

Miyawaki Farming: A Sustainable Solution for Urban Greening

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OPEN ACCESS

Keywords

Miyawaki Farming, Urban Greening, Biodiversity Conservation, Sustainable Urban Development, Ecological Restoration, Climate Resilience

How to cite this article:

Dileep, K. C., Lavanya, N. and Rakshitha, V. 2026. Miyawaki Farming: A Sustainable Solution for Urban Greening. *Vigyan Varta* 7 (09): 1-4.

ABSTRACT

Rapid urbanization has replaced natural landscapes with concrete infrastructure, leading to reduced green cover, higher temperatures, air pollution and biodiversity loss. The Miyawaki method has emerged as an effective urban greening approach by establishing dense, native mini-forests that replicate natural ecosystems. Unlike conventional tree planting, it promotes rapid growth and develops self-sustaining forests within a few years. These micro-forests mitigate the urban heat island effect, improve air quality by absorbing pollutants and enhance biodiversity by providing habitat for birds, butterflies and beneficial insects. In addition to ecological restoration, they create valuable green spaces that improve community well-being and contribute to the development of healthier, more sustainable and climate-resilient cities.

INTRODUCTION:

Rapid urbanization has transformed natural landscapes into built-up environments, leading to a significant

decline in urban green spaces. This has intensified environmental problems such as the urban heat island effect, air pollution, climate



change and biodiversity loss, thereby affecting the ecological balance and quality of urban life (IPCC, 2023). As cities continue to expand, the adoption of sustainable, nature-based solutions has become essential for enhancing environmental resilience and restoring ecosystem services.

Among the various urban greening approaches, the Miyawaki method, developed by Japanese botanist Dr. Akira Miyawaki, has gained global recognition for its ability to establish dense, native and self-sustaining mini-forests within limited urban spaces (Miyawaki, 1999). By planting diverse indigenous tree species at high density, Miyawaki forests grow rapidly, improve air quality, mitigate urban heat, enhance biodiversity and sequester atmospheric carbon. Owing to these ecological and social benefits, Miyawaki farming has emerged as an effective strategy for promoting sustainable urban development and building greener, healthier and more climate-resilient cities.

Miyawaki Farming

The Miyawaki method is an ecological restoration technique developed by Japanese botanist Dr. Akira Miyawaki to establish dense, native and self-sustaining forests based on the concept of potential natural vegetation (PNV). Unlike conventional tree planting, which generally uses fewer species at wider spacing, the Miyawaki method involves planting 3–5 indigenous saplings m^{-2} , enabling rapid growth, higher biodiversity and faster ecosystem restoration (Schirone *et al.*, 2011).

The method begins with site selection and soil assessment, followed by soil enrichment using organic amendments. Native species representing different forest layers are then planted at high density, mulched and irrigated during the initial establishment period. Within 2–3 years, the plantation becomes largely self-sustaining and develops into a dense mini-

forest, providing ecosystem services such as carbon sequestration, urban cooling, improved air quality and biodiversity conservation (ICFRE, 2025).

Importance and Benefits of Miyawaki Farming in Urban Areas

Miyawaki farming has emerged as an effective nature-based solution for addressing environmental challenges associated with rapid urbanization. By establishing dense native forests in limited urban spaces, it increases green cover, reduces the urban heat island effect, improves air quality through pollutant absorption and carbon sequestration, and contributes to climate change mitigation. These mini-forests also enhance rainwater infiltration, promote groundwater recharge, reduce dust and noise pollution, and improve the overall urban microclimate (IPCC, 2023).

Ecologically, Miyawaki forests restore native biodiversity by providing habitat and food resources for birds, butterflies, bees and other beneficial organisms. They improve soil structure, increase microbial activity and support essential ecosystem services such as nutrient cycling, carbon storage and water regulation (Miyawaki, 1999). Beyond environmental benefits, these forests enhance physical and mental well-being by creating accessible green spaces, encourage community participation in conservation activities, serve as outdoor learning sites for educational institutions and require relatively low maintenance once established, making them a sustainable and cost-effective approach to urban greening (ICFRE, 2025).

Success Stories and Case Studies

The Miyawaki method has been successfully adopted in India, with notable urban forest projects in Bengaluru, Hyderabad, Chennai, Delhi and Pune, where degraded and vacant lands have been transformed into dense native forests. These plantations have demonstrated



rapid canopy development, high sapling survival (often 80–90% under well-managed conditions), increased bird and pollinator diversity and measurable improvements in the urban microclimate within a few years (Roy and Chatterjee, 2023).

Internationally, the Miyawaki method, first developed in Japan, has been widely implemented in countries such as the Netherlands, France and Pakistan for urban ecological restoration. Studies have shown that these dense mini-forests grow several times faster than conventional plantations, enhance biodiversity, improve carbon sequestration and contribute to local temperature regulation and climate resilience.

Challenges of Miyawaki Farming

Despite its numerous advantages, the Miyawaki method faces several challenges that may limit its widespread adoption. The establishment of Miyawaki forests requires relatively high initial investment for site preparation, soil improvement and dense plantation, making implementation difficult in resource-constrained areas. The success of the method also depends on the careful selection of indigenous species suited to the local climate and soil conditions, as inappropriate species can reduce survival and ecological benefits. Furthermore, the Miyawaki approach is not equally suitable for all ecosystems, particularly natural grasslands, wetlands and arid regions where dense forest vegetation is not the native ecosystem. Regular watering, weeding and monitoring are essential during the first 2–3 years to ensure successful establishment before the plantation becomes largely self-sustaining. In addition, a common misconception is that Miyawaki forests can replace natural forests; however, they are best viewed as a complementary urban greening strategy rather than a substitute for conserving and restoring existing natural ecosystems.

Future Prospects of Miyawaki Farming

Miyawaki farming has significant potential to support sustainable urban development and climate-resilient cities. As cities continue to expand, the method can play an important role in initiatives such as India's Smart Cities Mission by increasing urban green cover and improving environmental quality (MoHUA, 2023). Integrating Miyawaki forests into urban planning and landscape design can transform vacant lands, institutional campuses, roadside spaces and public parks into biodiverse green ecosystems.

The method also contributes to climate resilience by enhancing carbon sequestration, reducing urban heat, improving air quality and supporting ecosystem restoration, thereby advancing several Sustainable Development Goals (SDGs), particularly SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action) and SDG 15 (Life on Land). Furthermore, the active involvement of local communities, schools, industries and non-governmental organizations in establishing and maintaining Miyawaki forests can promote environmental stewardship and expand community-driven urban afforestation, ensuring greener, healthier and more resilient cities for future generations.

CONCLUSION

Miyawaki farming has emerged as an effective nature-based solution for restoring urban ecosystems and addressing the environmental challenges associated with rapid urbanization. By creating dense, native and self-sustaining forests in limited spaces, it enhances biodiversity, improves air quality, sequesters carbon, mitigates urban heat and strengthens climate resilience. Although careful planning and initial maintenance are essential, its long-term ecological, social and economic benefits make it a valuable strategy for sustainable urban development. As governments,

institutions and communities increasingly embrace urban afforestation, the Miyawaki method can play a pivotal role in transforming cities into greener, healthier and more resilient environments. Investing in native forests today is an investment in a cleaner, more sustainable future for generations to come.

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