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## In Brahmaputra's floodplains, planted forests can help in tackling soil erosion

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A new study that examined the plant diversity and carbon stock of a 39-year-old human-created forest, Molai Kathoni in Assam, and a natural forest of comparable age, shows that a mixed tree species plantation in Brahmaputra's degraded floodplains can be a viable nature-based solution to address flood and erosion impacts.

The Molai Kathoni forest on the Majuli river island was created using mixed species planted by Padma Shri Jadav Payeng, now popularly known as a the "Forest Man of India".

"The river valleys in the region are annually affected by intense flooding, causing erosion of flood plains, loss of vegetation cover and land-use change," study co-author Anudip Gogoi told Mongabay-India. "The Molai Kathoni forest was planted using mixed species on the degraded sandbars along the stretch of Brahmaputra river."

The researchers found that plant species composition, plant diversity, and carbon stocks after 39 years of the plantation were similar to those in the natural forest (in Jorhat district) studied as a reference.

"The higher plant diversity in the planted forest could be because of species composition fully dependent on the interest of the stakeholder while it is a naturally driven phenomenon in the natural forest," explained Gogoi who was earlier with the Mizoram University. "Our study demonstrates that the establishment of mixed-species planted forest on a degraded floodplain can provide sufficient opportunities to maintain plant species diversity."

"Also, planting such forests on degraded land can store a similar amount of biomass and carbon stock that are sequestered in the natural forest ecosystem of comparable age," Gogoi said. "Therefore, we conclude that the planted forest can act as an ex-situ conservation ground for valuable local species at a regional level."

Flood and erosion are two perennial problems of Assam which have impacted the life, livelihood and economy of the state over many years. As per the data from the national flood commission, the Rashtriya Barh Ayog, 39.58% of the total land area of Assam can be called flood-prone. The flood-prone area of the entire country meanwhile stands at 10.2% of its total area.

Erosion is another serious issue as thousands of families are rendered homeless every year with large chunks of land lost to the mighty Brahmaputra. Data from Assam's Water Resource Department shows 7.40% of the area of the state has been washed away by the river Brahmaputra and its tributaries since 1950.

While building embankments along the Brahmaputra is considered a common solution to counter flood impacts, in many places it has stopped being effective as the embankments are breached by heavy flash floods every year.

Considering this, nature-based solutions are one of the ways that could contribute to ecosystem-based disaster risk reduction. According to the International Union for Conservation of Nature, nature-based solutions are actions to protect, sustainably manage and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing "human well-being and biodiversity benefits".

The Sendai Framework, an international document on disaster risk reduction, adopted by the United Nations, recognises that environmental management can help reduce disaster risk and increase resilience.

Preventing erosion

Bombax ceiba (locally known as simolu), Dalbergia sissoo (or sishu), Samanea saman, Tetrameles nodiflora and Gmelina arborea are the dominant tree species that contribute 56% of the total biomass carbon in Molai Kathoni, the planted forest.

The study argues that since most of the river valleys are annually affected by intense flooding, promoting the establishment of planted forest on degraded sandbars may help protect the flood plains from river erosion. The planted forest may also reduce anthropogenic pressure on the remnant natural forests and create livelihood opportunities for the associated communities.

“Moreover, the sustainable management of these forests will help in regional biodiversity conservation and climate change mitigation,” the study concludes.

The researchers recommend mixed-species plantations on the flood plains. Gogoi said that earlier, social forestry was used to identify some species helpful for soil conservation and trees like *sishu* and *simolu* were planted.

“The mixed-species plantation has not been popularised much,” added Gogoi. “They generally go for two types of trees – tall trees where birds can take shelter and plants which can help in soil conservation and stop soil erosion. For soil conservation, they plant *sishu*, bamboo and *simolu.*

“We need to bring engineering, bio-engineering and nature-based solutions to make this approach successful*,”* Gogoi said. “Trees can help to a certain extent but their capacity is limited. They might help preserve the top layer of the soil. We do not know whether there has been any proper assessment of sandbars. If not, then it needs to be done on a priority basis.”

**Molai Kathoni model**

Gogoi reminisced about the three weeks that he spent at Molai Kathoni for his research: “I saw birds and deer there.”

“Half of the chaporis (local name for sandbar) comprise villages,” Gogoi said. “People from the Bihari community brought by the British to construct ships gradually settled there. There are also the Mising indigenous people in the chaporis.”

“The belt touches Neematighat social-forestry area,” Gogoi said. “The total size of the area is around 550 hectares. The forest also hosts large mammals like elephants, rhinos and tigers, many of which migrated to the chapori during floods from Kaziranga National Park.”

The “forest man” himself endorses the findings of the research. Speaking to *Mongabay-India*, Jadav Payeng said, “To protect Majuli from erosion, we need to turn all its sandbars green.”

“We need to do this urgently as our land is decreasing,” Payeng said. “The problem with the forest department is that it takes time for them to get the funds. But even if we can’t plant trees, we need to ensure that we do not cut trees. The most beautiful thing about nature is that it does the job on its own. In my Molai Kathoni, everything from winds, elephants, insects, birds plants trees by dispersing seeds.”

Payeng said that when carrying out plantations, the administration should only go ahead with local species. “The British brought segun [teak] trees here from outside to build boats,” Payeng said. “This disturbed the natural plantation in the area which later led to problems like man-elephant conflict. So, we should only go ahead with plants which are found locally.”

As per the Majuli district administration website, a forest range office under the social forestry wing was established in 1985 in Majuli to raise plantations along the roads, embankments and sandbars. Majuli was declared as a district in 2016 and was notified as a forest division on May 20, 2017. So far, the forest department of Majuli has raised 745 ha of plantation in the chaporis. There are 33 sandbars in Majuli.

Jairam Baruah, Divisional Forest Officer, Majuli said, “Next April, we will be going ahead with a 50-hectare plantation at Karhi chapori.”

“There is not much human settlement here,” Majuli said. “Planting trees obviously helps to combat erosion. We do not allow exotic plant species here and always go ahead with local plants. Majuli has sandy soil which helps plants like simolu, sishu and kadam.”

Batting for nature-based solutions, Arun Jyoti Nath, associate professor, Department of Ecology and Environment, Assam University, who was not associated with the study, said: “This is obviously a good idea in the long term.”

“When we talk of climate change mitigation, the social perspective is more important,” Nath said. “If we are managing some very traditional type of agroforestry system, it serves the purpose of rural people who are managing it over a long period of time.”

“The agroforestry system is treated as a nature-based solution,” Nath said. “The product coming out of agroforestry can be sold as well as they can be consumed. When we are talking about agroforestry, people are directly availing the benefits.”

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