting intensities and areas of broadleaved forest harvested annually in the tropical Asia-Pacific region

Period	Average harvest intensity	Area of forest harvested annually (000 ha)	
		Primary forest	Secondary forest
1961-65	42	510	78
1966-70	43	750	135
1971-75	35	1343	221
1976-80	33	1732	319
1981-85	32	1718	369
1986-90	33	1861	453

commercial timbers in them. While some of the denuded areas may never recover naturally, the less degraded sites may do so in time, perhaps several centuries later. While it is possible to let nature take its course, socio-economic and political conditions may not give these forests such a reprieve. The reasons are several. Populations in the tropics are rising rapidly, increasing the demand on the natural resources, particularly land for agriculture and industrial crops. The chances are there will be strong forces to convert these unproductive lands for such purposes. Forests are the first to go when feeding of the population becomes critical.

Loss of tropical forests, including their degradation, could also mean permanent loss of a considerable number of plants and animals in these biodiversity-rich centres of the globe. Bad logging practices, usually entered into for earning foreign exchange rapidly and for funds to fuel industrial development, often can result in marginalisation of large numbers of rural and forest dwelling populations. Loss or degradation of forests impoverishes the lives of those who have depended on the forest resources for much of their physical needs, including food, shelter, medicines, and some cash income from sale of forest produce. An additional concern is the fact that loss and degradation of tropical forests represents also a loss in an efficient system of carbon sequestration system, which can lead to global warming. One way to ameliorate these effects and regain the forests, both in terms of biodiversity and timber productivity, is to rehabilitate them.

THE NEED FOR ACTION

Considering the extent of forest devastation in the region, something has to be done to reverse the situation. Researchers have been looking intensively into the causes of degradation and rehabilitation techniques. Identifying the causes will help authorities in preventing or reducing forest degradation, but what can be done with the extensive areas of degraded forests that already exist? Rehabilitation has been suggested as the best

option. A quick glance of the literature in the field of rehabilitation suggests that considerable amount of work has already been undertaken. Despite it, there is little rehabilitation work in the region to vindicate the research efforts. Numerous reasons can be identified for the lack of success in rehabilitation work. Some of the constraints include:

Continuity

The major problem is the lack of continuity either of research or extension pilot trials. Funds often are not allocated for many of such long-term rehabilitation trials, and the essential observations are not made and published. Staff often get moved and field trials may be forgotten. Records are often made on an *ad hoc* basis.

Research site security

Often the sites where trials have been located may be alienated for other purposes and the trials are lost. Also, if the trials are located in areas with difficult access, temporary roads may deteriorate and the plots become inaccessible. When the trials are not adequately protected from grazing or fire, hard work goes to waste. Likewise, many inaccessible research sites are maintained by locals who have no interest or foreseeable benefits from the work. Such sites are in constant danger from external threats.

Purposes of rehabilitation

Views on rehabilitation have been evolving. At one time, rehabilitation may be focused on production of timber as the end output while soil protection may be a secondary effect. However, the primary focus on timber production has been set aside where community needs are taken into consideration and the end products may be timber, fuel wood, animal fodder, fruit, medicinal plants, etc. At present, ecosystem rehabilitation is coming into vogue. Planting is considered appropriate if the end result is a heightened biodiversity in the forest. Other cases of rehabilitation are linked with CO_2 sequestration. As concepts change, researchers also move with the result that important studies on the silvics of species have been neglected.

Economic evaluations

Most of the projects concentrated on the rehabilitation in terms of the biological aspects have paid scant attention to the viability of the system in socio-economic or monetary terms. As a consequence, the systems developed have had little or no practical value. This kind of effort disappointed field managers who are looking for practical and implementable systems.

Design of research

There have been a plethora of research initiatives on rehabilitation but they were not undertaken in a manner which allowed cross-region or cross-country comparisons. This limited the application of the findings to the local conditions. The experience and knowledge gained could not be extended to neighbouring countries which share similar forest and climatic conditions other than in a general sense. The many research efforts can be short-circuited with one exemplary project that can act as a demonstration plot for the whole region. Such research and formulation of field work may require collaboration and networking through international agencies rather than by individual countries. However, there are already many international initiatives operating without the benefits of networking and collaboration.

Analysis and publication

If research trials are poorly formulated, they are difficult to analyse. Sometimes, the assistance of statisticians is not available and the results are never properly analysed. Many results do not get published and remain in inaccessible departmental records. The lessons learned by one generation may be forgotten, and a whole new crop of people start the same work without the benefit of lessons previously learned.

FORSPA'S INITIATIVE

The Forestry Research Support Programme for Asia and the Pacific (FORSPA) identified rehabilitation of degraded forests as critical in the coming decades. Some 40-50% of the existing "productive" forests in the region may require rehabilitation. In 1997 FORSPA in a joint collaboration with the Forest Research Institute Malaysia (FRIM) initiated the programme of forest rehabilitation for the Asia-Pacific region. As the programme developed, and interest in rehabilitation began, the two organisations initiated a network to promote forest rehabilitation with collaborating countries in the region.

