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ANALYSIS OF THE MIYAWAKI AFFORESTATION TECHNIQUE

*Alka Parikh and Aaisha Nazrana

Director of Centre for Field Learning

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*Corresponding author:

Alka Parikh and Aaisha Nazrana

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ABSTRACT

This article gives a detailed description of the Miyawaki afforestation method. It gives the steps for planting a Miyawaki forest, the benefits of the Miyawaki forests, the cost of growing the forest and the funding options, how to grow the Miyawaki forest in difficult terrains and how to maintain it. The main criticism levied against this method is that it is too new to know its longevity and hence benefits. However, the article concludes by saying that the Miyawaki method has proved its replicability because Miyawaki forests are grown all over the world now. Even if the forests do not last for more than 2-3 decades, they would still create a very positive impact on the environment.

INTRODUCTION

"I can't stop cutting down of trees. But I can start growing trees"
- R. K. Nair

The world has been losing 10 million hectares of forest every year since 2015 [UN, 2023]. Such destruction of the natural environment has been attributed to climate change (forest fires), urbanization and industrialization. However, for the world as a whole, the rate of deforestation has come down in last few decades. But for India, the nation that the researchers belong to, forest destruction has increased. Forests covered 7,13,789 sq km in India in 2023 which is 21% of the total geographical area of the country. In last 23 years, India has lost 19% of its forest cover [Geography Host, 2023]. Deforestation has been heavy for last 23 years, but from 2015-2020, there is a large increase in forest cutting. 384,000 hectares of forests were cut down between 1990 and 2000 (10 years), but the figure increased to 668,400 ha for just five years between 2015-2020 [2]. This has given India the dubious distinction of being the nation with the second largest amount of deforestation in the entire world. Even sadder part is that, Brazil, which ranked first in its loss of forests, has actually reduced its deforestation by thousands of hectares while India has accelerated its pace of deforestation [Jha, 2023]. Obviously, the forest departments of many of these nations that have been losing forest cover, have not been able to keep up their reforestation efforts to compensate for this accelerated pace of deforestation.

Interestingly, some individuals and organizations have been planting many hectares of forests in various parts of the world, on their own motivation. For example, Cardenas et al [2022] report that 175 tiny forests, using the Miyawaki method, have been planted in urban areas of UK, engaging local community. Poddar [2021] describes how the Miyawaki technique is being used in Japan and South America. To understand the implementation of the method on ground, we interviewed Dr. R. K.Nair, who is known as the Green Hero of India. Dr Nair used to run a readymade garments export business before he started giving majority of his time to the afforestation efforts. His organization, Forest Creators, has created 109 forests till August 2023, spread across 12 states in India.

Forests with rich Biodiversity: As mentioned earlier, Miyawaki method of growing forests has gained much popularity all over the world. In India also, it is touted as one of the most efficient methods to green the urban areas. Traditionally, the forests grown by the Forest Department had the single objective of growing timber and getting money with the plantation. Monoculture was the chief method of afforestation. Even for social forestry, at the most 6-10 species were planted. Unfortunately, that does not give the biodiversity that natural forests bring. When the diversity in the flora is limited, it affects the fauna. Each bird makes a nest in a different kind of tree, each insect species makes home in a different plant. Extinction of species has accelerated over last few centuries, as has been noted by Johnson from the Royal Society. Thus an afforestation method that

encourages many species to take shelter in the new forest can serve an urgent ecological need. If the manmade forest has to mimic the ecosystem of a natural forest, it has to have a large variety of flora. In Miyawaki method, almost 80-90 species of vegetation are planted in one acre of land. The vegetation includes trees, plants, shrubs, grass, canopy and timber. Thus, it tries to introduce rich biodiversity in a small area. It should be mentioned here that the forests created by the Miyawaki method still have much lesser biodiversity compared to a natural forest. Native species that already used to grow in the area without any human intervention are given priority while selecting the species. A typical characteristic of a Miyawaki forest is that trees are planted very close to each-other. In just one square meter, usually three trees are planted. The idea is to create an organic and dense forest with rich biodiversity.

