

Changing the standard model of reforestation across the Asia-Pacific

BY DAVID LAMB

The degree to which forest cover was lost across the Asia-Pacific region during the 20th century was probably unprecedented, as was the rate at which this loss occurred. While this forest loss continues, as the century unfolded, considerable reforestation also began to occur. This article reflects on reforestation efforts within the region.

Much of the clearing of forests was done to create agricultural land, but the conversion process was flawed and large areas of abandoned or under-used lands were created. Natural regeneration accounts for some of the reforestation that has taken place, but active treeplanting has occurred, with the earliest active reforestation efforts undertaken by state-owned forestry agencies. Subsequently, privately-owned plantation companies became active and have begun establishing plantation estates. Many are large and in parts of Malaysia and Indonesia may exceed 100,000ha in size.

But any description of reforestation as either a state or corporate activity is misleading. Recent statistics collected by the United Nations Food and Agriculture Organisation (FAO) reveal the importance of 'smallholder' or on-farm plantings. Most of these are less than five hectares in size and many of these farmers are relatively poor but, collectively, these plantations nearly match the global plantation area established by state forestry agencies and are almost double the area of plantations established around the world by corporate groups (Public 77.3 million ha; Corporate 27.2 million ha; Smallholder 50 million ha).

A similar pattern holds across much of the Asia-Pacific region. In short, farm forestry is becoming much more important than it once was.

Several factors are driving this reforestation effort. A primary motive is that the remaining natural forests are no longer able to supply the timber resources needed by society. This was certainly the rationale behind the establishment of many government-owned plantations. Most were established to produce sawlogs, designed to trigger new rural industries and employment. Likewise, most corporate plantings have been driven by the perception of a timber scarcity and an unfilled market niche – although, in this case, the majority of plantations are being grown on short rotations for pulpwood rather than for sawlogs. In both cases, the main measure of 'success' has simply been the growth rates of the plantations and their overall timber yields.

Diverse reasons

But smallholders have taken up treegrowing for rather more diverse reasons. Some have done so because of perceived timber or pulpwood market opportunities. Others have sought to utilise otherwise marginal agricultural land and as a means of diversifying their incomes. Some of these growers have done



A mixed-species plantation with a multi-storied tree crown and a shrub layer. This is more suitable for watershed protection and likely to provide habitats for more wildlife than simple monocultures.

so without being entirely clear about the prospective markets. And, especially outside Australia, still others have done so to produce not only timber, but also goods such as fruits, nuts, resins or medicines for subsistence purposes or for sale. Finally, some landholders outside Australia have undertaken tree planting simply to assert ownership of the land.

Some of these smallholders have copied the silvicultural systems developed by government forestry agencies and corporate growers and are growing trees in the expectation they will all be felled at the end of a rotation. But many others are unconcerned about such formalities and prefer not to have a single fixed rotation. Instead, they plan to harvest trees whenever some cash is needed. This variety of motives and management intentions means that 'success' is less clear than it is for most industrial plantations. It also means that the species and the silvicultural techniques developed for these government or corporate plantations may not necessarily prove the most appropriate for the circumstances faced by many smallholders.

Another factor is beginning to also drive reforestation. This is a trend towards tree planting to supply ecological services rather than forest products. For example, several years ago Vietnam embarked on what it called the Five Million Hectare Reforestation Program. This was triggered by deforestation having driven the nation's forest cover to dangerously low levels. As the name implies, this program aimed to reforest five million hectares within a certain period. However, two million hectares of this total are to be undertaken primarily for watershed protection and biodiversity conservation rather than timber production. The program marks a dramatic change in attitude concerning the reasons for reforestation.

Similar changes are taking place in various parts of China. While large timber plantations exist, the country has a long history of establishing forests for protective reasons. One recent example is the Sloping Land Conversion Program,

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which is reforesting marginal agricultural lands for watershed protection on a large scale, with a target of 32 million ha.

In Indonesia, the government recently embarked on large scale restoration of degraded forests and land for watershed protection and wildlife conservation. One project in Jambi Province covers 98,000ha and forest restoration projects for conservation purposes covering a further two million hectares are being considered.

These types of reforestation are difficult to implement and measures of success are less clear than a simple assessment of mean annual increment. One particular difficulty is that, as was the case with smallholder plantations, the silvicultural techniques and species used to establish industrial timber plantations are not necessarily those needed to establish protection forests or wildlife habitats.

