

China Needs Forest Management Rather Than Reforestation for Carbon Sequestration

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As a “close-to-nature” approach for carbon sinks, planted forests (afforestation and reforestation) have a priority to combat climate change in China. During the past decade, the Chinese government invested billions of dollars in a large-scale tree-planting (e.g., the Six Key Forestry Programs). At the U. N. Climate Summit (New York, 2009), Hu, China’s President, also committed that China should endeavor to increase forest coverage by 40 million ha to energetically increase forest carbon sinks by 2020 from the 2005 levels. Obviously, it is afforestation that makes remarkable contributions to carbon sinks in China.¹ However, excessive and monoculture afforestation to implement China’s carbon sequestration programs may be inefficient and cause unintended disastrous environmental consequences, especially in arid and semiarid regions.²

In fact, forest’s functions in carbon stock increasing are addressed by two Kyoto Protocol activities: afforestation/reforestation and forest management. Afforestation/reforestation has a top priority for carbon sink in China, whereas forest management has been almost thoroughly ignored. Further, from 2000 to 2010, although roughly 15 million ha of plantation were planted, which prompted the total forest coverage and forest stock being increased from 16.55% to 20.36% and 11.27 to 13.36 billion m³, respectively; China’s average forest stock, forest biomass carbon and forest carbon density still remain far less than international

level. For example, China’s average woody forest volume was 85.88 m³/ha accounting for only 78% of the world, the plantation was even lower; meanwhile, the mean forest carbon stock in biomass (40.4 t/ha) was much lower compared to the global average of 71.6 t/ha. The gaps indicate the poor quality of China’s forest, which however implies the huge potential for carbon sink in the activities of forest management. Shao et al.¹ estimated that if China followed forest management activities of the U.S., the increasing forest productivity would boost China’s forest carbon sequestration from 96 to 152 Tg C/yr without requiring additional forestland area (Table 1). In addition, if the existing carbon stock of forest biomass can be increased by 10% between 2010 and 2020, the cumulated carbon sinks will be much larger than 683 Mt of the Chinese official afforestation target; moreover, this amount is also much less than 65% of the latest international level.

Scholars have been questioning that large-scale afforestation efforts in China have failed in the environmental restoration and carbon sequestration because of the negative chain ecological problems. For example, afforestation with unmatched species in afforestation regions may damage the local water balances, even exhaust limited groundwater resulting in trees death or dying; in arid or semiarid regions, it will finally lead to an enlarging desertification.³ In addition, monoculture plantations or exotic species can also reduce biodiversity when it replaces natural ecosystems. Compared with this above, forest management may have many positive impacts on environmental recovery. Forest management emphasizes natural approaches instead of monoculture tree planting for environmental restoration. Afforestation can be replaced by the native vegetation recovery. In northern China’s arid and semiarid regions, it is much more reasonable that small halophytic shrubs, savanna and steppe vegetation, and some herbaceous plants grow on aeolian sands and other land vulnerable to wind erosion.⁴ Meanwhile, a better mixture of plant species and appropriate measure of human activities will make a promotion to increasing biodiversity. In the socioeconomic aspect, with a cumulative afforestation cost and decreasing suitable forestland, forest management can reduce the investment, as well as provide excessive jobs in a large area and promote rural development.

Hence, forest management rather than the large-scale afforestation meets the complex requirements of environmental restoration; and it is an efficient approach for forestry carbon

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Table 1. The U.S.-China Comparisons in Forest Area, Carbon Stock in Forest Biomass and Their Annual Change⁵

	forest area			carbon stock in living forest biomass					
	2010	annual change/10 ³ ha		1990	1995	2000	2010	Annual change/10 ³ t	
	10 ⁶ ha	1990–2000	2000–2010	10 ⁶ t					
U.S.	304	386	383	16 951	17 998	18 631	19 308	105	131
China	207	1986	2986	4414	5295	5802	6203	88	91

In the last decade, both the U.S. and China implemented forestry carbon sequestration programs to reduce the carbon print. However, compared to China's large-scale afforestation, the U.S. has a much more carbon sinks with little additional forest area because of its emphasis on carbon sequestration activities of forest management.

sequestration. The preservation and restoration of existing ecosystem should be the primary goal of carbon sequestration, and the destruction of these ecosystems by large-scale afforestation may be counterproductive.² However, in fact, it is the government who has authority over policy making. It is hard for government officials facing urgent tasks to give up the short-time benefits which can show their merits and achievements. Thus, in China, although an increasing number of people have realized that monoculture afforestation is not appropriate, government attitudes still changed slowly. Based on deep examinations, officials, scholars, managers, and citizens should have common understandings of China's environmental restoration strategy. In a word, forest management has larger potential carbon sink ability than large scale afforestation, and can avoid the potential large risk to ecosystem health. It is suggested that forest management should be a sustainable and sagacious choice for China's forestry carbon sequestration.

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