People, Land Use and Forests in the ASEAN Region: Policy Challenges in the 21st Century
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THE SCIENCE AND TECHNOLOGY OF FOREST REHABILITATION

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INTRODUCTION

- Rehabilitating degraded forests to improve their structure and functions requires in-depth knowledge of ecosystem processes and how the degraded land responds to different interventions.
- Rehabilitation efforts and the associated technologies depends on what precisely is being visualized as regards the structure and functions of rehabilitated forests.
- This will also depend on the relative roles nature and nurture and the technology to be deployed will vary depending on the level of nurture required. In the case of passive restoration - leaving rehabilitation to natural processes - the role of nurture will be very limited.
- Developing a very different structure of vegetation and its associated functions would require significant nurturing, to prevent the natural processes taking over and to direct restoration/ rehabilitation in a human determined path.

WHAT DO WE WANT TO ACCOMPLISH?








RESOURCE OWNERSHIP, REHABILITATION OBJECTIVES AND TECHNOLOGY

Owner/stakeholder	Rehabilitation objectives	Technology involved
Government	Enhancing production of wood and other products as also environmental services	• Assisted natural regeneration • Afforestation
Private sector	Increasing wood production through plantations	• Afforestation/ reforestation with fast growing species
Local communities and farmers	Production of multiple products and services for improving livelihood	• Agroforestry with a wide array of mixtures often mimicking natural vegetative cover.

- **Based on the work done during the last many decades, there is a fairly good understanding of technical aspects of rehabilitation, even in very difficult environmental conditions.**

STATE OF KNOWLEDGE

A wide array of technologies are available as regards degraded forest rehabilitation. These relates to:

- **Species site suitability.**
- **Tree improvement practices, adopting a wide array of technologies including genetically modified trees.**
- **Assessment of site conditions and site management practices (for example soil amelioration practices).**
- **Silviculture of different species**

STATE OF KNOWLEDGE

However there is considerable imbalance in the state of knowledge:

- **Most of it relates to the development of highly simplified ecosystems like plantations.**
- **Knowledge about restoration to multifunctional forests and farm lands (for example home gardens) is still very limited.**
- **The social science dimension, critical in the adoption and application of silvicultural knowledge is largely missing.**

SOURCES OF KNOWLEDGE

There are diverse sources of knowledge. But most comes from:

- Public sector R&D institutions, universities and research units in forestry departments and ministries.
- Private sector, especially research undertaken by large plantation companies.
- Local knowledge gained from the experience of people (including traditional / indigenous knowledge).
- Externally sourced knowledge.

How these knowledge sources are functioning:

- In terms of the different components of knowledge development, especially basic research, strategic research, applied research and adaptive research.
- In transferring it to those dealing with the problems.

INDIGENOUS/ TRADITIONAL KNOWLEDGE

1.The narrow focus of early rehabilitation efforts led to a near total neglect of traditional/ indigenous knowledge.

2.However this has started changing in the context of:

- **Thrust on generating multiple values especially inclusion of meeting livelihood of local communities as an important objective of forest rehabilitation.**
- **Local communities becoming a key stakeholder requiring their active participation in the rehabilitation efforts.**
- **Better understanding of the ecosystem processes and the realization that local communities have significant site specific knowledge that could help restoration/ rehabilitation efforts.**

3.But we also have to be realistic about the limitations of traditional knowledge.

KEY BARRIERS

- Access to existing knowledge is extremely uneven between countries and among groups within countries.
- Weak linkage between research institutions and users of research.
  - Research is not demand driven and not always problem focused.
- Even proven technologies are not put into practice largely due to policy and institutional problems and resource constraints, which reflects the fragmented nature of research.

EMERGING CHALLENGES

- **Major challenges for science and technology will come from climate change related problems.**
  - Extreme and unpredictable climatic events
  - Changes in the distribution of species and site conditions

- **Increasing population, competition for resources (especially water) and the need to move to a low-carbon economy would compel a shift to resource conserving, low-energy input technologies.**

EMERGING OPPORTUNITIES

1. **Improved knowledge on ecosystems and ecosystem processes.**

   - Many of the earlier interventions in natural forests –especially as regards assisted regeneration in logged over natural forests – were not based on a thorough understanding of ecosystem processes.

   - Apart from economic reasons, management of natural forests faded out of interest on account of persistent knowledge gaps and the associated uncertainties.

2. **A revival of interest in multi-functional forests coupled with better knowledge on ecosystem processes provide new opportunities, especially for "precision forestry".**

EMERGING OPPORTUNITIES

1. **Rapid growth in remote sensing technologies.**
   - ❑ Improvement in the resolution of satellite imageries.
   - ❑ Three dimensional assessment through LIDAR
   - ❑ Ability to access and analyze information on a real time basis.
2. **Developments in communication technologies enabling easy and timely access to information.**
3. **Sensor technologies enabling the monitoring of minute changes in various environmental parameters.**

EMERGING OPPORTUNITIES

1. Advancements in processing technologies.

- Use of small dimension timber.
- Use of less known timber species: The species and natural properties becoming less important.
- Improved tools and equipment suitable for small scale and micro-enterprises.
- Improvements in energy technologies, especially wood gasification, suitable for domestic uses.

2. Other emerging technologies:

- Biotechnology and bio-refineries
- Nano technology applications
- 3-D printing/ processing.

SUMMING UP

1. A wide array of knowledge on rehabilitation already exists; yet many challenges exist as regards access to such knowledge and their actual application.

2. Most of the knowledge pertains to the development of highly simplified systems – especially monoculture plantations. We are yet to develop/ improve our knowhow on nurturing the development of complex ecosystems providing multiple products and services.

3. Climate change related uncertainties and risks will necessitate more efforts to build knowledge on developing more resilient ecosystems.

4. Efforts to understand the human dimension require much more efforts. Many of the failures of past rehabilitation efforts stems from the poor understanding of human behavior.

5. Developments in science and technology, especially outside the traditional forestry sector offers immense opportunities for improving rehabilitation efforts.

Thank You