

TREES HAVE GENES TOO 'WHAT THE WORLD'S NEW REPORT ON FOREST GENETIC RESOURCES MEANS FOR INDIA'

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Walk into any roadside nursery and watch how people buy saplings. They check the height of the plant, the colour of the leaves and, of course, the price. Almost nobody asks the one question that matters most: where did the seed come from? Yet that invisible detail, the genetic make-up of the plant quietly decides whether the tree will survive a scorching May, shrug off a termite attack, or grow straight enough to fetch a good price at the timber market twenty years later.

Foresters call this hidden wealth 'forest genetic resources'. FAO defines them as the heritable materials within and among tree and other woody plant species that have actual or potential economic, environmental, scientific or societal value. Put simply, it is the variation inside a species that lets one neem tree tolerate drought better than its neighbour, or one teak population produce finer wood than another. That variation is what allows forests, and the farmers who depend on trees, to adapt when conditions change.

In 2025 the Food and Agriculture Organization (FAO) of the United Nations published the Second Report on the State of the World's Forest Genetic Resources, the first global stocktaking in more than a decade. Its findings deserve far more attention in India than they have received so far.

A global health check for trees

The report draws on information from 77 countries that together hold about 77 percent of the world's forest area. Some of its numbers are worth pausing on. There are roughly 58,000 tree species on Earth, along with about 1,600 woody bamboos and nearly 500 rattans.



Figure 1. Key global figures from FAO's Second Report on the State of the World's Forest Genetic Resources (2025).

Around 30 percent of tree species are threatened, and most of these are found in tropical and subtropical regions.

Countries together reported more than 2,800 species of trees and other woody plants, of which nearly 1,800 have been genetically characterised. Around 1,400 species are covered by in situ conservation programmes and about 1,100 by ex situ programmes. That sounds impressive until you set it against the 58,000 tree species that exist. The report is candid that, although information has improved, it remains inadequate and most woody species are still poorly studied.

One finding is especially relevant to anyone who grows trees. Common, widely distributed species still hold much of their genetic diversity, but rare and threatened species have lost a significant amount of it. The main culprits are familiar: deforestation, degradation, climate change, fire, pests, diseases and invasive species. The report also notes that more than two-thirds of countries run national tree-seed programmes, yet many of them face shortages of seed and planting material.

On the technology side, only about 19 percent of reporting countries said they use genomic tools in tree breeding. Genetically modified lines exist for more than 30 tree species but are rarely used in practical forestry, and gene editing remains at an early research stage. The conversation has not ended with the report either; FAO's Intergovernmental Technical Working Group on Forest Genetic Resources met again in Rome in May 2026 to take the follow-up forward.

Why should India read this report closely?

India is one of the world's mega diverse countries and shares parts of four global biodiversity hotspots: the Himalaya, the Western Ghats, the Indo-Burma region and Sundaland through the Nicobar Islands. Most of our forests are tropical or subtropical, which is exactly where the report says threatened tree species are concentrated. In other words, the global warning applies to us with extra force.

There is a second, more practical reason. A large share of India's timber, fuelwood and fodder now comes from trees grown outside forests, on farm bunds, in agroforestry blocks and along roads and canals. India adopted its National Agroforestry Policy in 2014, becoming the first country to adopt a national policy dedicated to agroforestry. Farmers in Punjab, Haryana and western Uttar Pradesh plant poplar and eucalyptus by the lakh, while *Melia dubia*, teak and bamboo are spreading in the south. Many of these plantations rest on a surprisingly narrow genetic base: a handful of popular clones multiplied again and again. When large areas are planted with genetically similar material, a new pest or disease can pose a greater risk of widespread damage. Diversity is not an academic luxury; it is crop insurance.



Figure 2. A clonal poplar-based agroforestry plantation illustrating the use of genetically uniform planting material in farm-based tree production

What India already has in place?

India is not starting from zero. The Indian Council of Forestry Research and Education (ICFRE) and its institutes, such as the Institute of Forest Genetics and Tree Breeding (IFGTB) in Coimbatore, and Himalayan Forest Research Institute etc., have long worked on seed production areas, seed orchards, clonal banks and provenance trials for species like teak, eucalyptus, casuarina and sandalwood. State forest departments maintain seed stands, and the country's network of protected areas, biosphere reserves and community-protected sacred groves conserves many tree populations where they grow naturally.

Indian scientists are also active internationally. In January 2026, IFGTB hosted the International Conference on Population and Conservation Genetics in Coimbatore, together with IUFRO and the Asia-Pacific Forest Genetic Resources Programme (APFORGEN). The themes discussed there, from landscape genomics and local adaptation to tree seed systems for restoration and forensic timber identification, show how quickly the science is moving.

