Reforestation and Afforestation (Southeast Asia)

Reforestation and afforestation efforts in Southeast Asia have relied on the use of a small number of nonnative tree species, often planted as monocultures, with little participation by local communities. The situation is changing, however, as regional institutions have developed more ecologically and socially sustainable approaches to restore forest cover, and market-based funding mechanisms are beginning to finance these efforts in the region.

Most countries in Southeast Asia have experienced widespread deforestation and forest degradation over the last century due to unsustainable forestry practices, conversion to agriculture, mining, urbanization, infrastructure development, and fire. This dramatic transformation in the region's vegetative cover has impacted not only the availability of timber and non-timber forest products, but has also had a correspondingly large effect on the ecosystem's ability to sequester carbon, maintain the hydrological cycle, minimize soil erosion, and preserve biodiversity. Most countries in the region now have large areas of degraded land, which governments are targeting for return to productivity through reforestation and afforestation.

While the exact definitions of reforestation and afforestation vary from source to source, both processes can generally be understood as the practice of planting trees in areas that are considered degraded or otherwise of low productivity. Reforestation is typically differentiated from afforestation by virtue of the fact that it involves returning tree cover to land that was formerly forested. Afforestation, on the other hand, involves planting trees on land that either never was forested, or that has been deforested or under an alternative land use for a long period of time. Successful reforestation and afforestation are marked by reestablished tree cover, without consideration given to the type of tree cover, or the diversity of reestablished trees. Forest restoration is a related term that often connotes an attempt to return the forest's original structure, function, and composition to the degraded land. Forest restoration is also sometimes used as a general term that includes tree planting, as well as less active methods to speed up natural succession (like assisted natural regeneration; see below).

Conventional Approaches

Reforestation and afforestation has a long history in Southeast Asia, having been initiated by colonial and, in some cases, precolonial governments. Usually these early programs were small in scale and aimed at restoring denuded areas and increasing supplies of premium timber species. Since the 1950s and 1960s, reforestation and afforestation have taken on much greater importance as the high levels of forest exploitation have resulted in huge areas of degraded lands. Government forestry departments and large industrial corporations have typically taken the lead in these efforts. Throughout the region, these reforestation and afforestation programs have tended to rely on the large-scale planting of a small number of species, including *Acacia mangium, Gmelina arborea* (beechwood), *Eucalyptus* spp., *Swietenia macrophylla* (mahogany), and *Tectona grandis* (teak), which are nonnative in part, if not all, of the region and are planted as monocultures (i.e., as the sole crop). These species are favored by foresters, because they have well-established markets, good survivorship in open areas, and because they are easy to propagate and manage. Local community members, if involved at all in these reforestation and afforestation efforts, have often been employed as hired laborers with little stake in the program. Funds available through

government initiatives have generally been allocated to meeting the goal of planting large numbers of trees, but little effort has been put on maintaining those trees, with the result that few survive. The exact impact of these programs remains largely unknown due to the lack of any long-term, systematic monitoring.

New Approaches

There are currently a number of programs underway working to restore forest cover that are both more ecologically and more socially sustainable than previous approaches. The United Nations Food and Agricultural Organization, for example, is promoting an approach known as assisted natural regeneration (ANR) in the Philippines, Indonesia, Cambodia, Laos, and Thailand. ANR consists of a series of techniques to reduce the labor and cost associated with nursery establishment and tree planting by facilitating the growth of the small, woody seedlings that are typically found even on extremely degraded sites. ANR techniques revolve around working with local communities to protect these seedlings from disturbances, such as animal grazing and fire, to reduce competition from weeds, and to promote their growth through fertilizing and mulching. The resulting forest, which is usually dominated by fast-growing, pioneer species, can be planted with shade-demanding tree species, if there are no nearby forest patches that can provide seedlings through natural dispersion methods (e.g., dispersal by wind, birds, or bats).

The Forest Research Restoration Unit (FORRU) at Chiang Mai University in Thailand is promoting a technique known as the framework species method (FSM). This approach, which was initially developed in Australia, has been successfully adapted to the ecological conditions of northern Thailand. FSM relies on the planting of moderately high densities of thirty or so native species of trees that have been chosen for their high survivorship, ability to shade out grasses by quickly achieving canopy closure, and attractiveness to wildlife, which, in turn, brings in seeds of additional tree species. This influential approach, which is being disseminated to southern Thailand, Cambodia, Indonesia, the Philippines, and elsewhere, is particularly relevant in national parks and other areas where there are nearby remnant patches of forest and where restoration for biodiversity conservation is the primary objective.

