

GUEST EDITORIAL

MIXED DIPTEROCARP FORESTS OF THE SUNDA LANDS: WHAT CAN BE DONE NOW WITH WHAT IS LEFT?

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There has been much discussion of late over optimal methods for managing lowland tropical evergreen forests for timber production, yet at the same time also conserving arboreal vertebrate diversity; and, in some countries, continuing yield of products other than timber. In reality, of course, management—concentrated on the timber harvesting operation—has been left, with few exceptions, to the concessionaire who, in all but a few cases, has a license which provides incentive to maximise timber output alone. Much damage to the residual forest has resulted. However, the future is going to be different because the next stands of timber will be both shorter and of lower maximum diameter, requiring less destructive machinery and extraction. It will likely comprise different dominant species. How might the objectives of future management best be defined, its methods optimised and licenses devised that will give incentive for these to be executed? Further, until recently, major forest-holding states have remained happy to leave the major profit, which is in processing, to the importing countries. That cannot continue, though most timber exporting countries are now industrialising through processing to increase labour and added value, thus increasing trade and decreasing exports of roundwood. Since the middle 1990s, for example, Indonesia and the Malaysian state of Sabah have put an emphasis on labour-intensive plywood production and associated plywood adhesive manufacturing.

With few exceptions, forests on land suitable for commodity agricultural crops will have gone. However, domestic demand for timber will continue to increase, especially in forest holding nations. As national economies approach maturity, and as populations become increasingly urban, the service value of the residual hill and

montane forests will continue to increase—especially for sustainment of water supply and quality, and reduction of erosion; also for amelioration of local weather, and for recreation including managed hunting, and nature tourism will proportionately increase; and for the increasingly vital conservation of biodiversity and sequestration of carbon. In short, the economic value, albeit not the financial, will continue to increase.

We all know that little incentive was offered this last half century for management directed towards enhancement of ensuing timber crops. In fact, in all but a few forests, the new crop will be inferior in both quality and quantity. What options remain for reversing this trend? They will inevitably be demanding in both skill and investment. And what has been learned? We see so many articles in this journal on timber technology and the like, but how many which report the results of silvicultural or other management experiments? In our Sunda region of perhumid climates and leached soils, we had forests unique in the tropics for their timber potential, dominated by quality light hardwoods and sustainably manageable by shelterwood systems such as the Malayan Uniform System. However, they are being all but eliminated, except in Sabah where, with commendable foresight, long-term licenses are now the rule. Our future forests will have lost their advantage over those of seasonal regions, where slower growing heavy hardwoods prevail.

What is left is the hill forests. At their best, the hill ridges carried magnificent stands of medium and heavy hardwoods, while the slopes, usually steep, supported light hardwood stands of relatively low basal area although of similar composition to the lowland forest. Now, the ridge forests especially have been additionally

degraded by road building and skid trails. Plantation on more level sites where their soils have been compressed or truncated may be inevitable.

The original forest, with diffuse notophyll or microphyll canopy on ridges, and lateral light penetrating beneath, often supports higher densities of pole-sized juveniles of timber species than lowland forests; these are of shade tolerant, slower growing species. Further, the residual stands originating as advance regeneration on ridges and upper slopes will grow slowly, and within a narrow range of rates on their drought prone often leached soils: ranges between 5–8 mm diameter growth per annum for elite individuals should realistically be expected. The so-called selection systems based on a minimum felling diameter have failed, notably because little or no attempt was rarely made to ensure the survival solely of elite full-crowned individuals for the next crop. Leaving elite trees of the next cycle in competition with stagnating individuals, often of species of no value, is leading to failure to produce a crop within an economically viable period from the owners viewpoint. Is it really the case that the furniture on sale in the West, of ‘sustainably managed’ *merbau* and *balau*, is really so, or is it that the stand, not individual species, has been certified as sustainably managed? And where is the continuous forest inventory to prove at least some sustainability of timber?

Repeated re-entry before stands have recovered an economic basal area, as has occurred in Sarawak and elsewhere, will lead to forest degradation, loss of advance regeneration, and inability to restore stocking of quality timber. Felling cycles of less than 40 years, even with a selection system, will need skill and careful management. This implies that a modified (irregular) shelterwood system of management may be the best that can be achieved initially, that is an initial single cycle of perhaps 70 years or longer. A polycyclic selection system can only be reintroduced when regeneration, as well as structure and stocking, has been restored. Further, competition where immature stands remain dense will lead to stagnation rather than dominance of a few faster growing species, even where a shelterwood is applied. This can also be seen on the drought prone low nutrient humic yellow sandy soils so widespread in lowland Sarawak, and Brunei where Borhan Mohamad, for example, reported this consequence following Malayan Uniform System management in Andulau Forest Reserve.

