REGENERATION OF HILL DIPTEROCARP FORESTS IN PENINSULAR MALAYSIA: THE SELECTIVE MANAGEMENT SYSTEM

Zulmukhshar bin Dato' Md. SHAARI*

Introduction

The problems of regeneration of the dipterocarp forests have always been very complex. Although research has been done in regeneration of the lowland dipterocarp forests, much more needs to be done to overcome the problem of regeneration of the hill dipterocarp forests. With forest land being more and more confined to the hills due to socio-economic pressure, this problem becomes more and more significant.

This paper describes briefly the introduction of the "Selective Management System" into Malaysian forestry and how this system can contribute to overcome the problems of regeneration of the hill forests. The paper also points out briefly the problems faced in implementing this system and the role of research in achieving the objectives of the system.

Background

Peninsular Malaysia covers an area of 13.3 million hectares (32.5 million acres) of which 7.2 million hectares (17.8 million acres) or 54.8% is under forests. Of the 7.2 million hectares, 2.1 million hectares (5 million acres) are found suitable for agriculture and will be converted for such purpose. The remaining 5.1 million hectares (12.8 million acres) have been proposed as a Permanent Forest Estate. Out of the 5.1 million hectares of Permanent Forest Estate, 1.9 million hectares (4.7 million acres) are unproductive as the forests are inherently poor or are located on very steep terrain and adverse sites that cannot be economically harvested. Thus the forests left as productive forests are confined to only 3.2 million hectares (8.1 million acres).

The forest is of the mixed Tropical Rainforest with a dominance of the family *Dipterocarpaceae* which forms the bulk of the commercially valuable timber. Since agriculture, as in many developing countries, has priority over forestry in land-use planning, the forests to be maintained as productive forests are mainly of the Hill Dipterocarp type since much of the lowland areas are earmarked for conversion to agriculture.

The regeneration problem

The silvicultural system employed in Peninsular Malaysia is the "Malayan Uniform System" which involves the removal of timber stand to a minimum girth of 4 feet at breast height. This is then followed by a regeneration survey (sampling) to verify the presence of sufficient natural regeneration. Based on the results of the regeneration survey, suitable silvicultural treatments are prescribed. Areas lacking in regeneration are artificially regenerated by line-planting.

This system, where felling is done irrespective of the status of the natural regeneration has been generally successful in the lowland forests where natural regeneration is generally sufficient. Only small acreages need be regenerated through line-planting. However, in hill forests, where the bulk of the productive forests is located, natural regeneration where present is only confined to the ridges (Tang & Wadley, 1976).

Regeneration surveys on areas felled in these forests showed that an increasing number is lacking in natural regeneration consequently resulting in more and more areas requiring artificial regeneration by line-planting. Although success has been obtained with line-planting on a small scale, line-planting on a large scale has failed due to both technical and administrative problems. The overall cost of regeneration using this method is also too high (Cheah, 1977).

* Plantation Forests Silviculturist, Forest Research Institute, Kepong, Selangor, Malaysia.

The selective management system

Although ways and means are being sought for to solve the problems associated with line-planting, other methods of overcoming the regeneration problem are also being studied. One such method is the selective management system.

Basically the selective management system is "the application of cutting regimes (minimum diameter cutting limits) over a specified area of forest that will yield an economically viable amount of timber while retaining adequate advance regeneration for future economical cutting cycle in the shortest time" (Griffin & Caprata, 1977).

The system involves a pre-felling inventory over the area to assess the forest resource available. Based on the results of the inventory and other characteristics like climate, soil, ecological balances and the demands of man (economic, socio-political and technological considerations, Griffin & Caprata), the forest manager would then find a suitable cutting regime to achieve, as close as possible, the objectives of the system. Besides the fact that the output from harvesting must be economically viable, the system is flexible enough to cater for all the variations found in the forests.

The main advantages of using this system of partial cutting of the forests are:

(1) Regeneration can be ensured before felling is actually carried out since the determination of the cutting regime is directly based on the availability of the regeneration for the future crop. The need for line-planting is cut down to the very minimum.

(2) Since the resource base is known before felling (through inventory) this will allow preference to be given to bigger regeneration materials as the potential crop for the next harvest. This will then reduce the length of the cutting cycle as compared to that under the Malayan Uniform System.

(3) By the retention of some trees as a result of the selective felling, these trees can act as mother trees and it is possible to increase the amount of seedling regeneration on the ground.

Although the system introduced has the above advantages, there are still problems to be solved. In this respect, research plays as important role.

One of the main factors that will affect the success of the system is the response of the residual stand after felling. The system assumes that the residual stand will respond vigorously after felling. The growth data that are only available now are from the regenerated forests. Growth studies on residual stands under the selective management system have only just been initiated.

Data from some sample plots of regenerated forests showed that the periodic current annual increment over a ten-year period for dipterocarps was 0.35 inches and for non-dipterocarps LHW (light hardwoods), MHW (medium hardwoods), and HHW (heavy hardwoods)/miscellaneous species 0.20, 0.21 and 0.15 inches respectively. It is quite likely that these growth rates could be further improved if the forests were to be given regular intensive silvicultural treatments (Tang, 1977). Preliminary studies have shown that the commercial species in the residual stand can compete successfully with the non-commercial species (Jonkers, 1977).

More research in this respect is necessary. If the growth of residual stand can be increased tremendously, either the initial stocking to be left can be reduced so as to give a higher volume of present harvest or the volume of future harvest can be increased.

In addition to the growth rates, mortality rates will also affect the development of the residual stand. Again, mortality rates in residual stands are still not available. Preliminary studies in regenerated forests have shown that the mean annual mortality rate (over a period of ten years) of trees 8″ d.b.h. and above was approximately 2.0% and for trees below 8″ d.b.h. the mortality rate was approximately 4.0% (Tang, 1977).