In the Philippines, a reforestation approach, known as rainforestation or rainforestation farming (RF), was developed by Visayas State University and the German Agency for International Cooperation (GTZ) as an agroforestry system that integrates the use of annual crops, fruit trees, and native timber trees. The mixing of economically and ecologically important species was considered necessary in the Philippines, where the rural population density is very high, as a way for local communities to gain multiple economic benefits while restoring forest cover to the land. A number of organizations in the Philippines have adopted RF, leading to a diversification of approaches aimed at using native species to address an array of management objectives, including timber production, biodiversity conservation, watershed rehabilitation, slope stabilization, urban beautification, and others. RF is now being widely promoted in the Philippines and is also being disseminated to Cambodia, Vietnam, Sri Lanka, and southern China.

ANR, FSM, and RF are some of the best-known alternative approaches to reforestation and afforestation in Southeast Asia because information about them is widely disseminated through publications and trainings. There are many similarities between these approaches: all three involve collaboration with local communities and rely on natural succession to develop more diverse forests that provide a greater variety of environmental services and are more resilient to disturbance than are the conventional methods. There are also other approaches to reforestation and afforestation being used in Southeast Asia that have not been institutionalized in the same kind of way. The Borneo Orangutan Survival Foundation, for example, conducted significant experimentation on forest restoration at the 1,800-hectare Samboja Lestari site in East Kalimantan, Indonesia, for which it has received significant international attention, even if it did not develop its own "brand" of reforestation. This project was particularly noteworthy because it involved the planting of large numbers of indigenous plants.

Local Communities

The meaningful involvement of local communities in reforestation and afforestation efforts in Southeast Asia is being facilitated by a broad paradigm shift away from centralized government control of forestlands (which are often highly degraded and in need of reforestation) to one in which rural communities are given a direct stake in how those lands are managed. This trend toward decentralization has occurred due to the recognition that state agencies are not able to adequately control access to the huge areas of forestland that they claim authority over, while rural and indigenous communities have a greater stake and ability to see that those resources are managed sustainably. Decentralization or cooperative management agreements have also become more appealing to government forestry departments since most of the valuable timber resources have often already been extracted. While the nature and extent of decentralization varies

from country to country, reforestation and afforestation projects typically require that institutional arrangements be established between the different stakeholders (i.e., those people who have a stake in an enterprise) to determine who will contribute labor to the project, how benefits will be divided, and how conflicts can be managed. Community members are then often involved in all stages of reforestation and afforestation programs including planning, species selection, seed collection, nursery establishment, planting (or assisted natural regeneration), maintenance, and monitoring.

New Sources of Funding

Reforestation and afforestation programs in the past have been largely financed through government budgetary allocations, reforestation funds collected from concessionaires, corporate investment, and bilateral and multilateral grants and loans. In recent years, however, new funding mechanisms, known broadly as payments for ecosystem services (PES), have been developed that financially link the people who protect and/or restore forests with various stakeholders who receive direct economic benefits from the forested areas. These PES programs hold the potential to significantly increase the amount of regional, national, and international funds available for reforestation and afforestation initiatives.

The most developed of the PES programs revolve around the role of forests in sequestering carbon as a way to mitigate climate change. There are currently two different types of carbon markets through which carbon credits from reforestation and afforestation projects can be traded. The Kyoto Protocol's clean development mechanism (CDM), which is part of the so-called regulatory market, includes afforestation and reforestation as a way for developed countries with greenhouse gas emissions targets to offset their emissions by paying for projects in countries of the developing world, which have no such targets. To date, most reforestation and afforestation projects in the region have been developed in China and India, but there is one such project in Vietnam as well. Reforestation and afforestation also constitute a significant part of the voluntary carbon market, with projects currently in the Philippines, Indonesia, and Cambodia. The voluntary carbon market differs from the CDM in that it is not tied to any regulations, but rather is primarily driven by peoples' and companies' desires to offset their own emissions, and by corporate social responsibility campaigns. Under these two programs, as well as the Reducing Emissions from Deforestation and Forest Degradation (REDD+) mechanism, which is still under development, reforestation and afforestation project proponents are required to put in place stringent carbon accounting, monitoring, reporting, and verification systems, which help insure that reforestation projects achieve their greenhouse gas reduction goals. Many of reforestation and afforestation projects also seek validation under the Climate, Community, and Biodiversity Alliance (CCBA) standards, which are designed to ensure that carbon projects also have significant community and biodiversity benefits.

