

Some Issues in Implementing Forest Carbon Sink Projects to Realize Carbon Emission Reduction for Climate Change Mitigation

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The global climate warming caused by greenhouse gases poses a great threat to human living and biological ecosystems. To mitigate climate change, many measures have been taken to reduce carbon dioxide emissions. Among them, the forest carbon sink (FCS) is considered as one of the most economical and effective carbon sequestration methods to realize carbon emission reductions in next 30 to 50 years. FCS projects are being implemented in many countries to increase their carbon sequestration and thereby to realize carbon emission reductions. However, there are some issues associated with implementation with such policies. Firstly, these projects mainly have focused only on carbon sequestration and have ignored the comprehensive ecological effects to obtain their best economical benefits. Secondly, implementing these projects fails to establish a sustainable and healthy forest industry because they place too much reliance on preferential policies from governments. Finally, the projects lack systematic technological standards and legislation to guarantee their smooth implementation. This editorial briefly discusses these issues for the suitable implementation of the FCS projects.

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Forest Carbon Sink Projects: An Economical and Effective Measure to Realize Reductions in Carbon Emissions for Climate Change Mitigation

Carbon dioxide, as the largest contributor to greenhouse gas effects, has drawn much attention in recent years. With continuous population growth and accelerated industrialization process, the balance between carbon dioxide emissions and its redeposition into the biosphere has been broken. It is reported that the atmospheric carbon dioxide concentration has increased to 400 ppm from 270 ppm since pre-industrial times. This increase of the carbon dioxide concentration mainly comes from such human activities as land-use changes and the massive usage of such fossil fuels as coal, oil, and natural gas. The land-use changes are generally causing the decrease of carbon deposition, especially for the forest carbon sink (FCS), which sequesters carbon in forest plants and soil in terrestrial ecosystems by absorbing carbon dioxide in atmosphere via photosynthesis. The use of fossil fuels leads to more carbon dioxide emissions to the atmosphere. Because of the increasing carbon dioxide concentration, global climate warming may become

disastrous to the ecology and environment. The earth's average surface temperature has increased by about 1 to 1.5 °C in the recent 150 years. It reached 17.23 °C on July 6, 2023, which became the hottest day since there have been records. The global climate warming leads to sea level rise, iceberg shrinkage, and frequent occurrence of catastrophic weather events, which gives great threat to human living and biological ecosystems. Hence, realizing carbon emission reductions for climate change mitigation has become an urgent issue to keep sustainable development of our society.

Many measures have been taken to maintain carbon balance and realize carbon emission reductions for climate change mitigation by reducing carbon emissions and/or increasing carbon sequestration. The carbon sequestration can be considered as a form of carbon emission reduction because it offsets the carbon emission, which leads to the net carbon emission reduction. To decrease carbon dioxide emissions, lots of studies have been carried out related to developing new energy sources and improving energy efficiency. There are also many new technologies developed in carbon dioxide capture, storage, and utilization to increase carbon sequestration. However, most of these technologies are now at the demonstration stage. Because of the strong carbon sequestration ability, the FCS is considered as one of the most economical and effective sequestering carbon methods to realize carbon emission reductions for climate change mitigation in next 30 to 50 years. For example, the FCS in China is now about 11.5 billion tons and the annual FCS is approximately 8% of China's annual carbon emission. It plays an important role in carbon emission reductions in China. To make full use of its role in reduction of carbon emissions, the FCS projects are being implemented to increase carbon sequestration in many countries and regions. This is being done through such activities as afforestation, reforestation, and reducing deforestation. However, there are some problems that have arisen during implementation of these activities in recent years. Therefore, it is necessary to deal with these issues for their suitable implementation.

Some Issues in Implementation of Forest Carbon Sink Projects

FCS, as the main form of terrestrial carbon sequestration, is now of great importance in maintaining carbon balance and realizing carbon emission reductions for climate change mitigation. Many policy and financial incentive measures have been taken to support the FCS projects. Most of these projects are going well in maintaining carbon balance for realizing carbon emission reductions. However, there are still some issues that are encountered in the process of implementing these projects.

Firstly, the FCS projects generally are focused on carbon sequestration as a unique goal and neglect their other ecological roles, such as maintaining biodiversity, water retention, and soil fixation. Because only the carbon sequestration is being counted as an ecological product for carbon trade with an economic benefit, these projects focus on increasing their carbon sequestration and overlook their comprehensive ecological effects in order to obtain their best economic benefits. It is reported that some grasslands and wetlands with excellent ecological functions are being used to implement these projects. These projects seriously damage their natural ecology, including biodiversity, water retention, and soil fixation. Moreover, in order to decrease their cost and increase their economic benefits, monocultures of fast-growing trees are being planted for these projects, which leads to fragile bio-systems with single species. Therefore, implementing the FCS

projects should put their comprehensive ecological effect first and shouldn't only focus on their carbon sequestration.

Secondly, the FCS projects heavily depend on financial support from governments and neglect to establish a sustainable and healthy forest industry. In order to promote these projects, national and local governments often provide financial support and encourage investments from entrepreneurs. Some projects rely excessively on these preferential policies and can't establish their own economical strengths. When approached differently, the FCS projects have potential to provide multiple profit models besides carbon trade and traditional wood industry. For example, these projects can combine ecotourism, eco-recuperation, biomass energy, and forestry crops in combination to increase their revenues. Thus, more efforts should be made to establish a sustainable and healthy forest industry during implementing the FCS projects.

Finally, the FCS projects lack systematic technological standards. In some cases the financial support and preferential policy to these projects are insufficient to maintain their continuity and sustainability. These problems can have seriously impact on the sound implementation and effectiveness of the FCS projects. Moreover, the rights and interests of the forest farm workers and investors can't be guaranteed without specialized legislation. Therefore, the specialized technological standards and a sound legal system should be established for the FCS projects.

Implementation of FCS projects can be an economical and effective measure to realize carbon emission reductions for climate change mitigation in next 30 to 50 years. However, there are some issues that need to be seriously addressed. More attention should be paid to their comprehensive ecological effects apart from their carbon sequestration during implementing these projects. A sustainable and healthy forest industry needs to be established through implementing these projects. Meanwhile, it is also necessary to establish systematic technological standards and a sound legal system for the FCS projects, by which to guarantee their suitable implementation. Through these efforts, we believe that the advantage of the FCS projects in the protecting our ecology and environment can be fully reflected.