The first step in any plan for restoration of a productive silvicultural management system absolutely must be removal of overtopping or competing trees to release desired individuals in dense stands. Future management will require skilled technicians, experienced in the ecology of hill forests and with deep knowledge of the site preferences of their species under the diverse soils prevailing in the hills. A flexible approach is necessitated, in which choice of species and thinning intensities must reflect variation in site conditions if performance is to be optimised. In effect, silvicultural operations would broadly model the variation in gap regimes, albeit with increased frequencies, occurring in unlogged forests on these sites. Such management, focused on optimising sustainable timber production, would concomitantly restore canopy conditions and corridors favourable to canopy wildlife.

Much forest is so severely depleted that little regeneration of preferred species survives. Enrichment or even plantation will prove necessary but itself requires careful planning and execution. Slopes must continue to be protected from erosion by whatever regeneration does exist; but they can be enriched with light hardwoods where soil is deep, and heavier hardwoods on upper slopes and spurs. Carefully selected exotics with diffuse crown foliage, notably pines, some legumes and perhaps mahogany, have a place on gentle slopes and ridges. They could serve as nurse for subsequent plantation of native species, and would not invade, provided native stands succeed.

Restoration to sustainable productivity will be costly: immediate profits have relied on deferment of these costs to later generations and to others. They may be difficult to meet without international subsidy. Critical will be the establishment of rigorous monitoring of the growing stock and silvicultural experiment. Critical for the success of this will be free access to existing data, fundamental to all scientific endeavours.

Essential to continuing success would be unlogged set-asides—virgin jungle reserves (VJR)—representative of site and forest conditions at initiation of silvicultural operations, to permit rigorous evaluation of methods while also acting as refuges for biodiversity and wildlife. Any unlogged areas should be likewise conserved, though these will unlikely represent the full range of site conditions.

Given the huge advances in mapping technology through satellites, GIS and LIDAR, the ability to develop precise, site-specific stand-level maps to define areas for production versus protection, and within which stands are treated uniquely, is huge. It is now feasible to create uneven-aged forests with a mosaic of differing stand development stages, also control plots (VJRs), nested within a network of protected corridors along some ridges, as well as the banks of water courses. The book keeping in each stand also can be monitored remotely for performance and growth, yield and structural development. Outside authorities can likewise monitor compliance for watershed protection, carbon credits and conservation.

These opportunities return responsibility for sustainable management fairly and squarely to the owner, and that owner must be an institution that fairly represents all stakeholders. If forests are to continue to be owned by the nation, representing us—the population, then skilled silvicultural technicians must be employed by the state represented by the Forest Department, not by the concessionaire. This will often require additional employment of a new cadre and new training opportunities. But it will provide increased rural employment, thereby returning some forest wealth back to forest communities and giving them increased incentive to respect their ancient resource. How prepared are our universities, our forest schools, to meet this demanding challenge? Where are the foresters, with deep field experience of forest reality, to teach these skills?

Forests ownership was transferred in colonial times in effect from traditional communities and rulers to nation states, therefore in principle (though hardly in practise) to everyone within them. This has broader implications now that we have come to realise that nations must act as one—if we are to continue to live in comfort through harmony with nature. In recent years, failure to increase royalties has meant that not everyone within nations has benefited, either from the revenue itself or from the opportunity to vote how it should be fairly allocated. This raises the question whether authority over our forests by government alone can ever succeed in a world of increasing population, rural as well

as urban, and which is increasingly educated and articulate. India is engaged in a range of experiments aimed at participatory management between local as well as broader constituencies, and the professionals of the forest service, while China is pursuing similar objectives in regions dominated by minorities. But rainforests yield services which transcend property boundaries and concessions. Water from rainforests are a downstream value of national concern for drinking, fisheries and agriculture. Other services, notably climate amelioration, carbon sequestration and biodiversity conservation are of global value. Should a wider representation at some level, and with an agreed authority, be involved in oversight?

We visualise a world increasingly forced to face issues of shared concern, as climatic catastrophes increase in frequency and strength. It will be one in which the need to share experience and influence over the fate of our forests, temperate as well as tropical, in industrialised as well as developing economies, will grow. Willingness to share will grow as the mutual gains become increasingly apparent. Trusts rather than bureaucracies, in which local communities and states will have shared authority, will become responsible for management policy and oversight. Forest departments will have the skill and responsibility for management but with oversight by specialists on behalf of the trusts. Specialists in climate, and the management of carbon stocks, biodiversity and other services—national and international—would serve in advisory capacity. And the cost of restoration would be shared. Dear reader, please offer us a more effective—and practical—scenario!

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