More species needed

Simple monocultures grown for a fixed period of time are rarely sufficient. It is an astonishing fact that in one of the world's most biologically diverse regions, the species used in most reforestation programs to date have been small in number and have come from an even smaller number of genera (e.g. *Acacia*, *Eucalyptus*, *Pinus*, *Tectona*). This may make sense in industrial timber plantations, but it makes no sense at all when the objective is to establish protection forests or to rehabilitate degraded lands for conservation reasons.

The dilemma is that the standard industrial plantation model is hard to change. Effort expended over the last 50-60 years has led to the point where seed supplies, nursery techniques and establishment methods are well-established. The success of these efforts can be seen in the large industrial plantations we now have.

Arguably, this golden age of silvicultural research is now drawing to a close. But a new one may be just beginning as forest growers begin to explore methods of re-establishing forests on degraded lands in ways that generate economic benefits for rural communities and which also provide various ecological benefits. It is important to recognise that the context in which this future reforestation will be done is going to be different to the last few decades. Some of the critical elements are shown in Table 1.

Most of these are well known, although the magnitude of the changes at particular places is not so obvious. We know

1.	A rising population growth and hence a dramatically increased need for more agricultural land (and, hence, less land for reforestation?)
2.	Increasing rates of urbanisation meaning a reduction in rural populations at least in some locations (and hence less competition for land?)
3.	Rising middle class leading to increasing concerns about environmental matters and biodiversity conservation (hence pressure for reforestation for conservation and environmental protection)
4.	Changing markets for forest products and new markets for ecological services, especially watershed protection and carbon sequestration (hence new forms of reforestation needed?)
5.	Climate changes that will affect the productivity (and location) of agricultural areas and, in the case of tree plantations, species-site relationships (hence new species and silvicultural systems needed?)

Table 1: The context in which future reforestation will be carried out across the Asia-Pacific region.

that the world's increasing population is likely to require more land for food production. On the other hand, increasing rates of urbanisation may mean that small farms are amalgamated and farming becomes more efficient, freeing up marginal land for reforestation.

Rising levels of concern about environmental degradation are leading to pressure on governments to restore forests and to develop markets for ecological services. But, at the same time, the rise of economies such as China and India mean changes are underway in the markets for forest products. Given that natural forests seem destined to continue to decrease in area (and even more in their capacity to supply timber), at least in the short term, these changes may affect the market for higher quality timbers, as well as lower value material such as pulpwood.

Finally, there is the huge uncertainty concerning how we adapt to the changes in climate that seem likely to occur. While these will affect food production systems, they will also affect the methods and location of any future reforestation. Perhaps the main driver of any reforestation in future will be largely concerned with dealing with this adaptation process.

All of these potential trends suggest there is a need for new forms of plantation silviculture and that the methods that have served in the past will no longer prove sufficient. Simple monocultures of fast growing species may serve pulpwood production, but may be quite unsuitable for forests supposed to protect watersheds, conserve biodiversity or sequester carbon over long periods. Some issues are outlined in Table 2.

Topic	Explanation
High value timbers	As natural forests decline, a niche market for high quality timbers should arise. But which species?
Conservation and watershed protection	Polycultures, rather than monocultures, generate functionally effective forests and provide habitats. But how many species will be needed?
Plantation silviculture for smallholders	What types of plantation designs are most suitable for smallholders, especially poorer farmers in the Asia-Pacific region?
Carbon sequestration	Likely to be most effectively provided by multi-species plantings of long-lived woody plants. How can such communities be assembled?
Landscape issues	How much reforestation should be undertaken, where and what type of reforestation should be carried out to achieve desired environmental outcomes?

Table 2: Research issues for future reforestation

What this means is that Australian forest growers should be willing to explore and innovate, testing new methods of reforestation and remaining open to the new opportunities that are likely to emerge.

David Lamb worked in the PNG Forestry Department for some years and then taught forest ecology at the University of Queensland. He has worked on reforestation issues in a number of countries across the Asia-Pacific region. His most recent book is called *Regreen the bare Hills: Tropical Forest Restoration in the Asia-Pacific Region* (Springer). The link is <http://www.springer.com/life+sciences/forestry/book/978-90-481-9869-6>

