

Study finds reforestation may lower the climate change mitigation potential of forests

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Scientists at the University of Oklahoma and the Fudan University in Shanghai, China, have found that reforestation and afforestation -- the creation of new forests -- may lower the potential of forests for climate change lessening.

Yiqi Luo, professor of ecology in the OU College of Arts and Sciences Department of Botany and Microbiology, and Changzhang Liao, Bo Li and Changming Fang, professors of ecology in the Fudan University Department of Ecology and [Evolutionary Biology](#), examined whether plantations have the same ecosystem carbon stock as natural forests.

By synthesizing 86 experimental studies between plantations and their natural forest counterparts, Luo and colleagues found plantations substantially reduce carbon stock in ecosystems in comparison with natural forests.

"That decrease in ecosystem carbon stock should be accounted for, together with other forest products such as the harvested wood, when the total mitigation of reforestation is evaluated," said Luo.

This study challenges the idea that planting non-native or native-improved growth species on historical forest land yields greater carbon accumulations rates. They argue against the replacement of natural forests by reforestation, also known as plantations, to help stave off [climate change](#).

Plantations established on non-forested fields such as agricultural lands do help with the control of [carbon emissions](#); however, converting farmland to forests decreases the amount of carbon absorbed by the soil. Another form of gas, methane, also is affected by the conversion. Converted soil loses 80 percent of capability to degrade methane as compared to natural forests when it is developed as a plantation.

To minimize negative effects of plantation, appropriate [forest](#) management practices need to be adopted. Site preparation without burning, for example, leads to less [soil carbon](#) loss than that with burning. To avoid ecosystem degradation associated with plantations, restoration measures need to be implemented to engineer ecosystems toward their natural potentials.

"The shifts from natural forests to plantations can also generate other ecological problems," writes Luo. "For example, soil bulk density, representing the degree of soil compaction, increases, possibly leading to limitation of rooting systems and destruction of soil structure in plantations. Additionally, plantations decrease stream flow.

"On the positive side, plantations can provide commodities for human needs (e.g., timbers). Therefore, we are now facing a great challenge of developing a management policy for plantation practice that minimizes their negative impacts on ecosystems but maximizes their commodity values."

More information: Findings from this research were recently published in the scientific journal PLoS One.

Provided by University of Oklahoma

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