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Trees not a silver bullet to mitigate climate change

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Researchers have shown that India has additional tree potential over the western and eastern coasts as well as northwest and central eastern region. Photo: Getty Images

In the current discourse on climate change, trees and forests are often positioned as viable mitigation measures. Big numbers like the need to plant trillion trees are often mentioned. However, there is emerging scientific thinking that trees alone cannot be a silver bullet and that forests are the most effective as a part of a broader portfolio of mitigation measures.

While forests can create local microclimates to help generate local rainfall, decreased evapotranspiration can intensify droughts when soil moisture decreases due to warming or rainfall deficits.

Plants exchange energy, carbon and water with the atmosphere as a part of photosynthesis and respiration. Warm temperatures can exacerbate soil moisture loss via evaporation and intensify droughts. Plants also try to save water by modulating water that reaches the atmosphere through process known as evapotranspiration.

Measurements have shown that temperature, vapour pressure deficits and heat loss from the soil, which together determine how rapidly droughts intensify, depend not only on climate but also on plants due to their own efforts to manage their water demand.

This was presented nicely in the context of what are known as Natural Climate Solutions (NCSs) by Bronson Griscom of Nature Conservancy and collaborators from across the world in a 2017 publication in the Proceedings of the National Academy of Sciences of USA.

The crux of their finding is that Natural Climate Solutions have maximum payout when implementation considers food and fibre security as well, besides biodiversity.

If carbon reduction is kept as the sole goal for reforestation and afforestation, we will lose the target on important socioeconomic factors of food and fibre security, especially for the developing world.

The portfolio of NCSs, therefore, must include conservation, restoration, and management of land use across forests, wetlands, grasslands and agricultural lands.

Afforestation and reforestation efforts should provide pathways to balance the portfolio when tradeoffs may be needed to manage food and fibre security and biodiversity with urbanisation and other economic development goals.

Griscom and his colleagues provide detailed carbon mitigation potentials of 20 Natural Climate Solution options for 2030, which is an important year for many of the goals under the Paris Climate Agreement. The forest-based solutions focus on reforestation and avoidance of forest loss and fire management.

The solutions under agricultural and grassland management rely on biochar (charcoal created by converting biomass into solid carbon to manage soil carbon, fertility and agricultural productivity), agroforestry, conservation agriculture, grazing and nutrient management. Coastal and peat restorations fall under solutions for wetlands.

The inclusion of such solutions could offer many potential benefits such as improvements in water and soil quality, biodiversity and habitats, protection against floods, and overall enhancement of climate resilience.

More importantly, these also significantly enhance the probability of restricting global warming to less than 2 degrees by 2050 by sequestering carbon and avoiding some greenhouse gas emissions.

Development and careful management of such a broad portfolio is critical particularly for a country like India, which must always balance its commitment to the Paris Agreement with its growing population and demand for food including meat and fish products due to increasing income levels.

Such solutions are also extremely beneficial to maintain adequate quantity and quality of water to meet the demands for industrial, domestic, food and energy sectors as well as increasing monsoon extremes.

Returning to trees, a new study reported in journal Science maps global natural tree cover by focusing on protected areas. In an innovative approach, researchers have used climate, soil and topographic features to develop a predictive model for calculating additional potential for tree cover for the entire globe.

The team estimates that the existing canopy cover of 4.4 billion hectares could be expanded by an additional 0.9 billion hectares leading to a total sequestration of over 200 giga tonnes of carbon.

In their map, researchers have shown that India has additional tree potential over the western and eastern coasts as well as northwest and central eastern region covering Andhra Pradesh, Telangana, Chhattisgarh, Odisha, West Bengal and Madhya Pradesh.

All of these regions are also at a potential risk of canopy cover loss under climate change. This should serve as guidance for choosing areas for forestation and species of trees for each region with future climate in mind, to ensure their growth and survival.

When it comes to implementing Natural Climate Solutions on agricultural land, India needs to consider the growing agricultural vulnerabilities with multiple stressors from global warming, monsoon extremes, groundwater depletion, and struggles with crop choices.

Scalable solutions for agricultural land management including conservation agriculture, biochar and agroforestry must find new and viable approaches and incentives.

Additional carbon sequestration on agricultural lands is an imperative for India to stay true to its Intended Nationally Determined Contributions (INDC) targets. Such an approach will also bring soil health improvement as well as soil moisture persistence and drought resilience with reductions in agricultural vulnerabilities.

The urgency of defining a portfolio of Natural Climate Solutions is obvious for India. A portfolio that manages carbon as well as water quantity and quality is the need of the hour for the country, considering that up to 70 per cent or more of the water resources are consumed by agriculture. (India Science Wire)

Source: <https://www.downtoearth.org.in/blog/climate-change/trees-not-a-silver-bullet-to-mitigate-climate-change-66050>