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Seeding Reforestation: What Drives Forest Expansion in China?

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Tropical forest destruction has been the subject of a great deal of research. Relatively little work has been done on the factors that lead to the expansion of forest land and help counter some of the negative impacts of tropical forest loss. Now, however, a young Chinese researcher has helped fill this research deficit by providing significant information on the factors that affect both forest loss and expansion. →

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A summary of EEPSEA Research Report 2001-RR2, *Econometric Analysis of the Causes of Forest Land Use Changes in Hainan, China*, by Yaoqi Zhang, Jussi Uusivuori, and Jari Kuuluvainen (Department of Forest Economics, University of Helsinki; contact: yaoqizhang@yahoo.com).

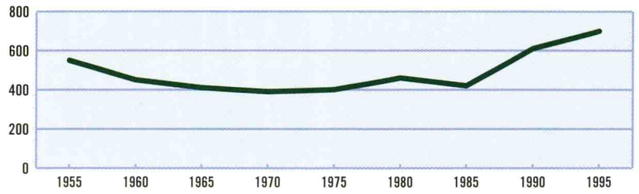
Natural forests shrink *while plantations expand*

The study, which looked at the Chinese province of Hainan, found that a wide range of socio-economic factors such as timber prices, population growth and land-management regimes have been leading to rainforest exploitation but also encouraging investment in forest plantations. Because the study found that managed forests and natural forests respond differently to such key developmental pressures, its authors concluded that it is vital for any evaluation of forest land development to analyze the two forest types separately.

In particular, the study found that deforestation resulting from agriculture and industrial expansion — driven in part by population growth — was not as a big a problem as the forest loss resulting from the inadequate or non-active management of land. In light of these findings, the author recommended that public intervention to protect rainforests be encouraged.

The study was carried out by Yaoqi Zhang as part of his PhD thesis with the Department of Forest Economics at the University of Helsinki, Finland. He looked at the whole of Hainan island, a region

Area under tree cover (in 1000 ha)



almost as large as Taiwan with an area of 3.4 million ha. Hainan's economic growth rate averaged 20% between 1988 and 1995 — the fastest level in provincial China. Its population has grown rapidly from five million in the mid-1980s to eight million at present.

One consequence of this development has been widespread forest loss that has produced many serious negative environmental and socio-economic impacts. It is estimated that 2,700 ha of Hainan's forests were destroyed annually in the 1970s and 1980s, with the forests shrinking to a low point of 15% of total land area in the late 1970s.

From forests to plantations?

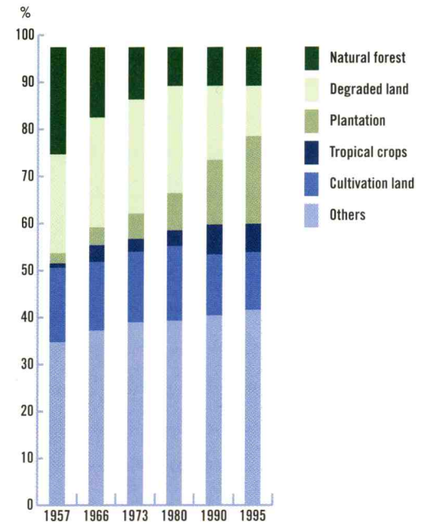
At that time, however, Hainan started programs to increase forest plantations. This was intended in part to meet growing demand for eucalyptus wood-chips at the same time that a market-oriented economy was gradually emerging in China. 130,000 ha of eucalyptus and other fast-growing species were planted between 1982 and 1995, contributing to a 4% increase in total forest cover. Plantation forests for wood-chip production also acted as as wind-breaks and water conservation mechanisms. Rehabilitating degraded land by closing access and improving enforcement of regulations have also led to a significant reduction in the logging of natural forest.

The relative success of reforestation programs in Hainan made it a perfect area for Zhang's study, since successful plantation forest programs are still somewhat rare in Southeast Asia. To investigate the factors driving tropical forest loss and plantation forest expansion in the province, he based his work on a theoretical land allocation model which assumed that landowners seek to maximize the total land rent they receive by allocating the land under their control optimally between different land uses.

Prices and property rights

Using this model, the author argued that, as well as markets and prices, institutional factors play a key role in rural land allocation in Hainan. He therefore analyzed the effect of economic development (using gross output value) and population, and changes in property rights. This latter issue was key, since over the last 20 years there have been a number of important land tenure reforms in Hainan. These have included the transfer of state-owned forestry land to state-owned enterprises, the decentralization of management, the distribution of forestry land to households through de-collectivization and the re-definition of property rights through various kinds of joint forest management ventures. To investigate the effect of these policy changes, Zhang looked at the share of land under the household responsibility scheme and that of forest land under state ownership, allowing him to measure the effects of land-tenure shift and the effect of decentralization of forest land management.

Changes in land use: 1957-95



The researchers found that, as expected, higher timber prices promote investment in managed forests and lead to a decrease in rainforest land area — indicating that increased hardwood prices have in the past led to an increase in the "mining" of rainforests. However, counter to the theoretical hypothesis, they found that agricultural product price has a positive effect on both managed and natural forest cover — indicating that farmers can meet their income needs with less harvesting when agricultural prices are high. Increases in tropical crop prices were found to complement rainforest conservation, but to reduce investment in plantations — implying competition between plantations and tropical crops.

Like many other researchers, Zhang found that a growing population and level of development causes rainforest to be converted into agricultural, industrial and residential land (and wasteland after logging). However, he also found that the area of managed forest in Hainan has actually increased with population. Managed forest cover has also increased alongside improvements in economic welfare — indicating that demand side effects and

infrastructure and law enforcement improvements have combined to promote plantation forestry.

Geography matters too

Not surprisingly, regional differences were related to the geography of the area — flat and low land was best suited to agriculture and tropical crop plantations, middle and high mountains in central Hainan retained significant rainforest cover due to inaccessibility, and hilly and low mountains were best suited to tree plantations.

Zhang's findings about land tenure were perhaps the most significant for policy formation. The researchers found that the share of forest land controlled by state-owned enterprises seemed to have a positive effect on plantation forest cover and a significant negative effect on rainforests — not surprising, considering that the state forest management bureaus were created to afforest public wasteland and to exploit natural forest. The researchers also found that de-collectivization is an incentive to investment in plantation and that it promoted the loss of natural forest before the 1980s (although it may have had an opposite effect subsequently). These results seem to indicate that privatization and increasing timber prices do not necessarily help rainforest conservation and that public intervention to protect rainforests is justified.

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