Further studies to review the mortality rates in the residual stand need to be carried out so that more accurate figures can be used to determine the stocking of the residual stand required.

Another problem that has to be considered is the damage done to the residual stand. Since the success of the system hinges on the success of the residual stand after felling, the amount of damage done to the residual stand during the felling operation is important. Climber cutting before felling can reduce damage. Directional felling can also help reduce the amount of damage in the lowland forests although it may not do so in the more difficult terrain.

Although "with proper training and introduction of new logging techniques, damage to the residual stand can be significantly reduced" (Griffin & Caprata), studies on the extent of damage are necessary since if damage cannot be reduced it can be allowed for when determining the stocking of the residual stand.

Although the system is made so flexible as to suit the variation found in the forests, a high technical ability is required generally to manage forests and particularly to decide on the cutting regimes. Simulation models have been suggested to help in deciding the cutting regimes (Canonizado, 1977).

At the moment the selective management system is only practised in large timber complexes with large concession areas, since it is not economically viable to implement this system in a small logging set-up.

More and more timber complexes are thus being set-up to manage the forested areas especially in the Permanent Forest Estate and the concept of timber complexes is here to stay, as it is "undoubtedly the most logical and most exciting innovation in Malaysian forestry" (Mok).

Conclusion

So far, only about 10% of all the areas that have been felled in the forests have been silviculturally treated. The intensive nature of the treatment under the Malayan Uniform System and the high costs involved in the treatment operations have been the main causes of this backlog.

It has been said that if the present rate of logging in Peninsular Malaysia is allowed to continue unabated, a serious timber supply gap would appear imminent in about 12 years. If strict control over the rate of logging can be enforced it may be delayed until about 35 years time. With the successful implementation of the selective management system, the supply of timber from Peninsular Malaysia would hopefully be maintained.

References

1) Burgess, P.F. (1975): Silviculture in the Hill Forests of the Malay Peninsula. Research Pamphlet No. 66, Forest Research Institute, Kepong, Selangor, Malaysia.

2) Canonizado, J.A. (1977): Simulation of Selective Forest Management Regimes. Paper presented at THE ASEAN Seminar on Tropical Rainforest Management, Kuantan, Pahang, Malaysia, 7-10.

3) Cheah, L.C. (1977): Forest Regeneration and Development Options in Peninsular Malaysia Today. Paper presented at THE ASEAN Seminar on Tropical Rainforest Management, Kuantan, Pahang, Malaysia, 7-10.

4) Griffin, M. and Caprata, M (1977): Determination of Cutting Regimes under the Selective Management System. Paper presented at THE ASEAN Seminar on Tropical Rainforest Management, Kuantan, Pahang, Malaysia, 7-10.

5) Jonkers, W.B.J. (1977): Growth Studies in the East Coast States of Peninsular Malaysia. Paper presented at THE ASEAN Seminar on Tropical Rainforest Management, Kuantan, Pahang, Malaysia, 7-10.

6) Tang, H.T. (1974): A brief assessment of the regeneration system of Hill Forest in Peninsular Malaysia. *Malaysian Forester.*

7) ________ and Wadley, H.E. (1976): A Guide to Artificial Regeneration with particular reference to Line-planting in Peninsular Malaysia. Research Pamphlet No. 68, Forest Research Institute, Kepong, Selangor, Malaysia.

8) .... Forest Resources of Peninsular Malaysia. Forestry Department Peninsular Malaysia. Paper presented at the ASEAN Seminar on Tropical Rainforest Management, Kuantan, Pahang, Malaysia, 7-10.

Discussion

Liew T. C. (Malaysia): Undoubtedly Selective Management System is one of the most viable systems for managing the rain forest. However, I understand that the Selective System adopted in Peninsular Malaysia which is also known as "Bicyclic Felling System" has a cutting cycle of 25 years. As the growth of rain forest species is slow, intervention to the forest within such a short interval may upset the ecosystems. Could you comment on this point?

Answer: The Selective Management System has been wrongly referred to as "Bicyclic Felling System". In fact, the Selective Management System is more flexible and the felling diameter limits and the length of felling cycle are determined after a pre-felling inventory. So the felling cycle is not limited to two cycles at 25 years per cycle as the name suggests.

Sasaki, S. (Japan): You mentioned the importance of pre-felling inventory. In various forest conditions such as under heavy canopy or poor soil conditions, stocks of seedlings may show variations in growth and vigour, for the same number of seedlings or stocks. Therefore the status of the seedlings should be considered in the pre-felling inventory, in other words the quality of the seedlings should be taken into account. Sometimes, immediately after seed fall the number of seedlings may be large but it may decrease soon after. The light conditions may affect the shape of the seedlings which may not be suitable for the future generations. I would like you to comment on this point.

Answer: I tend to agree with you that may be the condition of the seedlings was not always evaluated in past inventories. The regeneration sampling methods are being reviewed at present and this point is being considered. Under the Selective Management System emphasis is placed on bigger materials rather than on small regeneration. Simulation models are being considered to fix cutting and diameter limits.

Liew T. C. (Malaysia) Comment: With respect to the question asked by Dr. Sasaki I would like to make a comment. In Sabah, We have 20-year old research plots planted with Dipterocarp seedlings and it has been found that healthy seedlings could survive and develop into pole-sized trees. To date, the Dipterocarp trees average 24–30 inches in girth in the 20-year old regenerating forests and they have actually developed from natural seedlings. The mortality rate of pole-sized trees for a period of 20 years in the logged-over forest was found to be 11% i.e. 0.5% per annum.