PES programs are also being developed to provide funding for the pursuit of other environmental advantages resulting from the presence of forests, including a greater abundance of water and increased biodiversity. Payments for watershed-related services focus on the role played by forests in mitigating the severity of flooding and drought, and in ensuring the quantity and quality of water resources. In various locations throughout Southeast Asia, for example, upland farmers are paid to protect and restore forestlands in order to secure water supply for the downstream production of hydroelectric and geothermal power, for irrigation, and for direct human consumption. Biodiversity markets are also now being looked at as vehicles for companies or individuals to fund the protection and restoration of important wildlife habitat areas, sometimes as required by regulations to mitigate habitat loss elsewhere.

Future Outlook

Conservation initiatives in Southeast Asia continue to be dominated by efforts to protect large tracts of primary forest, but reforestation and afforestation of degraded land

are gaining increasing attention as the natural forests of the region continue to dwindle in scale and the demand for the goods and services provided by the forests increase. Climate change in particular has added a new impetus for governments to restore their forests. While conventional patterns of government-led reforestation, which prioritize the usage of non-native species in relatively homogenous plantings and allow for a minimal role by local communities, remain the dominant approach throughout much of the region, the situation is changing, as nongovernmental organizations, scientists, and concerned citizens have begun to question why such approaches are used, especially when more socially and ecologically sustainable practices are available. Capacity building and training are being used to disseminate these new approaches to a variety of practitioners in the field while networks are being developed to help address the other constraints to field implementation. It is imperative that these efforts continue to be scaled up, though, because as things currently stand, deforestation is still outpacing reforestation and afforestation efforts in most countries of the region.

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See also Agriculture (China and Southeast Asia); Agriculture (South Asia); Biodiversity Conservation Legislation (China); Endangered Species; Great Green Wall (China); Nongovernmental Organizations (NGOs); Public-Private Partnerships; Rural Development; Southeast Asia

Further Reading

Alexander, Sasha, et al. (2011). Opportunities and challenges for ecological restoration within REDD+. *Restoration Ecology, 19*(6), 683–689.

Corlett, Richard T. (2009). *The ecology of tropical East Asia*. London: Oxford University Press.

Diaz, David; Hamilton, Katherine; & Johnson, Evan. (2011). *State of the forest carbon markets 2011: From canopy to currency*. Washington, DC: Ecosystem Marketplace.

Forest Restoration Research Unit. (2005). *How to plant a forest: Principles and practice of restoring tropical forests*. Thailand: Chiang Mai University. Retrieved April 3, 2012, from http://www.forru.org/PDF_Files/htpafbook/htpafbook.pdf

Friday, Kathleen S.; Drilling, M. Elmo; & Garrity, Dennis, P. (1999). *Imperata grassland rehabilitation using agroforestry and assisted natural regeneration*. Bogor, Indonesia: International Centre for Research in Agroforestry, Southeast Asian Regional Research Programme.

Lamb, David. (2011). *Regreening the barren hills: Tropical forest restoration in the Asia-Pacific region*. Dordrecht, The Netherlands: Springer.

Madsen, Becca; Carroll, Nathaniel; Kandy, Daniel; & Bennett, Genevieve. (2010). *State of biodiversity markets: Offsets and compensation programs worldwide*. Washington, DC: Ecosystem Marketplace.

Milan, Pacencia. (2009). *Rainforestation farming: A farmer's guide to sustainable forest biodiversity management* (2nd ed.). Baybay, Leyte, Philippines: Visayas State University. Retrieved April 3, 2012, from http://www.rainforestation.ph/resources/pdf/howto/Milan_2009_Rainforestation_Farming.pdf

Schulte, Andreas. (2002). *Rainforestation farming: Option for rural development and biodiversity conservation in the humid tropics of Southeast Asia*. Aachen, Germany: Shaker Verlag, GmbH.

Stanton, Tracy; Echavarria, Marta; Hamilton, Katherine; & Ott Caroline. (2010). *State of watershed payments: An emerging marketplace*. Washington, DC: Ecosystem Marketplace.

TED: Ideas worth spreading. (2009). TED talks: Willie Smits restores a rainforest. Retrieved April 3, 2012, from http://www.ted.com/talks/lang/en/willie_smits_restores_a_rainforest.html