First, a meeting of experts from the region was held to identify the kinds of research, agencies best suited to undertake such research, best sites for the research, and the kinds of funding needed to start the work. Next, a network of scientists was formed. The Asia Pacific Forest Rehabilitation Network (APFReN) began in 1997, with its Secretariat FRIM. The network aims to provide technical support to countries/institutions to demonstrate how rehabilitation can be undertaken in the field, to support sharing of information and the development of channels for exchange of expertise and technology.

FORSPA also intends to raise funds for research, especially for setting up demonstration trials in specific parts of the region. Such a demonstrations can provide a model or reference point on which to base future work.

DEMONSTRATION PLOTS

The demonstration plots set up in strategic parts of the region should adhere to certain common guidelines and protocols so as to facilitate comparative studies and to enable extension of findings to other locations. When such norms are adopted in the establishment of plots, their management, recording of measurements, and analyses of data can be enhanced. Expert groups can develop many of the techniques which can then be employed in development of such plots even if expertise is lacking in the country. The plots should also address the location-specific problems.

Objectives for plot establishment

Proven technology

The plots will mainly focus on demonstrating well-proven technology applied on an operational basis and shall not be used for initiating new rehabilitation research. Probes to test out finer aspects of some of the technology may be adopted on a small scale. The plots shall serve to assess the value and practicality of the techniques involved. And as a means of technology transfer to managers.

Degraded forests

The rehabilitation techniques shall be confined to degraded forests, and not address issues related to establishment of regular plantations. They will focus on improving degraded forest areas that represent a working unit, e.g. the size of a compartment.

Existing protocols

Demonstration areas shall aim at improving and refining existing protocols for large-scale rehabilitation of degraded forests and, wherever possible, incorporate local people's interests.

Indigenous species

Techniques developed shall involve indigenous species as much as possible, which meets the secondary objective of rehabilitation of the ecosystem and enhancement of the biodiversity.

Monitoring

The demonstration plots will facilitate long-term monitoring of changes and responses to the treatments. This monitoring should be long enough to ensure the full implication of the techniques, species and financial impacts is captured.

Criteria for site selection

Due consideration should be given to site selection criteria as they are vital for the permanency or long-term existence of demonstration plots.

Factors that need to be considered include the following:

- Only important commercial indigenous species should be used.
- The proposed technique to be used must be economically viable. An economic/financial analysis should be carried out to evaluate the returns on investment over time.
- The techniques must be practical, feasible and achievable and congruent with the country's economic and social conditions.
- The techniques must serve as a reference for all future effort in rehabilitation of degraded forests in the country.
- Wherever possible, the local communities and their needs should be integrated into the rehabilitation work. In this regard, the social impact of project should also be studied.
- The rehabilitation work should also address issues of environmental amelioration.
- The forest should be representative of the most important natural forest formation in the area, and one that is subjected to heavy disturbances. The disturbances should be those regularly occurring in the forests.
- The site should allow for a range of rehabilitation techniques to be demonstrated.
- The site should be free of all encumbrances in terms of ownership, and where no future conversion plans exist. The duration should cover at least one rotation of the climax phase species used in the rehabilitation work.
- The institutions involved should be committed to maintain the area for a sufficiently long period.
- The site should be easily accessible currently and in the future.

Size of demonstration site

The size of demonstration site should be sufficient to meet several requirements, which include:

- Demonstration of most of the techniques for rehabilitation of logged over areas.
- Be at least the size of a forest working unit, e.g. a watershed or a compartment.
- Sufficiently large to allow for scaling up of demonstrations to pilot scale trials.
- A size that is easy to manage.
- The scale and nature of operations should reflect the normal conditions under which rehabilitation would be undertaken.

Treatments

The rehabilitation treatment for the area should be determined clearly. As indicated earlier, we will not be undertaking any original studies or research, and the effort will be directed entirely to demonstrating specific techniques with much potential. The protocol being developed should take into consideration the following:

- The nature of the treatments.
- How the treatments will be laid out?
- What measures have to be taken to ensure that it is possible to scale up from demonstration to large-scale application.

Data to be gathered

The data and background information need to be fully evaluated before the demonstration work is begins. The bench mark information required includes:

- A full description of the techniques used, the research findings and results.
- A work plan and a breakdown of the estimated cost of project implementation and maintenance.
- Topographic map on a scale of 1:50 000 to indicate the relative position of the demonstration plot and its access route.
- Soil map/soil studies map of scale 1:5000 to indicate the general topography and soil fertility.
- Inventory and regeneration survey map of scale 1:1000 to indicate the status of regeneration in the area with the objective of defining the nature of treatments.

- Working map of scale 1:1000 to mark the boundaries of the different techniques used.
- Description of the species composition, stocking and volume of the stand before the degradation occurred. This may not be always obtainable, and in such a case a general description may have to suffice.
- Past history of the area, inclusive of activities carried out.
- General description of the current status of the area, including stocking, species composition and ground cover. Existing community use and social implications of demonstration plot will require some additional attention.
- Climatic data, if available, especially on rainfall and temperature - 10 years mean monthly and annual rainfall and temperature patterns will be useful.
- Working plan and methodology of the rehabilitation programme.
- Subsequent tending, treatment, monitoring and maintenance of the area.
- What records are to be maintained?