Two Ways to Safeguard Tree Genes

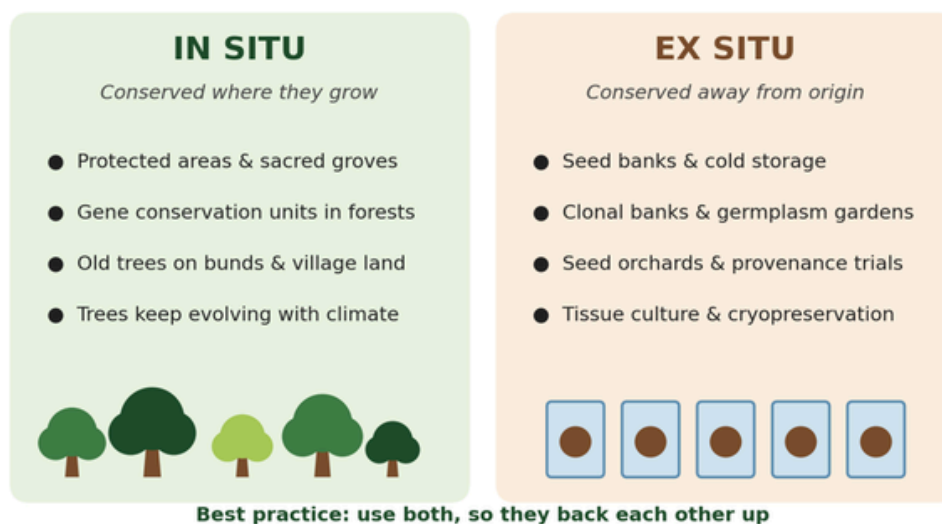


Figure 3. In situ and ex situ conservation of forest genetic resources work best as complementary strategies.
Source: Author's illustration based on FAO (2025)

The gaps we still need to close

Despite this foundation, three gaps stand out. The first is information. Like many countries in the FAO report, India lacks a complete, easily accessible inventory of the genetic diversity of its important tree species, especially lesser-known ones such as wild fruit trees, medicinal trees and fodder species. We cannot protect what we have not measured.

The second is planting material. A farmer can buy certified wheat seed with a label telling its variety and source, but quality control for tree seedlings is far weaker. Many saplings come from unregistered nurseries that collect seed from whichever trees are nearest, sometimes only two or three of them. Such seed lots may have a narrow genetic base, resulting in reduced genetic diversity and potentially poorer adaptation or performance.

The third is climate. Trees live for decades, so a seedling planted today must cope with the climate of 2050. Choosing the right provenance, meaning the right geographic source of seed, is becoming as important as choosing the right species.

What farmers and extension workers can do?

Not every solution needs a laboratory. Farmers can ask nurseries for the source of seed or the clone number and prefer registered nurseries and those linked to forest departments, ICFRE institutes, agricultural universities or Krishi Vigyan Kendra's. Planting a mix of several clones or seedlots rather than a single clone spreads the risk. Old local trees such as mahua, jamun, khejri, neem and native acacias on field boundaries and village commons are living gene banks and deserve protection rather than the axe. Where communities collect their own seed, the golden rule is to gather it ideally from many healthy, unrelated trees standing well apart, rather than from one convenient tree beside the road.

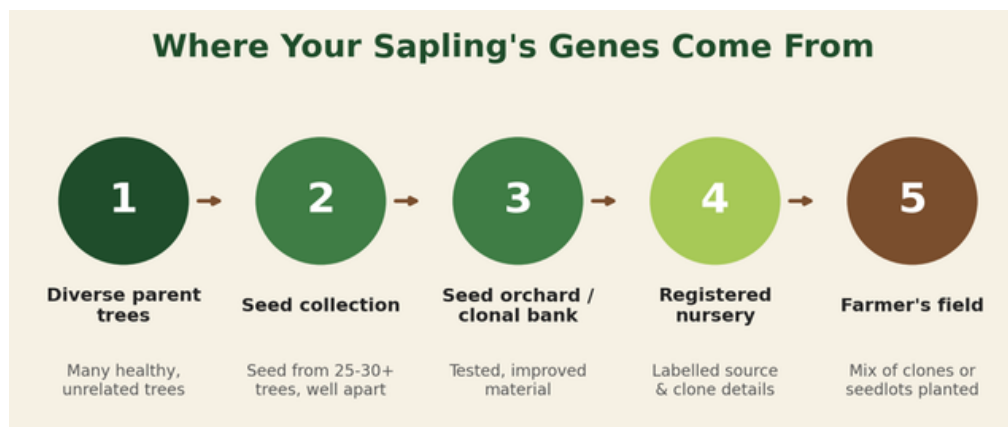


Figure 4. From diverse parent trees to the farmer's field: the pathway of quality forest reproductive material.



Figure 5. Ban oak (*Quercus leucotrichophora*): acorns, foliage and nursery-raised seedlings. HFRI has established a Seed Production Area (SPA) for this important Himalayan fodder species to support quality seed production, regeneration and conservation.

At the policy level, the priorities follow naturally from the FAO report: a national strategy and inventory for forest genetic resources, a practical certification system for forest reproductive material, more support for community seed banks and village nurseries, and wider use of modern genomic tools to identify climate-resilient populations before they disappear.

Conclusion

The FAO report carries a simple message: the diversity hidden inside tree species is shrinking faster than we are studying it. For India, where large numbers of farmers depend on trees for income, that is not a distant environmental concern but a question of livelihoods. The next time you buy a sapling, ask where its seed came from. That small question may be the first step towards forests, and farms, that can stand up to whatever the coming decades bring.