

Furthermore, it is imperative that a practical and workable scheme in certifying timber emanating from sustainable managed forests be developed and that such timber should be provided with greater market accessibility and financial returns. Besides, timber also emanates from planned and controlled conversion of forested land to non-forestry uses, such as in the establishment of agricultural tree crops and in meeting the need for infrastructure development. It is, therefore, critical to provide better conservation and management of these renewable forest resources for long-term benefits, to promote economic growth and development. In this light, future emphasis should focus on:

- (i) development of methodologies for the valuation of non-wood forest resources as well as the environmental cost incurred in forest harvesting;
- (ii) quantification of cost of forest depletion and its integration into the national accounting system;
- (iii) development of techniques for the complete appraisal of all forest genetic resources and ascribing economic values to them;
- (iv) improvement of harvesting techniques which are environment-friendly so as to reduce the current high level of harvesting losses, while promoting the utilisation of the under-utilised timber species;
- (v) identification of appropriate species for the rehabilitation of areas degraded by shifting cultivation.
- (vi) increment of the utilisation of other lignocellulosic materials, especially those from perennial agricultural crops through the development of appropriate industrial processes.

8.0 RESEARCH AND DEVELOPMENT ON FOREST MANAGEMENT PRACTICES

Forestry research in Malaysia dates back to the beginning of the century with the establishment of the Forest Research Institute in Kepong, near Kuala Lumpur as a research unit of the Forestry Department. In October 1985, the Institute became a statutory body, and is now known as the Forest Research Institute of Malaysia (FRIM). FRIM is responsible for research on all aspects of forestry and forest products. Research in ecology (Figure 13) and silviculture is carried out with the objective of developing suitable management and silvicultural techniques for the forest in Malaysia. Studies conducted in these areas are aimed at providing information to enhance the knowledge and understanding of the ecology and dynamics of these forests and their response to logging and other disturbances. Research in forest plantation is geared towards the fuller utilisation of wood properties, growth characteristics and species suitability. Forest products research is directed towards a more efficient and diversified utilisation of the nation's forest resource with the aim of promoting higher operational efficiency in existing production systems by introducing innovative technological systems, thereby reducing wood waste and encouraging fuller utilisation of the currently under-utilised timber species.

Being the national R & D organisation, however, does not mean it is the only agency responsible for forestry research in the country. There are a number of other centres of excellence where complementary R & D activities are being carried out. These include the Forest Research Centre at Sandakan in Sabah; the Timber Research and Technical Training Centre and the Forestry Research Division of the Sarawak Forest Department; and the Faculty of Forestry of University Pertanian Malaysia.

The need to carry out continued research and development on mangrove forests requires no emphasis as the ecology of mangrove forests has been found to be productive not only in terms of timber but also in the protection of the marine environment itself. Coastal erosion has recently been identified as having significant repercussions on agriculture schemes. Research is now under way, in collaboration with the Malaysia Agricultural Development Authority (MARDI), to overcome this problem.

Research has significantly influenced the development of the forestry sector and has resulted in the comprehensive documentation of the tree flora and fauna. Years of monitoring growth and performance of trees in established plots have provided the basis for current practices in silviculture. These lend support for the forest management policies in Malaysia and have influenced similar practices implemented in some other tropical countries.

9.0 CONCLUSION

Malaysia is aware of the need to manage sustainably its forests, not only for socio-economic benefits but also for climatic, ecological and environmental stability. It strongly believes in the principles of sustainable management and is openly committed to maintain its Permanent Forest Estate and the network of conservation areas. Compared to European forestry, forest management in Malaysia is relatively new, but British involvement in the early twentieth century administration of the Straits Settlement, the Malay States and North Borneo had brought Malaysian forestry to the fore in South-east Asia and the tropical world. "Malaysianisation" of the civil service in the post-independence era saw local foresters take over the helm as conservators and guardians of the forest, and with them, a lot of the knowledge and experience of the expatriates as well as what they had learned in British and Australia universities in the 1960s.

Almost three-fifths of the country is still forested, and its rainforest has been recognised as a rich, natural heritage which, in addition to providing valuable timber and other forest products, also provide essential environmental-friendly services such as recreation, aesthetics and other intangible values. The forests are also important for the conservation of biodiversity and as a carbon sink for the continually industrialised world. The anti-tropical timber campaign in the 1980s might also have helped Malaysia to consolidate its forest management practices and encourage diversification in the timber industry while instilling more conservational measures towards sustainability of this important resource. Indeed, for Malaysia, the long-term objective for the sound and sustainable management of its forests must be one that balances the needs and wants of society, both local and global, as well as the economic growth of the country and the environment.