DEVELOPMENTS

Based on the ideas developed above, national forestry agencies have been approached. The proposals have been received very enthusiastically, and some countries have begun establishing demonstration plots. The following countries have started the activities.

Laos

The Lao Forest Department has established a 100 ha plot in Pakkading District of Bolikhamsay Province. The site is being developed in collaboration with the District and Provincial Agriculture and Forestry Offices and the National University of Laos. The area is located within a 10 000 ha block of logged forests designated for rehabilitation. The demonstration site is being developed to incorporate research, education, training and extension functions. The first phase survey and demarcation, and preliminary mapping and classification of the area based on forest cover have been completed. An additional facet of work here is the raising of awareness among local communities. This should ensure their participation and the success of the project. A nursery has been established and seeds and wildings of selected tree species are being collected. Planting techniques have been identified.

Papua New Guinea

The Forest Research Institute of Papua New Guinea has started a preliminary survey of the demonstration site in Medang and approval from the landowner families has been obtained. They will be extensively involved in the setting up and managing of demonstration plot.

Sri Lanka

The Forest Department has located the site for the demonstration plot in Kalavana range of the Ratnapura district. The initial survey of the residual vegetation has been completed. Based on the survey, the need for the demonstration plot here has been affirmed. The precise location of the plot, the type of planting activities and the suitable species can be determined on the basis of the survey.

Vietnam

The Forest Science Institute of Vietnam is developing a demonstration site in the Kon Ha Nung area in Gai Lai Province. One hundred hectares have been demarcated for the demonstration plot, and for testing out practical and cost effective technologies for restoring logged-over natural forests. Survey, demarcation, and sample inventory of trees and young regeneration have been completed.

NETWORKING

FORSPA has identified FRIM as the referral centre for assisting in the development of the rehabilitation demonstration plots throughout the region. FRIM has also signed Memoranda of Understandings with Papua New Guinea Forest Research Institute and the Forest Science Institute

Vietnam to boost the collaboration among the institutes in the region. Activities have included a training workshop for 20 forest managers and researchers from the region. The training included general lectures on natural forest management, silviculture and mensuration. The workshop dealt in greater detail specific issues of management of second growth forests, enrichment planting techniques, inventory and sampling methods, and data analysis using computer software. The participants also conducted field work that included assessing planting trials in two forest reserves in Peninsular Malaysia.

To maintain links and discussions among the participating countries in the region, a newsletter "Asia-Pacific Forest Rehabilitation Network" (APFReN) will be launched. This will be augmented with a web page, now that electronic networking is becoming accessible to more and more people throughout the region. Additional workshops and meetings on rehabilitation issues are being planned. The demonstration plots, which will cover many parts of the region, are expected to act as nodes for further development in the region.

CONCLUSIONS

Networking is becoming an integral part of international and regional collaboration for scientific development work. The objective of international development work in R&D should aim at strengthening the capacities of individuals and institutes to carry out the necessary work, enable transfer of technology, and bring about scientific exchange and collaboration among the regions' Institutes. However, often international development work puts undue emphasis on basic research rather than solving problems that are facing developing countries. Moreover, the thrust of international assistance programmes too often directs local research and management institutions into academic work, with emphasis on publication credits. With this kind of arrangement, the benefits accrue more to the international scientists than to the collaborating agency. Much energy gets expended and many of the inexperienced scientists are thwarted from pursuing solutions for immediate problems. Unfortunately, even a cursory examination quickly indicates that in many countries, there does exist a lot of research and practical solutions, and considerable local knowledge. Even if it does not exist in the specific country, many of the neighbouring countries have reliable techniques for adaptation.

Hence, international research collaboration should aim to try and solve important problems instead of seeking to do more research of an academic orientation. FORSPA's initiative represents an important model, for the following reasons:

- The issue of rehabilitation is vital, will bring about definite gains for the host country, and the solutions are wide-based in a socio-economic sense.
- The experiences among the member countries in the region are many, and with slight adaptations they can be employed.
- A lot of expertise is available in the region and can be engaged cheaply or *gratis*.
- FORSPA identified an agency (FRIM) to take the lead, and become the referral centre for training and transfer of technology.
- Small grants were adequate to set up the demonstration plots, as most of the work was done by local scientists. FORSPA overall encourages the local institutions to do all the work, and assistance from outside is minimal, mostly in guidance on some techniques.
- These demonstration sites become models for testing out the best techniques already known in the region, and the plots are kept active for adequate length of time for others to gain the knowledge as well.
- Other agencies in the country are encouraged to work together with the lead agency in each country. Likewise, neighbouring countries can also gain experience from these sites.
- The networking can extend the experience and findings throughout the region.
- FORSPA further provides other kinds of training to the local scientists including monitoring of the plots, writing proposals to

apply for grants from international sources, and transfer of the findings to real situations. The networking overall aims to strengthen the local participants to do the work independently.

Overall, the FORSPA model has proven to be quite successful although it is still a very small initiative and the costs are minimal.

ACKNOWLEDGEMENTS

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