Generation of the ecosystem: The plant diversity enriches the soil with different nutrients. It also retains a lot of water because there is a great density of flora on the ground holding both the soil and water. A traditional manmade forest does not retain so much water. The dense forest makes the temperature fall. It also provides more forage that encourages pollinators and birds. More canopy cover discourages the growth of weeds and creates an amicable environment for the insects. Increased leaf litter protects the soil fertility. Sourik Poddar [2021] highlights carbon sequestration and soil health as the other benefits of Miyawaki forests. Taras Koziupa [2021] and Kurian & Vinodan [2022] add disaster resilience to the benefit list. Dr. Nair pointed out several examples of such forests acting against ash, air pollution, and noise. When trees are planted so close to each other, they do not have space to grow in girth. They grow tall, to reach the sunlight. Dr. Nair explained that because of the small girth, there is little incentive to cut down the forest; it is not possible to get much timber from it. The other non-timber-forest -produce (NTFP) are also not much because there would be only a few trees of that species in the forest, and they would be disbursed. Thus, the Miyawaki forest is grown only to help nature thrive; it does not satisfy the human greed for money. As the forests grow, in the middle of the places that had no wildlife to speak of, fauna start appearing. In small areas that are afforested, various types of snakes and lizards; rabbits and fox, tortoise and fish and a large variety of birds and insects can be found. These are not brought in by anyone, they just appear. Ecosystem seems to regenerate itself in enabling conditions. The intervention of humans is not needed in that.

The procedure for growing the Miyawaki forest [Forest Creator]:

- Understand the texture of the soil so that the required corrective materials can be added.
- Identify native species of different heights (trees and shrubs)
- Provide for water pipes and borewells or any other source of water
- Excavate the soil upto 3-4 feet, mix the dugout soil with cereal husk, cocopeat, cow urine, and vermicompost and refill the area.
- Make pits, about 3 in one square meter area. Put one sapling in each pit.
- Apply about half a kilo of mulch to each tree.
- Water the saplings immediately and thereafter daily in the morning and evening for three years.

Growing forests in difficult terrains: Forest Creators have grown forests in terrains where everyone had opined that nothing can grow. They grew a forest on 7.5 acres of land right next to the sea. It was impossible to grow anything on the sandy soil. Forest Creators decided to cover the entire area to be afforested with a good quality soil. The soil was not imported from outside the village. Instead, they deepened two existing ponds of the village. This way, the water holding capacity of the ponds increased and at the same time, good fertile soil became available for growing the forest. One more pond was also created in the allotted forest area. It was filled up by the rains within a year and boasts of being a waterbody with sweet rain water right next to the seashore! It has attracted many species of birds, tortoises, and fish.

Forest creators were called to grow forest in Rajasthan on a hill that was made of solid rocks. No soil was imported. Machines were brought in to break the stones. In the powder generated from the stones, vermicompost, cow urine, cocopeat and rice husk were added. And with the water from the borewell, the forest could be grown. Schirone et al [2011] similarly show that the Miyawaki technique with some modifications could be successfully used in the Mediterranean weather. The mine fields were afforested in a different manner. There were large ditches and holes everywhere. And the ore was already taken from that; so there was little dug out material available. Dr Nair asked for the ashes coming out of the nearby factories. With truckloads of ashes that were acquired free of cost (only the transportation cost was paid; the industrialists were happy to get rid of the mountains of ash generated by their factories), the ditches were filled. And with the same formula of vermicompost, cow urine, cocopeat and rice husk, the forest was grown. A chemical factory land was to be afforested. Water with chemicals used to flow on that land. Canals were made in that land to first divert the toxic water outside the land. Now there was no chemical water flowing on the land. Therefore, there was no new addition of pollution on the land. Then the soil dug out from the canals was used to spread on the existing contaminated soil. After that, the layer of new soil was treated with vermicompost, cow urine, cocopeat and rice husk. Then the forest was grown on it.

Cost of growing a Miyawaki forest: It is not cheap to grow a Miyawaki forest. It involves digging the earth deep (3-3.5 feet) and getting a source of regular water supply. Then mulching needs to be done; top quality seedlings have to be bought, stick support has to be provided to the young plants. Additionally, cow urine, cocopeat, good quality vermicompost and rice husk are needed to make the soil fertile enough to support the dense vegetation growth. About 150-250 workers have to be hired per day to undertake the plantation activities. In addition, managerial staff has to be hired to supervise the operations and to guide the whole process. All these activities need to be financed. To raise one sapling to the level of a tree, it costs Rs. 250 (\$3) in a large project, covering a few acres. If the project is small, the fixed costs will spread over a lesser number of trees so the cost per tree would increase. Usually about 16,000 trees are planted on an acre. Depending on the soil, it costs about Rs. 4,000,000 (\$48,352) per acre to grow a Miyawaki forest. Dr. Nair says that these are considered as economical rates; other organizations undertaking planting of such forests might charge more. Thus, the Miyawaki technique is capital intensive. It is expensive to grow a Miyawaki forest.

Acquiring the funding for afforestation: Akira Miyawaki, the botanist who invented the Miyawaki method, was the first one to make it economically viable. Miyawaki started studying the Shinto shrines in Japan as they still had some natural forests standing. Based on the list of native species of Japan, he developed his method of growing a forest. That time, Japan had already passed laws to make the companies compensate for the forests that they were cutting down. The industrialists invited Miyawaki to grow a forest for them. Thus Miyawaki grew forests with the funding from the industrialists. Most people who follow the Miyawaki method, try to have the same strategy [Akira Miyawaki Organization]. Dr. Nair said that they too depend on the Corporate Social Responsibility (CSR) funds for growing the forests. The companies feel good to use their CSR funds in a way that results in a tangible outcome – a standing forest. Additionally, the companies also get the carbon credits for these efforts. The land for the forest is typically not bought by the Forest Creators, it is taken on a three-year lease the gram panchayat, a village level elected government. Forest Creators ask for a waste land used for grazing, on which nothing is allowed to be built by law. More often than not, nothing much is growing on these lands. They are just barren waste lands. The village governments do not show much hesitation in giving their waste land because a standing forest brings many environmental benefits, including reduced pollution for the crops and more hopes for rains. Forest creators tell the village governments they have to bear no cost but they have to give an undertaking that the forest will not be cut. The CSR funds cover the whole budget: material cost, the labor cost, the cost of digging a

borewell, making the soil cultivable and the cost of supporting a managerial team. We are told that now many people have taken up forest creation as a profession in India because they get adequate returns from the CSR funding. It should be noted here that the economics would work out well only if the survival rate of the saplings is high. If it is just 70% or so, the forest growers would make losses because they have to show well grown trees of the number that the company had asked for. For Forest Creators, the survival rate is 97-98%. Therefore they do not have to suffer any losses.

Maintenance of the forest: Miyawaki forests do not require maintenance once they are three years old. For three years, they need to be watered regularly. That is why the availability of a reliable water source is a must for growing a Miyawaki forest. Once the forest has grown – in about three years – the soil and vegetation would hold the rainwater. As mentioned earlier, the Miyawaki forest is able to hold much more water than a traditional man-made forest. Therefore it does not need additional water supply. Weeding needs to be undertaken regularly only in the first year. Once the trees have grown above a few feet, the forest already becomes so dense that there is no room for the weeds to grow. A fence needs to be built so that animals and thieves do not damage the young forest.

Criticisms of the Miyawaki method: The Miyawaki method is relatively new. Hence doubts have been expressed regarding the longevity of these forests. Questions are also raised about the ability of these forests to maintain their diversity, and the rate of carbon sequestration over the long term. Concerns have been shown about the native and non-native species grown side-by-side to achieve diversity and rapid growth. It could disrupt or outcompete local ecosystems [Giseburt, 2023]. Critics also point at the limitation of the dense planting technique of the Miyawaki forests, potentially leading to weaker plants that can be susceptible to diseases and pests [Webber, 2022].

Dr Nair's NGO has been working since last 9 years and their forests have not seen any such attacks. Hence it can be safely assumed that the forests will last at least for 15-20 years.

Miyawaki plantations are very capital intensive, as shown in the above paragraphs. They require large amount of resources. It is questionable whether it is a practical solution for wide scale afforestation [Giseburt, 2023]. In sum, while the Miyawaki forest technique holds promise for ecological restoration, it is accompanied by a range of expert criticisms that underscore the necessity for thorough research, thoughtful implementation, and adaptive management strategies to ensure their lasting ecological integrity and sustainability.

Is this method easily replicable?

We find that many people have started planting Miyawaki forests all around the world. Some do it on a small piece of land while some have started growing trees on a large plot. Some have adopted it as their profession while some do it as a community activity. The funding methods of Akira Miyawaki (corporate funding) have also been widely used.

Thus the possibilities of adopting the Miyawaki method, especially for urban afforestation and for medium size plots, seem large. Even if the forests do not last for a long period, as some critics fear, they would generate only positive impact till they live.

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